ACEEE Appendices for Missoula Report Compiled Oct. 2020

Appendix A

Figure 2. Menu of Options

KEY									
Type of Tool			Building Stage				Feasibility Analysis		
Incentive-Based	Regulatory	Education	Blueprint	Construction	Operation	Next Life (Decon/Rehab)	Move ahead	Some reservations	Real difficulties

Tool Name	Other Possible Outcomes (in addition to more low-carbon buildings)	Implementation Lever	Could advance objectives of...	Legality	Cost	Momentum	Selected Precedents
Density Bonus	• Higher density • Tension with AH incentives	Zoning					Arlington, VA
	Qualifying projects can have more units than allowed in zoning. The increase in allowable units increases potential income for the developer, which can offset (and surpass) the higher costs that building beyond code may entail.						
Reduced Parking Requirements	• Less parking • Tension with AH incentives	Zoning					Flagstaff, AZ, Denver, CO, State of California
	Qualifying projects can provide fewer parking spaces than allowed in zoning. The decrease in required parking reduces development costs, which can offset (and suprass) the higher costs that building beyond code may entail.						
Relaxed Height Restrictions	• Taller skyline	Zoning					Arlington, VA
	Qualifying projects can build higher than allowed in zoning. The increase in height increases potential income for the developer, which can offset (and surpass) the higher costs that building beyond code may entail.						
Reduced Impact Fees	• Less $$ for new infrastructure • Tension with AH incentives	Municipal Code Section 15					Bernalilo County, NM
	Qualifying projects can pay reduced impact fee. The decrease in impact fees reduces development costs, which can offset (and surpass) the higher costs that building beyond code may entail.						
Property Tax Abatement	• Less $$ for general fund and city operations	New local government program					Cincinnati, OH
	Qualifying projects pay a reduced property tax for a set number of years. The decrease in property taxes reduces development costs, which can offset (and surpass) the higher costs that building beyond code may entail.						
TIF Funding Available	• Increased attention on TIF • Tension with existing TIF goals	State legislation passed					Chicago, IL
	Qualifying projects receive TIF funding. The increase in available financing reduces debt servicing costs, which can offset (and surpass) the higher costs that building beyond code may entail.						
Reduced Permit Fee	• Reduced $$ for Dev. Services	Fee Schedules Adjusted					San Diego, CA
	Qualifying projects pay reduced permit fee. The decrease in permitting fees reduces development costs, which can offset (and surpass) the higher costs that building beyond code may entail.						
Expedited Permit Process	• Stress on Dev. Services capacity	Development Services Staff Expanded					San Diego, CA
	Qualifying projects go through an expedited and streamlined permitting process, reducing uncertainty and waiting time. This decreases debt servicing costs, which can offset (and surpass) the higher costs that building beyond code may entail.						
Local Carbon Offset Fund	• Improved housing quality • Increased citizen engagement	Public Private Partnership					Ithaca, NY, Sitka, AK, Juneau, AK, Seattle, WA
	A local carbon offset fund can expand new financing sources and supplement existing residential retrofit programs. The public would be able to offset their own carbon footprints and accelerate low carbon building.						

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Tool Name	Other Possible Outcomes (in addition to more low-carbon buildings)	Implementation Lever	Could advance objectives of...	Legality	Cost	Momentum	Selected Precedents
Low Interest Rate Loans	• Greater engagement from financial institutions	Financing Institutions					Missoula, MT
Qualifying projects can access reduced interest rates on loan products. The lower debt servicing costs can offset (and surpass) the higher costs that building beyond code may entail. Clearwater Credit Union currently has a program.							
Bundled Loan Packages	• Greater engagement from financial institutions	Financing Institutions					Connecticut Green Bank
Qualifying projects can access bundled financial products. This decreases debt servicing costs, which can offset (and surpass) the higher costs that building beyond code may entail.							
Expansion of Design Excellence Overlay	• Greater low-carbon building expertise within Dev. Servs.	Zoning					Pittsburgh, PA, Missoula, MT
Amend current design excellence overlay to more holistically include the principles of low carbon building design. The current overlay encourages certain materials to be used over others, but this could be expanded.							
Disclosure Ordinance	• Increased data transparency	Local ordinance					Seattle, WA, Fort Collins, CO, and Philadelphia, PA (just a few)
Require projects to disclose their materials, embodied energy, energy use, and deconstruction plans via an online data portal. This accelerates market pressure for higher performance, as well as collects data to inform better decisions.							
Electrification Ordinance	• Increased focus on energy supply	Local ordinance					Berkeley, CA and San Jose, CA
No new projects are permitted to install natural gas hook-ups. This could be specified to a certain subset of buildings that are a certain size.							
Home Energy Label Ordinance	• Increased consumer awareness	Local ordinance					Minneapolis, MN
All home sales and rental leases must disclose the unit's energy report card at time of sale or lease.							
Green or White Roof Ordinance	• Increased public spaces • Decreased heat island effect	Local ordinance					Denver, CO
A green or white roof ordinance would require certain new construction projects to include a green or white roof for a portion or all of their roof to decrease cooling load during the summer.							
PACE Enabling Legislation		State legislation passed					In 37 states including Nevada, Utah, Colorado, and New Mexico
Property Assessed Clean Energy Programs, or PACE, allows a property owner to finance the up-front cost of energy or other eligible improvements on a property and then pay back the costs over time. It is attached to the property rather than the individual. First, Montana must pass PACE enabling legislation, which would allow counties to implement it. Northern Plains Resource Council is currently leading efforts to pass such legislation.							
Stretch Code Enabling Legislation		State legislation passed					Vermont, Massachusetts
Stretch code enabling legislation would allow municipalities to vote to adopt the Stretch Code (higher energy standards) in lieu of the base building energy code.							

KEY									
Type of Tool			Building Stage				Feasibility Analysis		
Incentive-Based	Regulatory	Education	Blueprint	Construction	Operation	Next Life (Decon/Rehab)	Move ahead	Some reservations	Real difficulties

Tool Name	Other Possible Outcomes (in addition to more low-carbon buildings)	Implementation Lever	Could advance objectives of...	Legality	Cost	Momentum	Selected Precedents
Adopt a Voluntary Stretch Code	• Increased community awareness • Increased expertise at Dev. Serv.	Local ordinance					Oregon, Massachusetts, Vermont, New York
Adopt a voluntary stretch code that new buildings may choose to adhere to rather than the base energy code.							
Promotion of Flagship Projects	• Increased community awareness • Marketing opportunity for leaders	Public private partnership					Sarasota, FL
Develop a recognition program for flagship projects, such as a story map, recognition placards, or a building tour (online or in person). The marketing campaign can serve multiple purposes, including community education, virtue signaling that this is a priority for Missoula, and recognition of project partners.							
One-Stop Shop	• Greater coordination	Public private partnership					Energy Trust of Oregon and Energy Works of Fort Collins, CO
The 1-stop shop approach makes energy efficiency more accessible for a larger portion of the population (commercial and residential) by simplifying a complicated process. It requires a strong partnership with the local utility.							
Voluntary Disclosure Map	• Increased community awareness • Marketing opportunity for leaders	Public private partnership					Seattle, WA, Fort Collins, CO, and Philadelphia, PA
A voluntary disclosure map creates market pressure for higher performance, as well as collects data to inform future decisions for building owners and operators, as well as policy makers. Climate Smart Missoula is currently developing this.							
Energy Savings Competition	• Increased community awareness	Public private partnership					Fargo, ND, Summit County, UT, Missoula, MT (previously)
An energy savings competition encourages owners and renters to reduce their energy consumption, all while building momentum and awareness at the ground level for greater energy awareness.							
On-bill financing	• More engaged utility	Public private partnership					North and South Carolina, Kentucky, Arkansas, and Kansas
Property owners can access the capital needed to finance energy efficiency or renewable energy and repay the loan via monthly payments that are added to the utility bill. The energy savings are automatically factored in to the repayment.							

Appendix B

Seattle Building Tune Up Accelerator - Deep Energy Retrofit Path

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ABSTRACT

This paper describes the implementation methods and initial results of a U.S. Department of Energy (US DOE) funded building-owner engagement and technical assistance process aimed at accelerating voluntary deep energy retrofits (20-50% carbon emissions reductions) in the existing medium-sized (approximately 20,000-100,000ft² (1,858-9,290m²) commercial building stock in Seattle, WA. Consistent with the City's climate goals (City of Seattle, 2013), in 2016 Seattle passed a mandatory Building Tune-Up requirement, focused on operational and maintenance improvements in non-residential buildings. This engagement with building owners and operators provided an opportunity to identify, plan, and document deep-energy retrofit project roadmaps and to document changes in energy use using measured energy consumption data reported by owners, which is mandated under the City of Seattle's Benchmarking program. This study covers three streams of research and implementation: (1) deep-energy retrofit project selection, (2) testing a process for energy-efficiency measure development, simulation, and savings estimates; and (3) owner engagement and ongoing monitoring of measured savings using building energy consumption derived from utility data.

Leveraging, the Tune-Up ordinance, and a suite of freely-available energy simulation tools including the Pacific Northwest-National Lab's (PNNL) Asset Score tool and the Northwest Energy Efficiency Alliance's (NEEA) SPARK tool, the research and deployment team seeks to develop a scalable pathway for creating custom technical and financial roadmaps for deep-energy retrofits that drive toward carbon-neutral operations. To encourage building owners to pursue deeper retrofit options beyond the tune-up, owners are offered, at no cost to them, targeted in-depth technical assistance and utility incentives. This suite of investments is anticipated to serve as a catalyst to motivate action over time, and generate an average of 20% energy savings per building during the 3-year program period.

This paper documents the method and results of this engagement, estimates savings potential using a simplified and detailed method for generating applicable energy efficiency measures, and offers lessons learned and proposed measures to increase adoption of deep energy retrofit measures in the existing commercial building stock.

1. INTRODUCTION

After extensive public engagement, in March 2016, The Seattle City Council passed Ordinance No.125002 to require commercial buildings 50,000 ft² (4,645m²) and larger to conduct a "building tune-up" (Seattle Municipal Code 22.930, 2016). Seattle Building Tune-Ups

(SBTU) aims to optimize energy and water performance by identifying low- or no-cost actions related to building operations and maintenance.

Seattle's Office of Sustainability and the Environment (OSE) developed and is implementing both the SBTU and energy benchmarking (Municipal Code Chapter 22.920, 2019), policies. SBTU was enacted to require a tune-up every five years for commercial buildings 50,000 ft² (4,645m²) or larger, starting in 2018. Although most buildings would likely need to "tune-up" the City specified several "Alternative Compliance" pathways to allow flexibility for owners of buildings with extremely low energy use, exemplary energy performance certification, or those that have recently completed a tune-up equivalent project.

Seattle's energy benchmarking ordinance, like those in many other cities in the United States, provides local building stock energy performance data that is foundational for research, programs, and policies. The benefits of energy benchmarking and disclosure are multi-fold including tracking and documentation of energy performance improvements, comparative analysis of similar building and climate typologies, inclusion of energy performance in the valuation of buildings, improvement in the persistence of energy savings measures, and assistance in crafting policy. These are well-documented in a publication by Cox, et al. (Cox, 2013).

1.1 Establishment of a municipal tune-up ordinance and the Seattle Tune-Up Accelerator

In 2016 the project team, led by the City of Seattle Office of Sustainability and Environment (OSE), and including the University of Washington Integrated Design Lab (UW IDL), Pacific Northwest National Labs (PNNL), and the Smart Building Center (SBC) received funding from the United States Department of Energy's (US DOE) Office of Energy Efficiency and Renewable Energy under its Buildings Program to develop a Tune-Up Accelerator (TUA) program. Seattle City Light, the local electric utility was a key partner, but received no Federal funding, rather their commitment was local matching dollars in the form of energy efficiency incentives directed to building owners. The Seattle Building Tune-Up Accelerator program development, delivery structure, and process is described in detail in a publication by Ballinger, Mallory, and Brown (Ballinger, et al., 2020)

Tune-Up Accelerator Program Path	**Benefit to Building Owner**	**Recruitment Goal**	**Potential Average Energy Savings**
Basic Tune-Up	Meet City requirement early and obtain incentive and additional technical support.	35-40 Buildings	10%
Tune-Up Plus	Basic Tune-Up plus additional energy savings identified by provider already visiting for tune-up.	35-40 Buildings	20%
Building Renewal (Levels 1, 2 and 3 outlined in section 2.1)	Basic Tune-Up plus opportunity for free technical support to develop a strategic energy management plan.	20-30 Buildings	35%

Table 1: Building Tune-Up Accelerator Program Paths, Goals, and Potential Energy Savings

The Tune-Up Accelerator was aimed at accelerating improving operational energy consumption in the existing medium-sized (approximately 20,000-100,000ft² (1,860-9,290m²) commercial building stock in Seattle, WA, as an incentive for owners in this heterogeneous cohort to meet the tune-up requirements early and receive incentives for doing so. The Tune-Up Accelerator had three program paths available to participants at varying levels of increasing depth of engagement and energy savings targets. These are outlined in Table 1. This paper focuses on the development, technical delivery, and results of the "Building Renewal" deep-energy retrofit path.

The tune-up process offers an opportunity to identify deep-energy retrofit projects, and a point of engagement with owners to learn about future improvement plans, such as end-of-life equipment replacement or major renovations. Furthermore, this engagement provides the opportunity to present a roadmap for future improvements that is customized to specific buildings. Leveraging building energy consumption disclosure data, a municipal ordinance mandating building tune-ups at five-year intervals, and a suite of freely-available energy simulation tools, the university-based research and deployment team seeks to develop a scalable pathway for creating custom technical and financial roadmaps for deep-energy retrofits that drive carbon-neutral operations.

2. LITERATURE REVIEW

Cities are responsible for over 70 percent of global energy consumption and CO2 emissions, mostly from buildings, and building renovations currently affect only 0.5-1% of the building stock annually (Architecture 2030, 2014). In 2006, the United States Energy Information Administration published the Commercial Building Energy Consumption Survey (CBECS) which documented energy use data from a broad range of existing non-residential buildings by typology and climate zone (CBECS, 2006, 2012). This data set has enabled the establishment of broadly accessible building performance rankings that allow for an existing or future building to be benchmarked relative to its median comparator building of similar type and location through tools such as the EPA ENERGY STAR® Portfolio Manager tool (EPA, 2020). Subsequently, many municipalities have encouraged or mandated the disclosure of energy consumption data for existing commercial buildings. The benefits of these programs have been well-documented (Keicher, et al., 2012) and include providing building owners with a "benchmark" from which to understand where their building ranks among similar properties, and to establish a shared methodology for goal-setting at the individual building level, and to inform and shape policy at a municipal level. A similar program in Australia (NABERS, 2017) requires energy labelling and disclosure for commercial buildings in excess of 10,000 ft² (1,000 m²). The impact of this on the commercial building sector over time has been detailed in terms of incentivizing improvements (Palmer et al, 2017) and regarding the policy landscape in Europe and the US (Burr, et al., 2010). Furthermore, standardization and transparency of energy consumption data can help identify and reduce gaps between modelled or predicted performance and actual energy end-uses, the existence of which has been written about with respect to residential buildings in the UK (Gupta, et al. 2015), for commercial buildings in the UK (Menezes, et al., 2012), and in the US (Frankel, et.al.,2008), (Torcellelli, et al., 2006) among others.

To meet carbon emissions reduction goals, many cities have sought to leverage energy transparency with improved goal setting and analytical tools to drive the implementation of energy retrofits in the existing commercial building stock. Programs in Boston, Chicago, London, Mexico City, Seoul, Shenzhen, and Tokyo have been documented by the C40 Cities

Climate Leadership Group (C40, 2017) as well as in New York City, Seattle, San Francisco, St. Louise, Salt Lake City, Los Angeles, Philadelphia, Atlanta, Austin, and many others (IMT, 2020).

The background and intent of the Seattle Building Tune-Up Accelerator Program has been described extensively by Ballinger, Mallory, and Brown (Ballinger et al., 2020) and establishes the context and framework of the larger program in which the work described in this paper is situated.

3. METHODOLOGY

During the required Basic Tune-Up assessment phase, tune-up service providers created a Building Energy Asset Score (DOE/PNNL, 2019) for each building for which an Asset Score was appropriate. The Building Energy Asset Score is a national standardized on-line tool created by the US DOE for assessing the physical and structural energy efficiency of commercial and multifamily residential buildings. Asset Score reports provided an additional assessment of retrofit potential in the buildings and the results were also used for inputs into a building deep energy retrofit screening, technical assessment, and financial analysis tool called SPARK (NEEA, 2019). SPARK is an automated web-based parametric energy simulation and financial analysis tool created by the Northwest Energy Efficiency Alliance (NEEA, 2020), a regional energy efficiency organization, in partnership with public universities and industry partners. This program auto-generates a technical and financial scope for deep-energy retrofits that target 30-50% energy savings in commercial building typologies.

3.1 Implementation Strategy

Using energy benchmarking data reported to the City of Seattle, building information collected by tune-up service providers through a US DOE supported building asset rating tool, Asset Score, and the SPARK technical and financial analysis web-tool, along with targeted custom EnergyPlus (Guglielmetti, et al. 2011) analysis, the project team provided direct technical assistance to building owners and tune-up service providers in support of project-specific retrofits. These were delivered at three levels of engagement depth depending on project opportunities identified: (**Level 1**) Automated SPARK web tool evaluation that generated a building-specific report that provided financial and technical recommendations to the building owner; (**Level 2**) Level 1 activities, plus building walk-through with the university-based technical team that presented specific recommendations for implementation; and, (**Level 3**) Level 2 activities, plus custom EnergyPlus analysis and technical recommendations for a pathway to carbon neutral operations including a building-integrated renewables plan. The process of project selection, data collection, evaluation, energy/financial analysis, and owner outreach are described in the sections below.

3.2 Building data analysis and targeting

Using municipal records and required annual energy benchmarking data, about 400 mid-size commercial buildings were identified as subject to the mandatory tune-up ordinance. Of these, 102 buildings voluntarily enrolled in the Tune-Up Accelerator program. From that sub-set, 35 were identified as potential candidates for deep-energy retrofits based on project typology, scale, and current energy consumption. These projects were selected to reflect high energy savings potential (energy use intensity (EUI) greater than 55 kBtu/ft²-yr (173 kWh/m²-yr), buildings likely to remain for the next 15 years, and that represent a cross-section of project typologies deemed informative to the City of Seattle's future policy direction.

The Level 1 workflow for making deep energy retrofit recommendations to owners was carried out in six key steps: (1) collect building condition and system information from Asset Score rating tool (as submitted by service providers); (2) collect corresponding energy consumption (electricity, natural gas, etc.) data from the Seattle Energy Benchmarking data set; (3) report building characteristics, system vintages, and energy data into the SPARK tool; (4) SPARK auto-generates an optimized energy efficiency measure, scope of work, and estimated energy and cost savings using EnergyPlus and a measure costing table; (5) SPARK auto-generates a business case for the retrofit; and (6) The SPARK report is packaged and submitted to the building owner.

3.3 Field data and public disclosure data collection

Tune-up service providers were required to submit an Asset Score report using an on-line web-form. Per the US DOE's Asset Score website, the tool is a "national standardized tool for assessing the physical and structural energy efficiency of commercial and multifamily residential buildings." Through a set of standardized inputs, tune-up service providers enter building information about a building's: geometry, use types, construction assemblies, lighting, heating, cooling, water heating, operations, and estimated equipment vintages.

The Seattle Energy Benchmarking website contains recent utility data for most commercial buildings in the City of Seattle. The website includes three years of data pertaining to each building's annual and space normalized greenhouse gas emissions (GHG), EUI, electricity/gas consumption (in Btu and percentage), EPA ENERGY STAR rating, and comparison to the average of similar buildings. This data is the source of energy consumption inputs for the SPARK tool.

3.4 Project Qualification

The SPARK tool includes a "Quick-Screen" questionnaire to identify whether a building is an appropriate candidate for a deep energy retrofit. In general, suitability reflects buildings with high energy use (>55 kBtu/ft²-yr (>173 kWh/m²-yr)), that were built prior to 1996 (and the adoption of contemporary energy codes), and have poor envelope performance. Further sub-qualifications include buildings that were not likely to be demolished in the next 10-15 years, and those with opportunities for financial re-positioning. Since these latter factors were generally unknown to the project team, standardized inputs were adopted.

3.5 Simulation-based energy efficiency measures and financial analysis (Level 1)

For buildings that are deemed appropriate in the Quick Screen, the user is prompted to enter building address, size, primary HVAC system type (VAV, hydronic, heat-pump, etc.) and leasable area. This is followed by inputs related to energy use including the primary heating fuel, annual electrical consumption (kWh), gas consumption (therms), and instances of unique energy consuming equipment (ex. data center). Next, the user selects system descriptions including age and type of envelope/glazing, lighting and controls, plug-load management, and building-level and central plant HVAC (based on the system type). Finally, metrics about business performance are collected including percent vacant, stabilized vacancy rates, 10-year lease rollover, and the capitalization rate.

3.5.1 SPARK tool automated energy efficiency measure development

Using building input characteristics, the SPARK tool selects a pre-created EnergyPlus model adapted from US DOE reference models. Next, the tool assembles "bundles" of energy efficiency

improvements using the EnergyPlus Parametric Analysis Tool (PAT) (Parker, et al., 2014). SPARK then selects the best results to create an optimized measure package and reports the energy simulation data to calculate savings from the baseline (actual) energy consumption. A conceptual outline of the measures is described in the table below.

Measures	**Baseline**	**Upgrade**
Wall Insulation	U=0.17 (U=0.96 W/mK)	U=0.06 (U=0.34 W/mK)
New Windows	U=0.621 (U=3.52 W/mK) SHGC =0.41	U=0.3 (U=1.70 W/mK) SHGC =0.28
Envelope Sealing	0.5 ACH nat	0.25 ACH nat
LPD Reduction	1.5 W/ft² (16 W/m²)	0.6 W/ft² (6.4 W/m²)
Perimeter Daylighting	No sensors	Daylight sensors added
Comprehensive Lighting Control	No sensors	Occupancy sensors simulated through schedule changes
LED Task Lighting	Plug loads defined at (1.5W/ft²) 16 W/m²	Reduction in plug loads by 0.1W/ft²) 1W/m²
Occupancy Sensor Controls	Plug loads defined at (1.5W/ft²) 16 W/m²	Reduction in plug loads by20%
Optimized Controls (DDC)	Original Setpoints	Setpoints expanded by 1oF in each direction
VFD on Chilled Water Loop	Const. Speed Pump	Var. Speed Pump
VFD on Hot Water Loop	Const. Speed Pump	Var. Speed Pump
New Boiler	82% Efficient	93% Efficient
Chiller Retrofit	COP: 4 ; Min. PLR: 0.2	COP: 5.2 ; Min. PLR: 0.2
Chiller New	COP: 4 ; Min. PLR: 0.2	COP: 5.8 ; Min. PLR: 0.1

Table 2. Overview of SPARK energy efficiency measures. (Adapted from Woods, et al. 2016)

3.5.2. *SPARK tool automated financial analysis*

SPARK calculates construction cost data for the measures included in each scenario on a net area basis, per measure, and combined into a total project cost that includes general conditions, contractor mark-up, and taxes. Using the estimated energy savings, projected utility conservation incentives, capitalization rate, current vacancy rate (if non-owner occupied), lease rate, and projected asset appreciation, SPARK generates a financial analysis using a methodology developed by Molly McCabe of the strategic real estate advisory firm Hayden Tanner (Hayden Tanner, 2020). SPARK users have the opportunity to refine these numbers using slider-bar adjustments to further customize results, which are presented as initial capital required, net present value (NPV), and internal rate of return (IRR). Highlights from this analysis are presented in Figure 2.

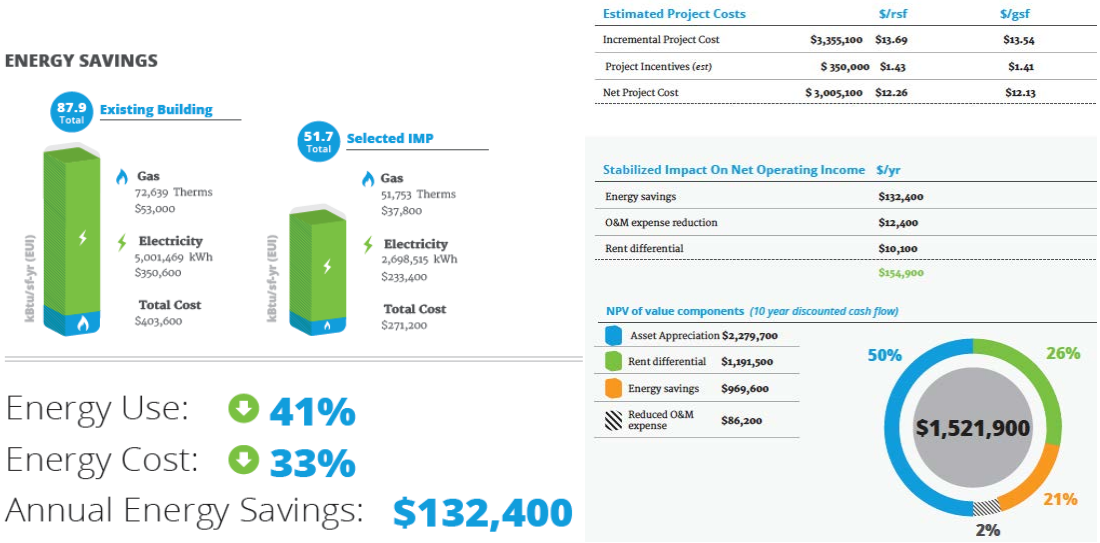

Figure 2. SPARK report partial excerpt of financial and energy analysis.

3.6 Reporting and Outreach

The SPARK tool generates a custom report that includes a general description of deep-energy retrofits, energy savings, project scope, cost, and financial analysis data described above. This report is provided by the City to the building owner, with an offer to follow up with technical assistance to interested owners, under Level 2 support.

3.7 *"Analog" measure Package Development (Level 3)*

To create comparison cases and to test our methodology, the authors conducted "analog" deep energy retrofit analysis on five Level 3 buildings. These were selected because the owner proactively indicated interest in doing a deep-energy retrofit, and the type and vintage was representative of a significant portion of the Seattle building stock. This process included a conventional building audit, walk-though, and the development of a manually produced calibrated baseline energy model using the Open Studio interface to EnergyPlus. Then several bundles (synergistic groups) of measures of varying depths were produced that could be implemented over time, along with an on-site renewables plan for net-zero energy and/or carbon neutral operations. This data was presented to owners for implementation. These projects are intended to become case-study roadmaps for owners with similar buildings.

4. RESULTS

As noted earlier, eleven mainly office buildings were sent Level 1 SPARK reports as part of the Assessment phase Building Renewal Recruitment outreach. No building owners chose to participate in the Level 2 offering. The Level 3 custom deep energy retrofit analysis was conducted by the UW IDL technical team on five buildings in close collaboration with the building ownership and operations team. This section details the process and findings from the Level 1 and Level 3 Building Renewal paths.

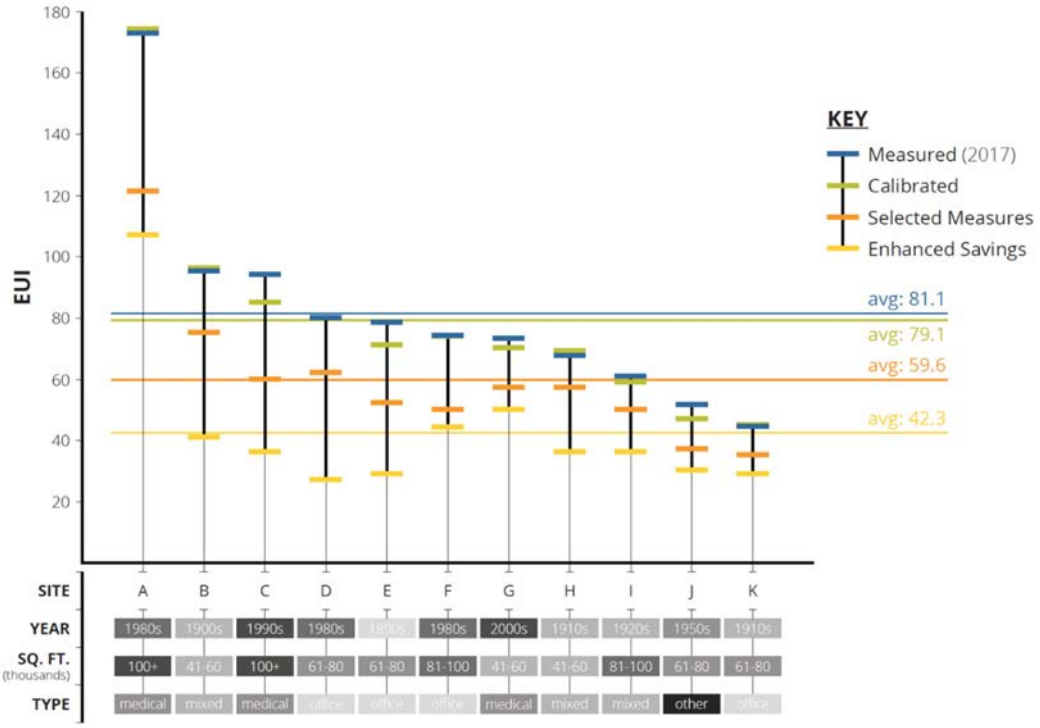

Figure 3: Level 1 baseline energy consumption with projected savings.

4.1 Level 1 Results

In total, thirty-eight (38) Level 1 reports were generated, with any reports indicating a positive net present value (NPV) issued to the building owner and service provider. A total of eleven Level 1 projects met this threshold. A description of the baseline/actual energy consumption, the cost optimized savings and energy-optimized (enhanced) savings of Level 1 projects is detailed in Figure 3. "Selected Measures" were auto-generated by SPARK to meet a savings target of at least 35% at the lowest possible total cost. "Enhanced Savings" measures were auto-generated by SPARK to maximize total energy savings.

The completed Asset Score reports submitted by the service providers, combined with readily available information about the property, enabled relatively quick generation of SPARK simulations and reports. Given the nature of the SPARK tool as a financial and technical analysis tool with predetermined savings targets (35% and 50% respectively), most of the energy savings results fell in these ranges. Office buildings built between the 1970s and 1990s showed the greatest total savings as well as the highest percentage of savings. The potential greenhouse gas (GHG) emissions reduction was dependent on whether the building used natural gas as a heating fuel. In the cases where Level 1 SPARK reports were used as a starting point for Level 3 detailed analysis, the SPARK tool provided measure recommendations (lighting upgrades, pump replacements, etc.) like those ultimately selected in the custom process.

Level 1 reports, though useful as a screening tool, did not generally result in direct engagement on Building Renewal projects. Anecdotally, there was feedback that simply complying with the Tune-Up Mandate was a primary concern, and that going beyond the current tune-up requirement was not an immediate priority. It is unknown if the building owners have used the SPARK reports for any future planning, or whether it provided education or influence

on the economic or technical potential of future building investments. Evaluating this impact via survey or other outreach method was beyond the scope of this project.

4.2 Level 3 Results

The five Level 3 buildings were all accepted for participation because the owner proactively indicated interest in doing a deep energy retrofit, and the type and vintage was representative of a significant portion of the Seattle building stock. This process included a conventional building audit, walk-though, and the development of a manually produced calibrated baseline energy model using the Open Studio interface to EnergyPlus. Then several bundles (synergistic groups) of measures of varying depths were produced that could be implemented over time, along with an on-site renewables plan for net-zero energy and/or carbon neutral operations. This data was presented to building owners or managers and the Tune-Up Specialist via a detailed report. One of the Level 3 projects was developed as a case study and will be shared with building owners for recruitment into potential future programs, such as the Retrofit Accelerator described in the "Discussion" section below.

The Level 3 program targeted an initial first-year average of 20% direct reduction in energy consumption (gas and electricity) from participating buildings and presented implementation packages that could result in energy savings upwards of 50% or more if implemented overtime (typically 10-15 years). Figure 4 and Table 3 summarize the energy savings for each building. These savings, if implemented, could be verified via required annual energy consumption disclosure data, collected through the utility meter. Recommended measures were documented, along with expected future projected building EUI estimates for up to four implementation packages.

Implementation packages were generally built around the following structure:

- **Measure package 1 (O & M):** Focuses on operation and maintenance measures already identified, and a DDC expansion or complete DDC retrofit where needed.
- **Measure package 2 (Load reduction):** Focuses on retrofitting lighting, envelope, and plug load management.
- **Measure package 3 (Mechanical system improvements):** Improves the performance of selected or out-of-date HVAC systems.
- **Measure package 4 (Electrification/operational carbon reduction):** Replaces the gas-fired heating (space and/or DHW) and/or process steam equipment with a heat-pump-based system for heating and cooling.
- **Renewables:** Provides a concept-level plan for sizing and locating on-site photovoltaic equipment and/or solar-thermal water heating systems sized to deliver net-zero energy operation.

Five (5) detailed Level 3 projects were completed and are anonymized for this paper:

- **Medical Office Building ("A")**: The medical office building analyzed is approximately 100,000 square feet and about 45 years old. Excluding renewables, an energy savings potential of 51% was identified with all measures included.
- **Mixed-Use Office ("L")**: The mixed-use financial office building analyzed is approximately 40,000 square feet and about 25 years old. Excluding renewables, an energy savings potential of 46% was identified with all measures included.

- **Hotel ("M")**: The hotel building analyzed consists of 2 wings; one that is about 60 years old and has approximately 40 guest rooms, and a newer addition that is about 30 years old and has approximately 60 guest rooms. Including savings associated with an on-site swimming pool, a savings potential of 50% was identified.
- **K-12 School ("N")**: The first K-12 school building analyzed is approximately 60,000 square feet and about 70 years old, though several renovations have been completed. Excluding renewables, an energy savings potential of 36% was identified with all measures included.
- **K-12 School ("O"):** The second K-12 school building analyzed is approximately 75,000 square feet and is originally about 100 years old, though a major addition was completed in the 1950s. Excluding renewables, an energy savings potential of 35% was identified with all measures included.

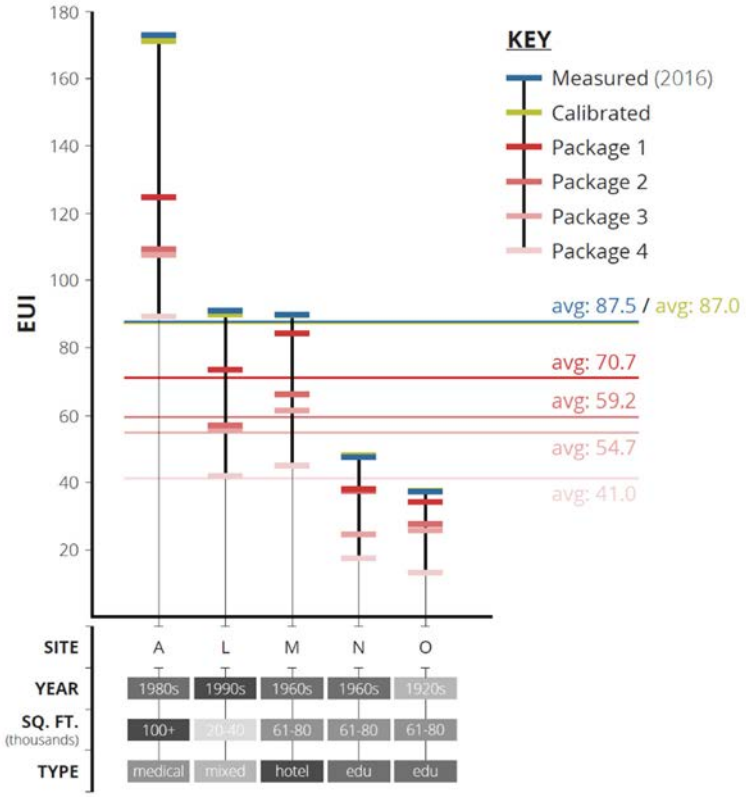

Figure 4: Level 3 baseline energy consumption with projected savings.

The energy efficiency packages were structured to deliver synergistic, cumulative savings with the intent of leveraging load reduction and expanded building controls capabilities to enable smaller and/or more energy efficient DHW, heating, cooling, and ventilation systems. Furthermore, measures were coordinated with capital investments that were in-progress, planned, or would be part of end-of-life equipment replacement. The complete packages typically represented investments over a 10- to 15-year timeframe corresponding with the owners' long-term capital plan for the building.

Building Area (SF x 1000)	TUA Building Name	Seattle Benchmark Site EUI (kBtu/SF/yr)	Package 1		Package 2		Package 3		Package 4	
			EUI	% Savings	EUI	% Savings	EUI	% Savings	EUI	% Savings
100+	"A"	173	124	28%	109	37%	107	38%	89	49%
20-40	"L"	91	73	20%	57	37%	55	39%	42	54%
61-80	"M"	90	84	6%	66	26%	61	32%	45	50%
61-80	"N"	47	38	19%	37	21%	24	49%	17	64%
61-80	"O"	37	34	9%	27	27%	26	30%	13	65%
Average EUI / % Savings			**71**	**16%**	**59**	**30%**	**55**	**38%**	**41**	**56%**

Table 3: Annual Projected Energy Use Intensity and Savings Percent for Level 3 Building Renewal.

For the five projects where the owners were provided with detailed evaluation and analysis, the identified energy savings potential was significant. These are detailed in Table 3, but generally averaged about 16% for operations and controls upgrades and well over 50% for full implementation of the complete package recommendations.

The “Package 4” measures converted most of the buildings from fossil fuel sources to all-electric heat pumps for space heating and domestic hot water. These measures tended to have the greatest impact on greenhouse gas emissions reductions, however, emissions reductions were found for nearly all packages and buildings. As indicated in Table 4 below, all but one building (Hotel “M”) was provided with a technical pathway to net-zero carbon operations by transitioning to all-electric operations. Furthermore, all but the hotel were determined to have enough site area for solar photovoltaics to meet net annual energy use.

Building owners (or usually their manager representative) were, when engaged, very receptive to Level 3 assistance and provided significant collaboration and feedback to identify specific energy efficiency measures and their potential implementation. These building owners typically were proactively interested in deeper levels of energy savings and had previous experience working with the City or the utilities on energy retrofit projects. Of the five Level 3 projects completed, all of them have implemented some of the capital measures recommended within the project period, except for the 4-story hotel that will likely be torn down in the next five years and replaced with a larger building. This change was due to the owner’s reaction to a recent zoning change which “up-zoned” the neighborhood to 40 stories.

Given the anticipated timeframe of Strategic Energy Plan implementation, there is insufficient time within the DOE award period to comprehensively evaluate direct energy savings from the Building Renewal component. However, OSE and UW IDL will track direct savings with Portfolio Manager on an ongoing basis. Further, by delivering direct technical assistance and documenting project-specific services delivered, outcomes, and lessons learned, using broadly available tools and best practices, replicable implementation guidelines will be developed for jurisdictions with benchmarking information who aim to use energy transparency data to take targeted action for carbon emissions reductions in future projects aimed at the existing commercial building market.

Building Area (SF x 1000)	TUA Building Name	Type	Seattle Benchmark Emissions (MT CO2e)	Package 1 (MT CO2e)	Package 2 (MT CO2e)	Package 3 (MT CO2e)	Package 4 (MT CO2e)
100+	"A"	Medical	454	138	275	272	454
20-40	"L"	Mixed-Use	88	1	31	38	88
61-80	"M"	Hotel	205	0	65	65	125
61-80	"N"	Education	120	31	24	72	120
61-80	"O"	Education	113	2	25	30	113
						Total Emissions (MT CO2e)	**900**

Using US EPA's direct emissions factor for natural gas (0.0053 MT CO2/therm).* ***https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references**. Indirect electric emissions, which are nearly carbon neutral for City Light due to 100% hydroelectric power with only occasional offsets for peak purchases were not includes in the UW IDL analysis.*

Table 4: Annual Projected Direct* Greenhouse Gas Emissions Reduction (GHG).

5. DISCUSSION: FUTURE DEVELOPMENT AND LONG-TERM OWNER ENGAGEMENT & ASSISTANCE

With the new Washington State building performance policy passed and a potential Seattle building performance policy in development, current attention is focused on understanding what processes, resources, and roles are required to accelerate market compliance. The Tune-Up Accelerator (TUA) experience suggests that early incentives and technical support are critical – and the support needed for the deep retrofits to meet these policies will be far greater than what was needed for TUA or the current SBTU mandate. SBTU and TUA are strong engagement models though and OSE's experience with them should be leveraged. Furthermore, small updates to SBTU data collection and outreach (as described above) would begin to prepare building owners and Tune-Up Specialists to think and plan more strategically for upgrades beyond "replace when broken."

Seattle commercial buildings over 50,000 ft² (4,645m²) will be required to comply with the new Washington State energy performance mandate beginning in 2026. However, applications for State incentive funding for early compliance will be accepted starting July 2021. With a limited amount of state funding available ($75 million), it behooves owners to start project planning and budgeting as early as 2020 and OSE wants to accelerate that effort.

OSE proposed a "Retrofit Accelerator" development project to SCL, working in partnership with UW IDL, to design and pilot a program that will accelerate market preparedness and move building owners towards greater efficiency sooner. OSE received a funding commitment from SCL for this work in 2020 and additional funding from Institute for Market Transformation to draft a building owner financing program.

As a first step, OSE will work to identify buildings with EUIs worse than the State performance threshold to find owners needing the greatest level of support, e.g. non-profit owners and/or buildings with WMBE businesses. The Program will seek to engage 2-3 buildings

in a pilot, building on our work through the TUA Building Renewal scope. This effort will grow OSE and SCL's understanding of the market's needs to meet the WA State BPS requirements and Seattle's goal of highly efficient, carbon neutral buildings. Outcomes will present a draft of framework and plan, as well as estimate funding needed to bring a Retrofit Accelerator pilot to scale.

Seattle's and other cities efforts to enact performance standards are rapidly changing the policy landscape. Our market work through TUA and our survey results show that many mid-size building owners want energy-efficient and climate friendly buildings—but funding, technical understanding and the time to engage with service providers are major barriers. Innovative and equitable support programs that break down these barriers are critical to success.

ACKNOWLEDGEMENTS

This work was funded by the US Department of Energy (DOE) Office of Energy Efficiency and Renewable Energy (EERE) Award #DE-RR0007556 and a matching grant from The Northwest Energy Efficiency Alliance (NEEA). We are grateful for their support without which this project would not have been possible. The authors would like to thank Prof. Renee Cheng and Prof. John Schaufelberger, Deans of the University of Washington College of Built Environments and Associate Professor Brian McLaren, Chair of the Department of Architecture for their ongoing support of this project. We would additionally like to thank the University of Washington Integrated Design Lab for space and operational support.

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Appendix C

Scaling Commercial Building O+M – Initial Results from Mandatory Building Tune-Ups in Seattle

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ABSTRACT

The City of Seattle's Building Tune-Ups policy is one of the few policies in the nation that requires existing commercial buildings to take specific actions in their building to save energy. In a city with carbon neutral electricity, focusing the tune-up on HVAC operations and maintenance maximizes the carbon impact of the energy savings and can save an estimated 10% to 15% on energy bills without significant capital investments if implemented correctly. Over the past three years, we've taken the initial policy framework and made it a reality – staffing up, building out IT systems, executing a strategic communications plan, training the local workforce, coordinating action with the voluntary Building Tune-Up Accelerator Program, preparing for impact analysis – and adapting along the way through early evaluation. The results were a first-year compliance rate for the largest buildings of over 95% and over 300 tune-ups conducted across the city in total. This paper highlights the main elements of successful early program implementation, identifies lessons learned, reports on key performance indicators, and discusses how this policy fits in the larger framework of Seattle's Climate Action Plan. It then offers recommendations to inform similar policies and programs in other jurisdictions given the current landscape of existing building energy efficiency and decarbonization policies.

Background

Seattle's residential and commercial buildings account for just over a third of the city's core greenhouse gas emissions.[1] In 2011, Seattle adopted a bold climate goal for our city to become carbon neutral by 2050 and over a two-year collaborative process developed a Climate Action Plan that set a target of reducing building sector emissions by 39% by 2030 and 82% by 2050 over a 2008 baseline (City of Seattle 2013). Around the same time, Seattle's Office of Sustainability and Environment (OSE) began implementing one of the nation's first mandatory benchmarking policies to require building owners, operators, and managers to track their buildings' energy performance and allow for easier identification of opportunities for improvement. From this policy context, Seattle decided in 2015 to become one of the first cities in the nation to regulate building energy use within existing commercial buildings and began developing the Seattle Building Tune-Ups policy (City of Seattle 2019), adopted into Seattle Municipal Code in 2016.

[1] Seattle's municipal electric utility maintains a carbon neutral electric grid, which leads to a smaller percentage of emissions from buildings compared to transportation than most other major cities. See seattle.gov/environment for the latest inventory.

Beyond Benchmarking

Seattle's Climate Action Plan included both near- and long-term actions to lower greenhouse gas emissions. In the building sector, a near term action included requiring building energy audits for the largest and least efficient commercial and multifamily buildings to help identify cost effective improvements. By 2014, while regularly benchmarked buildings had shown a modest reduction in existing building energy use and Seattle's GHG inventory revealed reductions in our residential building sector, commercial sector emissions reductions tracked well behind the Climate Action Plan targets.

Recognizing Seattle would need additional policies to meet our commercial sector emissions targets, an extensive research and stakeholder engagement process was launched. Audit policies in New York City and San Francisco were reviewed as potential approaches for the Seattle market along with Pacific Northwest National Lab's (PNNL) Re-tuning™ program. In parallel, researchers were analyzing early policy results and determining that benchmarking policies were foundational yet limited in their ability to generate savings while audit policies were not demonstrating substantial savings (Hsu 2014).

Seattle ultimately designed a policy that would deliver near term energy and emissions reductions at a low cost for building owners with typical payback timeframes of 1-3 years. This option was prioritized over more costly ASHRAE Level II audits that would not require implementation of energy reduction measures. Seattle adapted its policy approach from PNNL's Re-tuning research and retro-commissioning programs to create a first of its kind building tune-up regulation (PNNL 2019). Tune-ups aim to optimize energy and water performance by identifying low- or no-cost actions related to building operations and maintenance, that can generate 10-15% in energy savings, on average. The Building Tune-Ups Ordinance was adopted in March 2016 under Seattle Municipal Code SMC 22.930 and compliance specifications were detailed in OSE Director's Rule 2016-01, published January 2017 (OSE 2017).

What is a Seattle Building Tune-Up?

Building Tune-Ups involve assessment and implementation of operational and maintenance (O+M) improvements to achieve energy and water efficiency. Examples of operational fixes include changes to thermostat set points or adjusting lighting or irrigation schedules. Tune-ups also review HVAC, lighting, and water systems to identify needed maintenance, cleaning, or repairs - for example replacing faulty sensors or fixing problems with an economizer. According to PNNL's research on the Re-tuning program, the approach can yield 10-15% in average energy savings when implemented correctly (Fernandez et al. 2017).

Tune-Up Specialists Lead the Process

Building Tune-Up assessments, verified corrections, and reporting must be done by a qualified Tune-Up Specialist, a designation OSE developed through the policy development process to leverage one of seven existing building energy training or certification programs, as shown in Table 1.

Table 1. Building Tune-Up Certification Options

Certification	Certified/Licensed By
Professional Engineer (PE) in mechanical or architectural engineering	Washington State Department of Licensing per WAC 196-27A-020(2)(d)
Building Operator Certification (BOC) Level II	Northwest Energy Efficiency Council (NEEC)
Certified Energy Manager	Association of Energy Engineers (AEE)
Certified Commissioning Professional (CCP)	Building Commissioning Certification Board (BCCB)
Commissioning Authority (CxA)	AABC Commissioning Group (ACG)
Existing Building Commissioning Professional (EBCP)	Association of Energy Engineers (AEE)
Sustainable Building Science Technology Bachelor of Applied Science (BAS)	South Seattle College (SSC)

In addition to one of the certifications, a Tune-Up Specialist must have seven years of relevant energy education or experience and fill out an OSE Tune-Up Specialist Application which OSE uses to verify certifications.[2] Once a building owner has identified a Tune-Up Specialist to do the work, the tune-up process includes six main steps:

Tune-Up Specialist Registers. Tune-Up Specialists must create an account in the Seattle Services Portal and register as a Tune-Up Specialist by providing certification information such as license numbers and certification expiration dates. OSE reviews all Tune-Up Specialist applications to confirm the individual meets the required qualifications. Only approved Tune-Up Specialists are permitted to submit Building Tune-Ups.

Conduct a Building Assessment. The Tune-Up Specialist collects data on building systems and operations, including high-level building audit data, summary data on type and condition of HVAC systems, and a review of benchmarking and water data. The assessment is comprised of 39 prescriptive assessment elements across five focus areas: HVAC systems and controls, lighting systems and controls, domestic hot water, water usage, and the building envelope.

Identify Corrective Actions. Through the building assessment, the Tune-Up Specialist will identify required operational and maintenance improvements to the building and report these back to the building owner. If a deficiency is found, the Tune-Up Specialist must identify a fix for the deficiency, called a corrective action. Some corrections are required and must be implemented while implementation of voluntary corrections is optional. Both the assessment and corrections are heavily weighted towards building heating and DHW systems, which in Seattle often use natural gas, our most carbon-intensive energy source.

Implement Corrective Actions. After the assessment, the Tune-Up Specialist shares their findings with the building ownership and will discuss options for implementing the corrections.

[2] The Northwest Energy Efficiency Council (NEEC) maintains a directory of qualified Tune-Ups Specialists at www.neec.net. The City of Seattle cannot make any recommendations or referrals.

Implementation of the corrective actions may be completed by the Tune-Up Specialist or someone else qualified to do so, such as in-house facility staff or another vendor.

Verify Changes. The Tune-Up Specialist verifies that all corrected equipment and systems are functioning as intended, and that all identified required corrective actions have been adequately addressed.

Report to the City. The Tune-Up Specialist must complete the Seattle Building Tune-Ups Summary Report, review with the building owner, and submit to the City for review.

This process typically takes three to twelve months, depending on a variety of factors, including (1) how difficult it is for the Tune-Up Specialist to access tenant spaces, (2) how complex the building is, (3) how many corrective actions need to be implemented by the ownership, (4) how engaged ownership is, and (5) how much back and forth is required in the Tune-Up report review.

Who Has to "Tune" and When?

Building Tune-Ups are required every five years for buildings with 50,000 square feet (SF) or more of non-residential space, excluding parking. This translates to just over 900 of the largest commercial buildings in Seattle. To support building owners and allow for a more manageable implementation schedule, compliance deadlines were phased in by building size in four cohorts beginning in early 2019, as shown in Table 2.[3]

Table 2. Building Tune-Up Cohorts

Cohort	Building Size Range	Tune-Up Deadline	Buildings
1	200,000 SF+	3/1/2019	180
2	100,000 – 199,999 SF	10/1/2019	275
3	70,000 – 99,999 SF	10/1/2020	176
4	50,000 – 69,999 SF	10/1/2021	266

Although most buildings achieve compliance by conducting a tune-up, building owners have the choice of more than ten alternative compliance pathways or can apply for a waiver or extension in limited circumstances. The alternative compliance options were designed to try and recognize that many building owners are already making investments to save energy – and that could show up in an exemplary energy performance certification or evidence of a recently completed a tune-up equivalent project.[4] For buildings permitted to be demolished, undergoing a major renovation, or in extreme financial distress, owners can apply for a waiver for a five year tune-up cycle, but will need to comply in subsequent cycles. And under limited circumstances building owners can apply for a one-year extension, including a change of ownership within one year of the deadline, high vacancy rates, permitted mechanical improvements, or if more time is

[3] The first deadline for private sector buildings was originally 10/1/2018 but was moved back due to delays in the online compliance portal launch.
[4] See www.seattle.gov/buildingtuneups for a full list of compliance options.

needed to demonstrate a 15% EUI reduction through the EUI Reduction alternative compliance pathway.

Non-compliance leads to two potential fines, the first issued 180 days after the deadline and the second issued 360 days after the deadline, which vary in amount based on building size.[5] This creates a six month "grace period" for building owners to complete and submit their tune-ups before any fines are assessed and another six months following a smaller fine to comply. The use of grace periods and a smaller initial fine are designed to encourage compliance, giving building owners and their representatives time to finish the tune-up rather than receiving a large initial fine.

Standing Up an Innovative Policy

Beginning in late 2016 as the policy process wrapped up, OSE's Benchmarking team took on implementation of the policy and outlined an approach focused on building an effective outreach and communications strategy alongside efforts to develop compliance systems. Below we outline some of the key steps we took rolling out this new policy followed by some of the key lessons we learned that might be relevant to other jurisdictions.

Leading (and Learning) by Example

The Seattle City Council passed a companion resolution in early 2016 requiring tune-ups in City-owned facilities and guidelines for energy efficient asset preservation (Seattle City Council 2016). OSE was directed to coordinate and implement periodic tune-ups through its citywide Resource Conservation Management Initiative.[6] To lead by example and generate lessons learned for the market, the largest municipal facilities were required to complete tune-ups one year in advance of the private market. Serving as a process and implementation 'guinea pig', the City of Seattle worked with local providers to establish standard protocols and conduct assessments on a subset of large buildings across four departments.

Accelerating Tune-Ups: Scaling Up Local Expertise

Development of an existing building energy efficiency mandate creates a double-edged sword – while policy can move an entire market to required action, bringing along everyone from innovators to laggards, an unintended consequence is limited or prohibited incentive funding. In many jurisdictions, utilities are unable or hesitant to provide incentives if they are merely helping owners meet an existing code baseline, such as the Building Tune-Up mandate.[7]

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[5] The first fine ranges from $2,000 - $5,000 and second fines from $8,000 - $20,000, depending on the buildings size. See seattle.gov/buildingtuneups for detailed violation information.

[6] To improve resource efficiency across the City of Seattle's building portfolio, the Office of Sustainability and Environment coordinates a citywide Resource Conservation Management Initiative. In 2013, the City adopted a Resource Conservation Management Plan to centralize resource use monitoring and to coordinate with capital departments to build on their existing efforts to improve the efficiency of City facility operations.

[7] See Seattle Municipal Code Title 22 "Building and Construction Codes" Chapter 22.930 for Tune-Ups code language.

To address this issue, utilities are exploring ways to exceed new regulations or to help owners comply in advance of mandated compliance deadlines.

Seizing on this approach, OSE partnered with Seattle's municipal electric utility, Seattle City Light, to seek funding from the U.S. Department of Energy (DOE) to support "mid-size" buildings (approximately 50,000 - 100,000 SF) to meet the tune-up requirements early. The resulting Building Tune-Up Accelerator (TUA) Program not only aided owners of smaller buildings but also jump-started training of local energy service providers.[8] The program required a mandatory training to qualify as a Tune-Up Specialist and participate in the pilot. Partners at the University of Washington Integrated Design Lab, Smart Buildings Center, and Pacific Northwest National Lab (PNNL) offered a series of multi-day service provider trainings, scaling up local expertise and providing a training approach for the Tune-Up mandate to follow. Early adoption also presented an opportunity to uncover implementation issues. Areas of confusion or scenarios that required policy interpretation helped set precedent for the mandated market. The Accelerator program successfully worked with owners of 102 buildings to attain early compliance while allowing these smaller buildings an incentive of up to $0.12 per square foot (City of Seattle 2020).

Operationalizing the Checklist and Reporting Infrastructure

After passage of the legislation, OSE began drafting an initial reporting tool in Microsoft Excel to provide clarity to the public on what we expected in the eventual online report. The initial workbook, though not intended for final reporting, had multiple benefits: it allowed Tune-Up Specialists and owners to gain an early understanding of what they needed to prepare for final submittal, it allowed buildings participating in the Building Tune-Up Accelerator to have a reporting tool, it gave the City of Seattle a base to build an IT solution around, and it gave Tune-Up Specialists a readily available tool using a common software to collect to collect data in to prepare for online submission.

Seattle decided to invest in an online tool over an Excel-based tool for a number of reasons. First, to provide a portal for building owners, owner representatives, and Tune-Up Specialists to submit and update tune-ups, submit alternative compliance, or register for multiple buildings in one place. Second, to create efficiencies and automations to level-set the increased work from an existing team taking on a new program with minimal staff. And finally, to allow for integration with existing benchmarking tools to more easily build out partially automated compliance and energy tracking across two programs.

Communicating Proactively to Build Awareness

Establishing a new program, whether regulatory or voluntary, requires adoption by a variety of building owner representatives that range in expertise and role. Communicating effectively and efficiently with a variety of stakeholders starts with building awareness and a common understanding of the requirements. As a part of the policy proposal, support for

[8] See Ballinger, Nicole. "Carrots Before Sticks: Accelerating Mid-Size Commercial Building Compliance with Mandatory Building Tune-Ups in Seattle" ACEEE 2020.

communication and outreach activities in the first 18 months of program ramp up was requested and granted which resulted in the hiring of external consultant support.

To facilitate and maintain stakeholder engagement, a series of core approaches were deployed to increase awareness and understanding of the new regulation. First, program staff worked with consultants to outline strategies in a communication plan that identified target audiences, key messages and known obstacles. The process of developing a communication strategy also helped define and clarify program goals and objectives used to shape engagement actions. Second, a program brand was developed to create a platform of informational materials that clarify program details and help all players navigate complex and innovative policy. Development of a brand that invokes the program goals is an essential way to communicate what the program offers, what makes it unique, and in a sense, coveys its personality. Third, a website was launched accompanied by supplemental program and alternative compliance fact sheets. From there, an overview presentation slide deck was compiled that could be adapted per audience. Additional communication tools were added once the program was more established and outreach operations were running smoothly. These included a Tune-Up Specialist e-newsletter, case studies, blog posts and press releases announcing key compliance dates.

Partnering with trade groups to co-host program overview presentations and training helped Seattle reach building owners, managers and energy efficiency service providers. Articles in local trade organization newsletters ensured program announcements reached a larger audience and drove individuals to the program website to learn more. Formal notifications rounded out engagement activities providing official announcements of relevant compliance due dates and consequences for non-compliance per building size.

Throughout the ramp up period of program implementation, Seattle capitalized on the existing and well-established benchmarking program. Owners required to comply with Tune-Ups represent approximately a quarter of those that need to annually report and disclose building energy performance metrics. Adapting the existing e-newsletter to encompass the new requirement helped close the communication gap and provide a channel to grow awareness.

To embody a spirit of adaptive management, all communication, outreach and program implementation included methods for measuring and evaluating the results and effectiveness of the messaging, activities, and compliance processes. Frequently asked questions became a vital method for communicating code interpretations that inevitably arose as providers attempted to implement required and voluntary corrective actions. Measurement of effectiveness helped staff take advantage of intuitive opportunities and iteratively develop review processes.

Early Lessons Learned

In the process of turning this groundbreaking policy into a reality over the past three years, we've compiled a few observations about what's worked and what we've learned along the way.

Deadlines Matter and Grace Periods Worked – High First Year Compliance

Compliance for the first cohort of buildings (over 200,000 SF) surpassed 95% by the time the second round of violations were issued approximately one year after the March 1st, 2019 deadline. The pattern of submissions followed a cadence similar to many compliance programs –

a rush of submissions on and around the deadline and subsequent violation dates. Although at the original deadline for the first cohort only 43% of buildings were compliant, the deadline drove an additional 23% of buildings to submit. The grace period worked well and by the time the first violations were issued, compliance was up to 76% with an additional 12% recently submitted and under review.

This long process leads to drawn out and overlapping compliance periods that are challenging to manage – but giving owners ample time to comply with a new policy and escalating fine structures as a 'stick' to the tune-ups 'carrot' drove remarkably high compliance for the first year of a policy. By minimizing the number of fines issued through a compliance-focused approach, we also largely avoided tension with building owners and Tune-Up Specialists.[9]

Leading with Municipal Buildings Provided a Blueprint for the Private Sector

Ten municipal buildings 100,000 SF or larger completed tune-ups in advance of private sector deadlines and an additional fourteen city owned facilities less than 100,000 SF participated in the Tune-Up Accelerator program. Municipal tune-ups were designed to help Seattle track costs and explore the feasibility of completing voluntary measures. Early savings results and commonly found corrective actions became examples to share with the public through case studies. Municipal projects demonstrated the value of tune-up actions, illuminated upfront costs and payback periods, and proved how this new policy would save the City money and help us meet our energy and carbon reduction goals. These early tune-ups also allowed internal city staff to attain experience ahead of time to vet compliance and review processes. As a result, additional communication materials were developed or refined, and many ordinance requirements further clarified for the public to eliminate confusion ahead of time.

Tune-Up assessments generally provide an opportunity to learn about a building and budget for additional energy efficiency measures that can be implemented in the near and long term. Investing in a more robust and standardized building assessment report can reap great savings and create a roadmap for enhanced energy savings. In addition to completing the tune-up, Seattle created an audit template for city-owned facilities that went beyond tune-up requirements and captures the energy "story" of a building. The reports serve as an explanatory tool helping engineers convey a building's efficiency opportunities and challenges to management. By adapting the tune-up process, the requirement has merged into a standard data collection process that includes identifying short, long and very long-term energy conservation measures. The citywide resource conservation management program has been able to quickly implement measures with high returns on investment regardless of mandate. Economies of scale can be applied when implementing required or voluntary corrective actions. Energy conservation

[9] In addition to the use of the new IT tool, staff are able to manage the overlapping deadlines because the city allocated funding for technical assistance support (currently a temporary OSE FTE) during policy development and because OSE leveraged program staff from Benchmarking to implement the BTU policy.

measures were grouped or bucketed into similar project work and implemented in multiple buildings by the same contractor, saving on incremental project costs.

Early Evaluation Efforts Helped Identify Tweaks to Implementation

To help assess early implementation successes and challenges that could be used for iterative program changes, we conducted an early evaluation project in 2019 with the University of Washington's Evans School Consulting Lab. The evaluation had three main components: (1) a standard formative process evaluation to understand and tweak early program processes, (2) the development of key performance indicators based on interviews with internal and external stakeholders; and (3) a high-level outline of options for estimating energy and carbon impacts through a later, summative impact analysis.

The evaluation team conducted a literature review on relevant policy best practices and impact evaluation approaches, analyzed program process data (such as communication logs, previous survey results, and initial compliance data), and conducted in-depth interviews with both program staff and Tune-Up Specialists. Although difficult to execute due to time constraints, evaluating early and following up throughout program implementation – along with implementing a basic change management tracking and implementation process – allows for an adaptive management focused on iterative changes to improve program outcomes. Instead of using evaluation just to determine whether impact was achieved retroactively, this approach attempts to increase feedback during implementation and provide certainty about how to adapt on the fly to promote a culture of real-time learning (R4D 2020).

Close Tracking of Tune-Up Specialist Experiences Helped Target Support

This adaptive program implementation approach has been executed largely through close contact with Tune-Up Specialists, who are the key implementers in the field conducting the work. Over 900 buildings need to comply with Seattle's regulation, yet a small subset of professionals has been tasked with completing the work. Developing regular channels of communication with these market actors has helped uncover key barriers and allowed for more efficient allocation of program resources. Prior to the first compliance deadline, a survey was sent to approved Tune-Up Specialists to better understand how the market was adjusting to demand and determine if capacity issues were showing up. And to follow up, in-depth interviews during the evaluation and one-on-one feedback sessions during enforcement were conducted with service providers by firm. And technical assistance provided through a help desk has enabled regular communication with these service providers.

The initial survey helped identify the quantity of tune-ups underway or close to completion, confirming that a high compliance rate was feasible prior to enforcement action. The feedback also daylighted barriers for Tune-Up Specialists and for ownership and helped gauge awareness of the tune-up requirement among owners. Lastly, the survey helped determine how well outreach and educational materials were working or being used by Tune-Up Specialists and if there was demand for additional training.

Other key findings from the survey highlighted that the biggest barrier was generally a lack of building ownership knowledge of what a tune up entailed and how much time was needed. Through follow up interviews, it became clear that the concept of a prescriptive

operations and maintenance regulation was foreign to owners given that existing buildings had not previously had their energy use regulated post-occupancy. Building ownership was slow to understand the timeline required to fulfill their obligations and many owners started the process late, assuming compliance could be achieved in a few weeks. Another key theme was that due to the Tune-up policy owners have been forced to conduct operational work comprehensively, as opposed to piecemeal or per yearly maintenance schedules. Buildings that have on-site facility managers are often familiar with tune-up actions but have commented that this work is considered ongoing, work that occurs throughout each year and not at a set point in time. Seattle's ordinance has changed this pattern, forcing owners to comprehensively tune up all systems and conduct maintenance within a restricted, mandated timeframe. Unfortunately, budgets are often not in alignment with this type of one-time investment nor is the existing workforce able to dedicate the hours needed to execute required corrective actions. Additionally, many corrective actions require specialty services such as controls modifications. The need for additional budget or staffing to implement required corrective actions therefore extends the amount of time needed to comply with the regulation.

Tune-Up Specialists unanimously shared how helpful technical assistance has been to understand the requirement. Despite most help desk questions focused on non-technical issues, the complexity of the program has warranted full time help desk support. Providing consistent and timely feedback has been essential to program success. The qualifications of a Tune-Up Specialist ensure that providers have the technical knowledge needed to identify issues and recommend appropriate corrective actions yet navigating the required documentation, various alternative compliance options and meeting the intent of the regulation has required substantial interaction and regular communication.

Another theme across this work was that the policy has forced a profound change in relationship between an owner and a service provider. Prior to the regulation, service providers were hired by owners to implement energy saving measures, often "selling" an owner on their project or approach to optimize the operations of their asset. Providers would propose or bid on project work, conveying the return on investment and projected payback period. Now Tune-Up Specialists have been hired to help an owner comply and avoid fines. Inherently, the tune-up process requires the Tune-Up Specialist to expose all discovered required corrective actions regardless of their cost to correct. An owner is then required to act on the findings. Many providers have not included implementation of corrective actions in their contracts to create some separation of roles, with owners using internal staff or hiring contractors to implement fixes. Others have included contingency funding or flex hours that can be used to implement corrective actions uncovered during the assessment. Regardless of the arrangement, some providers perceive that they "work" for the city by upholding the new requirement at the same time that they have a legal contract for a scope of work for their client. The change in relationship and the tension that comes from having to "report" to two entities can present an uncomfortable challenge.

Together, this feedback helped shape key performance indicators, led to an earlier timeline for notifying buildings, drove changes to outreach materials to stress timelines and tailor content to owners, and exposed changes in the market to track moving forward.

KPIs Help Us Stay on Track

Through the early formative evaluation project and experience building out reporting systems, OSE developed a set of priority key performance indicators (KPIs) to help track progress against policy outcomes. KPIs were co-developed through in-depth interviews with relevant internal stakeholders at the City of Seattle and through the surveys and interviews conducted with Tune-Up Specialists. Detailed in Table 3, these indicators focus on easy to track processes and outputs for each cohort and fall into three main categories: corrective actions, compliance, and customer support.

Table 3. Summary of Tune-Up KPIs

Category	Indicator	Definition
Corrective Action Indicators	Required Corrective Actions Implemented	The number of required corrective actions implemented per building.
	Voluntary Corrective Actions Identified and Implemented	The number of corrective actions implemented by building owners beyond the minimum requirements.
	Voluntary Corrective Actions Identified and Not Implemented	This additional metric tracks what Tune-Up Specialists identify as corrective actions but are not being implemented by building ownership.
Compliance Indicators	Overall Compliance Rate	The percent of buildings in a cohort that have satisfied the compliance requirements for a given Tune-Up cycle.
	Compliance Impact Rate	The percent of buildings in a cohort that have satisfied the compliance requirements by either conducting a Tune-Up or through one of the tune-up equivalent alternative compliance pathways.
	Rate of Awareness	The percent of buildings in a cohort that are aware of the requirement and have communicated with us in some form.
Customer Support Indicators	Total Inquiries	The total number of inquiries per year as a measure of overall volume.
	Inquiry Response Rate	The percent of inquiries responded to within a three-day target response time.

Corrective action indicators provide a high-level sense of how much work is being done in each building and an understanding of potential for additional energy savings from more measures in a building. Compliance indicators are tracked to help understand how many buildings are likely to comply and how many of those buildings are doing something that has a direct energy impact. Awareness, when combined with the compliance rate, helps to understand who is missing in early outreach and gives us an upper bound of potential compliance in the near term. And customer service metrics track the number of inquiries responded to by the help desk and the average response time to measure how effectively key stakeholders are getting support as they implement the requirements in their buildings.

Taken together these indicators help track success in implementation of the policy and provide a guide to where attention might be needed. Among other things, these metrics help to quickly report progress to leadership and elected officials, prioritize outreach to non-compliant buildings, and quickly determine if certain Tune-Up Specialists might be systematically reporting fewer issues across multiple buildings.

Initial Tune-Up Findings from Seattle's Largest Buildings

This section provides summary data on the first two cohorts of buildings, including findings from nearly two hundred approved tune-ups as well as initial results for key compliance and customer support indicators.

Unsurprisingly, HVAC Operations Dominate Commonly Found Deficiencies

The ten most reported required corrective actions are displayed in Figure 1 below. HVAC sensor calibration fixes were identified and made in nearly half of all buildings above 100,000 SF to date, the most among all assessment elements. Tune-Up Specialists identified HVAC sensors that were uncalibrated, not functioning, or located inappropriately in 47% of the 176 approved tune-ups. Similarly, correction of improper HVAC set points and HVAC controls were the next most found required corrective actions, both being corrected in 45% of the approved tune-ups.

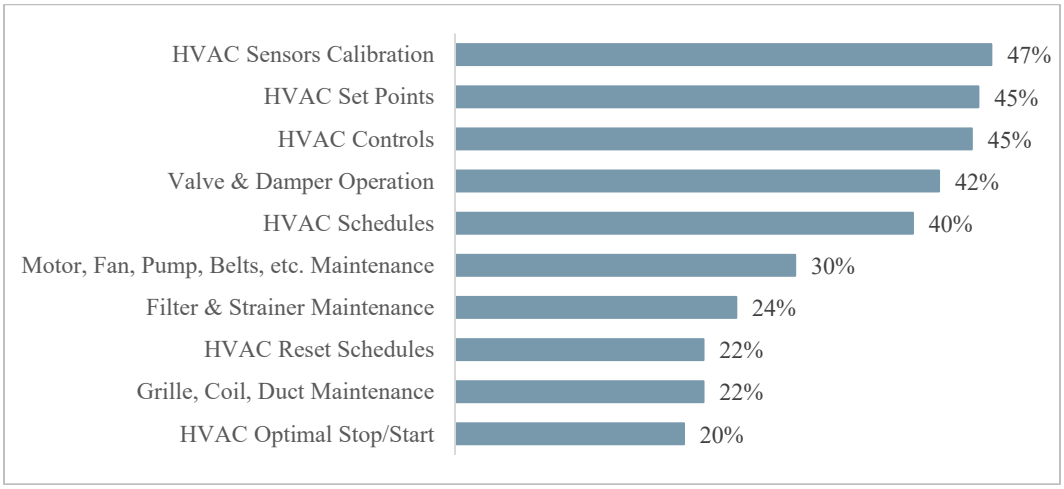

Figure 1. Ten most found required corrective actions in 176 tune-ups analyzed to date.

Similarly, the ten most found voluntary corrections actions can be seen in Figure 2 below. Inefficient lighting equipment was the leader in this category, with Tune-Up Specialists noting this deficiency in 44% of approved tune-ups, with approximately 15% of all buildings voluntarily taking action to improve the efficiency of lighting during or after the tune-up. The second most common deficiency of the voluntary corrective actions was the presence of equipment reaching the end of its service life, found in 40% of the approved tune-ups and acted upon in 9% of them. The voluntary corrective action that was the most implemented was repairing HVAC motors, fans, pumps, belts, pulleys, bearings, and steam traps according to

ASHRAE Standard 180. Corrective action was implemented on this deficiency in 19% of the tune-ups after being reported in 27% of them.

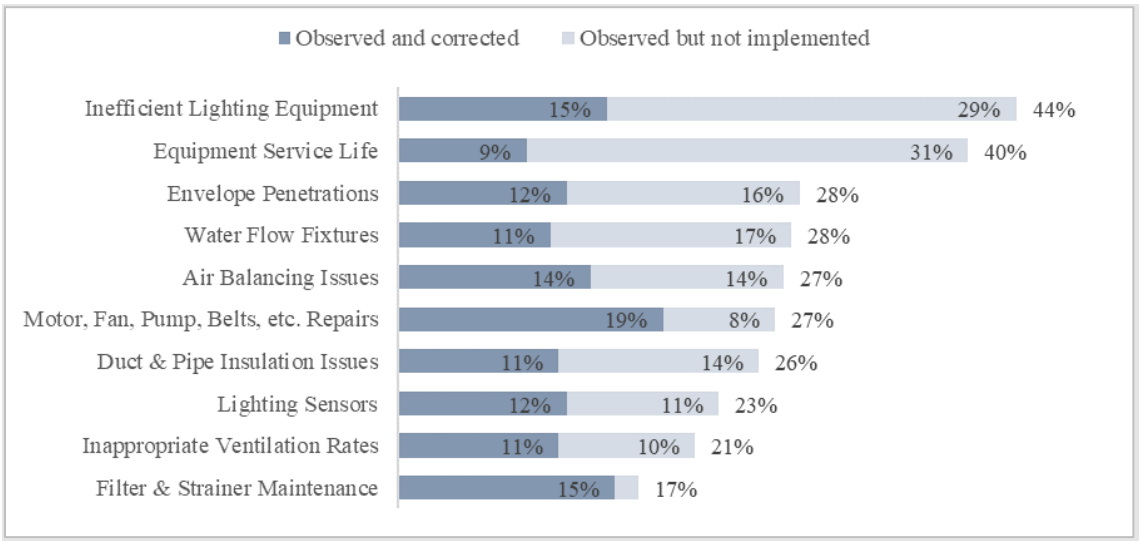

Figure 2. Ten most found voluntary corrective actions in 176 tune-ups analyzed to date, with those observed and corrected shown separately from those observed but not implemented.

Schools Lead on Corrections Made

To date, more total required and voluntary corrective actions have been found in schools than any other building type, as shown in Figure 3. On average, 5.7 required corrective actions and 1.9 voluntary corrective actions (a total of 7.7 corrective actions) have been implemented across 26 tune-ups in K-12 schools. The Seattle Public School system hired a small team of in-house retro-commissioning staff that met the Tune-Up Specialist requirements and conducted the entire school system's tune-ups. After analyzing their tune-up submittals, it became evident that a well-motivated internal staff of Tune-Up Specialists can find and correct an impressive number of corrective actions despite having a limited budget. Schools were closely followed by mixed-use buildings (5.0; 2.3; 7.3) and medical offices (4.5; 2.5; 7.0). Although hospitals implemented the fewest number of corrective actions (1.8; 0.6; 2.4) due to their complex operations, a handful have started or are considering implementing ongoing commissioning programs.

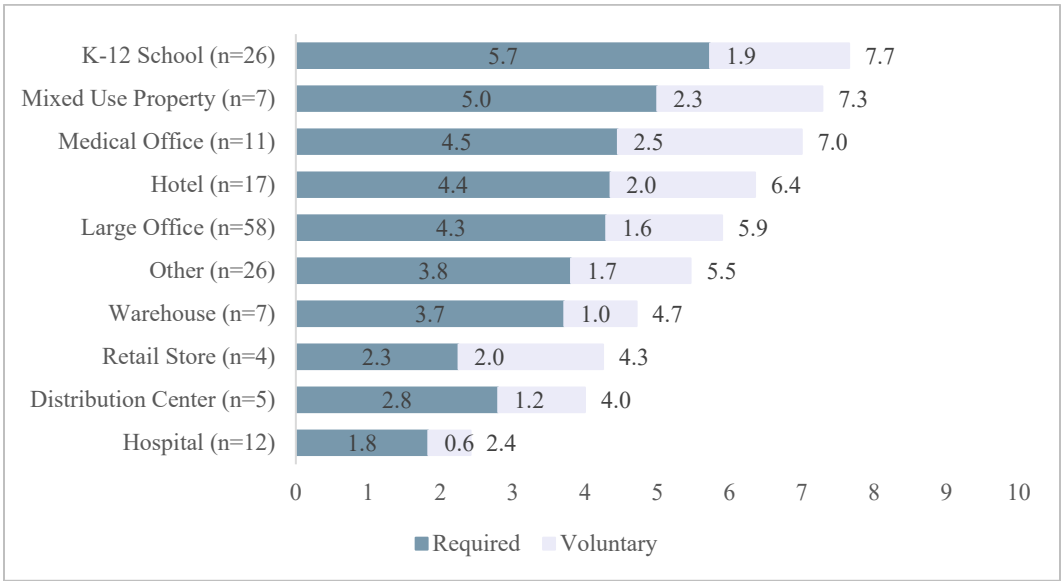

Figure 3. Number of required and voluntary corrective actions implemented by building type.

On average, 4.2 required corrective actions and 1.7 voluntary corrective actions were implemented per tune-up, for a total of 5.8. As expected, the number of corrective actions implemented varied greatly by firm (often according to area of focus – mechanical, controls, etc.), Tune-Up Specialist (background, experience, etc.), and whether the tune-up was conducted by an in-house or external Tune-Up Specialist. Across the 176 tune-ups that were analyzed, there were 21 firms who submitted at least two tune-ups (15 other firms submitted only tune-up each). The number of corrective actions implemented by firm varied from 1.5 to 18.7.

The initial expectation was that building owners who contracted third-party Tune-Up Specialist firms to conduct their tune-up would see more corrective actions identified compared to those who conducted the tune-up with in-house Tune-Up Specialists. That was proven incorrect. In-house (internal) Tune-Up Specialists, on average, implemented 6.7 required corrective actions and 3.0 voluntary corrective actions for a total of 9.7. That was more than double the 3.2 required corrective actions and 1.2 voluntary corrective actions (4.4 total) implemented by third party (external) Tune-Up Specialists.

Extremely High Compliance Rates for Cohort 1

By the end of the first cohort's compliance period one year after the due date, 96% of buildings were compliant. Only a small number of buildings received the larger fine and a few buildings were still working on tuning up their buildings. As shown in Figure 4, compliance at the deadline differs significantly from after the two grace periods, reinforcing the need for long lead times and a lot of follow up. The compliance impact rate for the first cohort of buildings ended up at 71%, with 62% of buildings conducting a tune-up and 9% of buildings pursuing alternative compliance pathways that went beyond a tune-up. And the rate of policy awareness reached 100% well before violations were issued, meaning that no buildings in the first cohort could claim to be unaware of the requirements during the enforcement process.

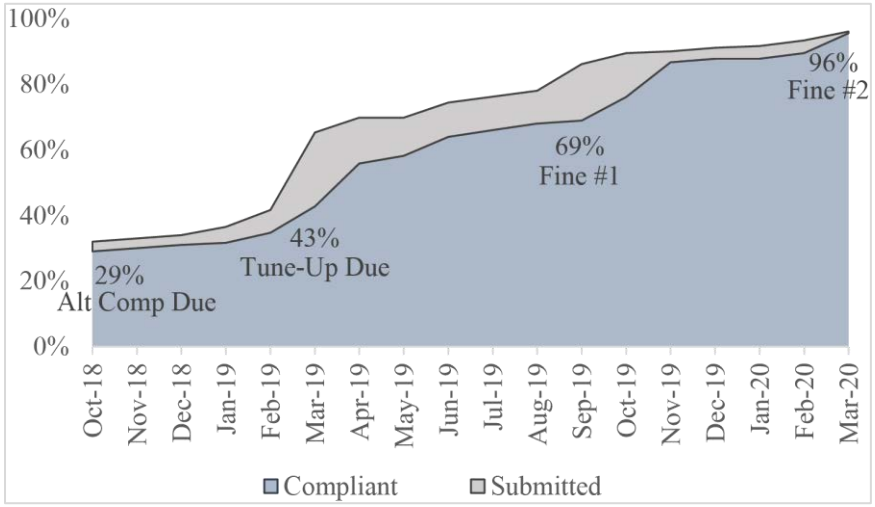

Figure 4. Compliance patterns for Cohort 1 (200,000+ SF) over time, with compliance rate shown at the alternative compliance deadline, the tune-up deadline, the first grace period, and the final violation date.

Though results from the second cohort are not final, compliance at the end of the grace period (six months after the Tune-Up due date) were identical to the first cohort at 69%. Some early indications for the remaining buildings suggest this long drawn out compliance process will get more difficult as smaller buildings with less management need to comply. But the success of the Tune-Up Accelerator Program in working with buildings under 100,000 SF – and the market transformation occurring through awareness campaigns and as providers conduct more and more tune-ups – provide some reason for optimism.

Customer Support Has Been Responsive – And Steady

The smaller number of buildings relative to Seattle's benchmarking requirement and the consolidation of actors in the compliance process through the use of Tune-Up Specialists has made tracking customer inquiries in detail more manageable. In over three years of fielding and tracking questions, the Building Tune-Up help desk has responded to over 1,500 inquiries outside of the tune-up review process and met the target turnaround of three business days for over 97% of phone calls or emails.

Takeaways for Jurisdictions Considering Similar Policies

From three years of experience implementing an innovative, prescriptive, existing building policy we've developed a list of key takeaways that other jurisdictions considering or designing existing building climate policies might consider.

Adjust Required Corrective Actions to Drive Higher Savings

Since tune-ups are required only once every five years, voluntary corrective actions that are identified but not corrected represent a missed opportunity. Although owners and managers are made aware of the issue and can potentially take action on their own, many simply will not.

Some voluntary measures align well with the tune-up ethos of solid savings for relatively small fixes, such as assessing and adjusting ventilation rates when a system can handle it. Currently, we do not require a fix if a space is being ventilated when unoccupied or overventilated during occupied hours.

Other changes to voluntary actions require a more substantial shift in scale or focus of a tune-up. To date, the overwhelming majority of required and voluntary fixes have been on the HVAC side. This is in part because the tune-up was designed to focus on HVAC systems as they are the most carbon-intensive savings – especially in Seattle where we have carbon-neutral electricity. But the skew towards HVAC is also exacerbated by most Tune-Up Specialists having a background in the HVAC industry. However, a lot of energy and water savings are still out there in inefficient lighting technologies, higher than appropriate lighting levels, envelope penetrations, or similar voluntary measures beyond HVAC systems.

Finally, a common challenge is in defining when new equipment is required as part of a tune-up. The tune-up is focused on maintaining and improving existing systems rather than forcing new capital costs – but owners and Tune-Up Specialists often push back when requiring replacement of smaller parts that are needed to optimize a system, such as HVAC sensors. Philadelphia's new tune-up legislation defines 'minor repair' as "low-cost repairs to existing equipment such that the scope of work does not require permits" and might offer a slightly higher threshold for equipment replacements that does not drift into costly capital measures (City of Philadelphia 2019).

Start Educating the Market Early – And Follow Up Often

To ensure building owners were aware of this new requirement, OSE sent out early mailings to all covered buildings in addition to the broad outreach conducted during policy development. However, *formal* notifications went out one year prior to a building's deadline for buildings in the first cohort. Due to the long timelines needed to execute a tune-up from start to finish – and complex nature of building management and ownership structures– it became clear that notifications needed to go out earlier to give adequate time for the process.

Similarly, training for Building Tune-Up Specialists took several forms but was not a defined curriculum and is not required. Dozens of Tune-Up Specialists have said that a mandatory training regimen is desired and should be focused more on compliance processes and specific requirements within the tune-up than on technical building education around operations and maintenance of commercial buildings. Developing a multi-stage training regimen that starts with O+M basics to ensure a baseline of common understanding but that focuses primarily on education around compliance processes can help address systemic issues in submittals and avoid high volumes of help desk inquiries.

Explore Random Audits or Quality Assurance Measures in Policy

One core concern is that relying on professionals outside the City as the core implementers of the policy is a potential race to the bottom – if service provide offers a bare bones tune up for cheap and city staff cannot enforce standardization or quality control, then a significant number of buildings looking for quick compliance can fake it. A mandatory training program can help mitigate some of this by ensuring a base understanding of building O+M

knowledge and program requirements, but jurisdictions should consider auditing tune-ups or exploring options to maximize consistency in Tune-Up Specialists work in policy design.

Compliance and Process Support is as Important as Technical Support

Although some technical knowledge of commercial buildings systems is necessary to review tune-ups and help field more technical questions from providers, most customer support and Tune-Up Summary report review had more to do with program processes and general policy questions. About 80-90% of technical assistance falls under basic compliance processes, IT and process help, and clarifying requirements. Only 10-20% of inquiries and tune-up review work requires technical building knowledge. Cities might consider staff or third-party vendors that can offer both.

Ensure Reporting Enables Easier Impact Analysis

Through the process of designing a data collection tool, reviewing hundreds of tune-ups, coordinating with the Accelerator, and preparing for evaluation, OSE has come up with a list of future changes to reporting that can help us better track success – and can help other cities designing these processes. In general, collecting more specific data on changes made in corrective actions to help estimate impact – like how much of a building or space the change applied to – can greatly refine impact estimates. Tracking and reporting occupancy and scheduling changes in more detail is a lot of work, but variation in occupancy can make estimating O+M impacts difficult. Since tune-ups happen in many stages, collecting dates on when the assessment was conducted and when corrections were made can help determine a cutoff date for pre-post analysis. And asking more specific questions about the quality and functionality of the building automation system (BAS), especially for smaller buildings, can help regulators determine if what the Tune-Up Specialist did or did not do on a number of corrective actions makes sense.

Building Tune-Ups – Living in a Performance Standard World

Through the course of the first five-year implementation cycle, early formative evaluation and change management processes were mechanisms designed to make tweaks to implementation on the fly to improve outcomes in the near term. But a rapidly changing climate policy environment is forcing longer term assessments of how this type of prescriptive operations and maintenance policy fits within the larger context of more aggressive policies to achieve our carbon neutral goals. In the time since the Building Tune-Ups policy was passed, cities and states have dramatically ramped up their climate actions as increasingly dire reports on rising emissions have spurred further action.

Most of these policies take an outcome-based approach, setting standards for performance that allow owners flexibility and long lead times to meet targets, like those in Washington D.C. and New York City. But some are starting to take a hybrid or holistic approach. Last year, the State of Washington passed the Clean Buildings Act which had at its core a building performance standard combined with prescriptive requirements for

benchmarking, operations and maintenance, and equipment replacement standards based on ASHRAE 100.

Although the future of tune-up policies in a performance standard world is uncertain, this first step into regulating energy and carbon in existing buildings at scale has provided a foundation for future policies to build on. Seattle has set the precedent with its building owners and managers of requiring investment to reduce energy and carbon in their buildings. And the market transformation required to scale these policies has been initiated, though getting to zero will require far greater changes. And until all our electricity is clean, all systems are electrified, and the grid is in perfect harmony, there will be a place for low-cost operations and maintenance programs.

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Appendix D

Energy Efficiency in the Rental Housing Market – Addressing Policy Gaps for a Large Sector of Housing

Hannah Bastian, American Council for an Energy-Efficient Economy

ABSTRACT

Rental properties can be a notoriously difficult target for energy efficiency policies. At the same time, they represent a significant energy savings opportunity. Residential Energy Consumption Survey data show that renters spend $0.27 more per square foot on energy than do owners, resulting in above-average energy burdens for many renters. Cities can do more to adopt and implement efficiency policies for rental housing, especially as they set aggressive energy saving and carbon emissions targets.

Two current policy trends have emerged to incorporate efficiency requirements for rental properties into existing policies—efficiency components in rental certification processes and multifamily benchmarking ordinances.

Rental certificate policies require owners to certify their rental buildings with the city before they can rent or lease out units. The city of Boulder in Colorado is the first city to amend its rental certificate policy to include minimum energy efficiency measures. Multifamily benchmarking ordinances require owners of larger buildings (typically greater than 20,000 square feet) to report and disclose their energy consumption each year. Washington, DC and New York City recently amended their multifamily benchmarking policies to also include audit and minimum efficiency requirements.

This paper explores the benefits, limitations, and opportunities for these two policy mechanisms to improve rental energy efficiency in cities nationwide. We also (1) provide an overview of the current policy landscape for rental energy efficiency, (2) identify segments of the rental market that may be missed, and (3) highlight the opportunity for more policies specifically targeting rental efficiency.

Introduction and Background

City-level energy efficiency policies often leave rental housing unaddressed. However, rentals represent a significant proportion of buildings and are therefore a key energy saving opportunity, particularly as cities pursue climate change mitigation goals. A few leading cities have passed policies that set minimum efficiency standards for rental properties. In this paper, we describe these policy efforts and analyze the potential for other cities to adopt similar policies.

Rental Housing in the United States

Rental housing markets vary greatly from city to city. Nationwide, rental housing accounts for 35% of all occupied units, but this percentage is significantly greater in many cities (Census Bureau 2020). For example, in Miami and New York City, rental housing accounts for 69% and 67%, respectively, of all occupied units. The types and sizes of rental properties also vary from city to city. Typically, large metro areas have a majority of rental units in large multifamily buildings with 10 or more units (Harvard 2020). Small and medium metro areas tend

to have more single-family, small multifamily (between 2 to 4 units), and mid-sized multifamily (5 to 20 units) rental buildings.

Rental property ownership tends to vary by building size. Individual investors own 76% of single-family rentals and 77% of small multifamily buildings (Harvard 2020). Owners of large buildings tend to be business entities including pass-through entities (limited liability partnerships and companies), general partnerships, and real estate corporations. The type of owner can impact the energy efficiency of rental properties because individual investors and business entities have different motivations, resources, and capacity to invest in their rentals. For example, while fewer individual owners report making investments to improve their rental units, those that do tend to spend more per unit than business-entity owners (Harvard 2020).

Split incentive. The split incentive is a major barrier to addressing energy efficiency in rental properties. The split incentive refers to the idea that neither owners nor tenants are incentivized to invest in energy efficiency, particularly if the tenant pays the energy bills. Owners are disincentivized from investing in efficiency upgrades because they do not reap the financial gains from lower energy bills. Conversely, tenants do not want to make capital investments in a property they do not own.

Minimum efficiency requirements try to address the split incentive by mandating efficiency improvements in rental housing. It is important that these policies include policy mechanisms that help reduce the cost burden to both owners and renters. These mechanisms could include implementing companion programs that provide technical and financial support, capping improvement costs to a certain amount, or providing exemptions and alternative compliance pathways to financially burdened owners. In our review of existing policies below, we highlight how some cities have included these mechanisms in their policies.

Energy Efficiency Policies Targeting Rental Housing

A few leading cities have passed policies requiring their rental housing to meet energy efficiency requirements. Two current policy trends have emerged to incorporate efficiency requirements for rental properties in existing policies—efficiency components in rental certification processes and multifamily buildings in commercial benchmarking ordinances.

Rental Certificates

Many cities have policies that require rental-building owners to certify their buildings with the cities before they can rent or lease out units. Traditionally, cities implement these policies to ensure rental properties meet health and safety requirements. Cities can incorporate energy efficiency requirements in their existing rental certificate policies. Both Ann Arbor and Boulder have already done so.

Ann Arbor, Michigan. In 1985, Ann Arbor, Michigan, introduced basic weatherization requirements into its existing rental certification policy (Ann Arbor 2020). The requirements outlined specific measures including sealing all gaps and cracks in the building shell and

required attic or top floor insulation. We were unable to identify any results or reports on the effects and energy savings from this policy.

Boulder, Colorado. In 2010, the Boulder city council adopted the Smart Regs program, adding efficiency requirements to its existing rental certification policy. The city granted owners two certification cycles (four years each) to comply with the new efficiency requirements, making 2018 the effective date.

Smart Regs requires all rental housing to meet efficiency levels set in the 1999 Energy Code. Owners can choose between two compliance paths to meet this requirement—one prescriptive, one performance based. The prescriptive path outlines and scores specific measures in a checklist format. Buildings must score 100 points to demonstrate compliance. The performance path uses the nationwide Home Energy Rating System (HERS) Index. Buildings must achieve a score of 120 or lower. To verify compliance, owners must obtain an inspection from a city-certified private inspector.

As of 2019, over 22,000 properties were certified, with about 1,000 remaining not yet certified. About 50% of units already met the requirements and were certified on the first inspection. Another 17% of buildings are exempt from the policy for reasons such as status as an affordable housing complex that has participated in a state or federal weatherization program, or designation as an historic building that follows reasonable modifications to the prescriptive and performance points. The remaining buildings require updates to become compliant. On average, buildings were 14 points short of the 100-point requirement and needed to pursue two measures. The most common upgrades were attic, crawlspace, and wall insulation. The average upgrade cost was $3,022 per unit.

The city also offered a companion program, Energy Smart, to support building owners by providing technical assistance, guidance for selecting contractors, and financial incentives (in addition to those offered by utilities). The city funds Energy Smart with a small tax on electric service, and in the past used a grant from the Department of Energy under the American Recovery and Reinvestment Act.

Building Performance Standards (BPS)

Several cities have benchmarking ordinances that require owners of certain buildings to report and disclose their energy use each year. Most benchmarking policies target commercial and multifamily buildings that are greater than 20,000 square feet. Recently, Washington, DC and New York City have amended their policies to also include minimum energy efficiency requirements, commonly known building energy performance standards.

Washington, DC. In December 2019, the Council of the District of Columbia passed the Clean Energy DC Omnibus Act, which included building performance standards for buildings greater than 50,000 square feet (DC Law 22-257). The standards require owners of buildings performing under a certain threshold to implement energy savings upgrades by January 2026 (DOEE 2020). The bill extends the requirements to buildings of at least 25,000 square feet to comply by January 2028, and buildings of at least 10,000 square feet to comply by January 2031. The bill calls on the DC Department of Energy and Environment (DOEE) to determine the specifics of the standards prior to the 2021 effective date.

While the DOEE is in the process of setting both the specific performance level requirements and compliance pathways, the Omnibus Act provides some guidance. The act sets

the performance threshold for buildings eligible to receive an ENERGY STAR® score at the median performance level for each building type. The DOEE will use this performance level to design equivalent requirements for buildings that cannot attain an ENERGY STAR score. The Omnibus act also instructs the DOEE to establish multiple compliance pathways including at least a performance pathway and prescriptive pathway. The performance pathway will require owners of inefficient buildings to demonstrate at least a 20% energy-use intensity reduction over a five-year period. The prescriptive pathway will identify cost-effective efficiency measures that achieve savings of at least 20% of total energy use.

New York, NY. In 2019, New York City passed Local Law 97, which sets carbon intensity limits on buildings greater than 25,000 square feet. The policy covers about 50,000 buildings, 59% of which are residential. The policy requires citywide emissions reductions of 40% by 2030, which equate to about 26% carbon emissions reductions for each covered building. The policy goes into effect in 2024. (Urban Green Council 2020).

The city included flexible compliance paths. Building owners can purchase credits for renewable energy credits or carbon offsets for 100% of their required emissions reductions. Rent-controlled buildings, houses of worship, and some subsidized housing can implement prescriptive measures to provide an affordable means for complying with the regulation.

Opportunities and Limitations of Rental Energy Efficiency Policies

Cities considering rental efficiency requirements will have unique opportunities and limitations for pursuing rental certificate and BPS policies. Existing literature and research reports explain the key considerations for cities pursuing these policies. Rocky Mountain Institute published a report, *Better Rentals, Better City*, which provides a roadmap for cities considering rental certificate policies (Petersen and Lalit 2018). ACEEE released a white *paper Mandatory Building Performance Standards: A Key Policy for Achieving Climate Goals*, which explains key considerations for minimum efficiency standards in all buildings, including rentals (Nadel and Hinge 2020).

In this paper, we analyzed building stock information from the U.S. Census to identify the type of buildings that represent the greatest energy saving opportunity. The goal of our analysis is to estimate the energy savings potential associated with improving rental housing of various sizes in each city. Understanding the types of buildings that represent the greatest opportunity can help policymakers decide the best policy to achieve the greatest impact in their city.

Energy Savings Methodology

We analyzed rental-housing data from 17 cities to understand the potential energy savings from implementing one or both policies. We selected these cities to include a variety of metropolitan sizes and geographical locations as well as a diversity of rental property types and ages. All cities have sizable rental housing markets where at least 40% of occupied units are rentals. Table 2 and Figure 1 summarize the rental market characteristics in these cities. All data are from the U.S. Census Bureau for 2018.

Table 2. Rental Housing Data

City	Occupied housing units	Renter occupied units	Percent renter occupied units
Atlanta, Georgia	211,819	115,789	55%
Austin, Texas	390,395	215,379	55%
Boston, Massachusetts	274,674	180,864	66%
Boulder, Colorado	43,328	22,413	52%
Chicago, Illinois	1,077,886	584,797	54%
Denver, Colorado	310,324	157,266	51%
Mesa, Arizona	185,509	73,796	40%
Miami, Florida	182,631	126,726	69%
Minneapolis, Minnesota	175,233	91,450	52%
New York, New York	3,184,496	2,139,778	67%
Orlando, Florida	114,176	72,316	63%
Philadelphia, Pennsylvania	608,233	287,384	47%
Phoenix, Arizona	574,645	266,540	46%
Portland, Maine	31,193	17,062	55%
Portland, Oregon	273,607	128,990	47%
Seattle, Washington	338,002	186,920	55%
Washington, DC	287,476	165,807	58%

Source: Census Bureau 2020

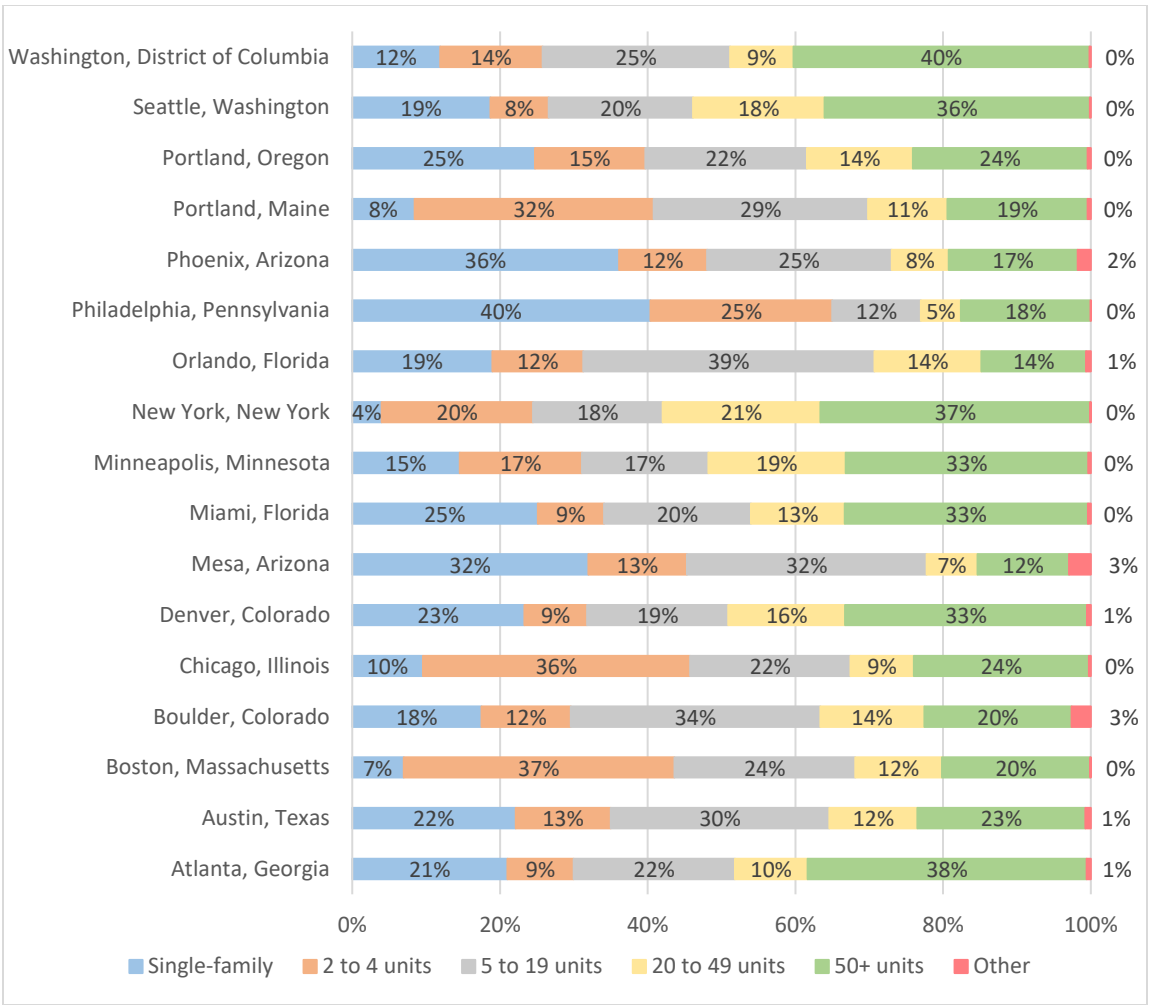

Figure 1. Rental housing by building size. Other includes boats, RV, vans, etc. *Source: Census Bureau 2020*

We calculated potential energy savings from targeting one or more of the building sizes above. We analyzed three potential groupings: (1) single family; (2) multifamily buildings with fewer than 20 units; and (3) multifamily buildings with 20 or more units. We used U.S. Census data for the total number of rentals and percentage of each building size. We used the 2015 Residential Energy Consumption Survey data to determine annual energy usage per unit based on each city's climate region. We used these numbers to calculate the total amount of energy used for each grouping.

To determine potential savings, we had to make two key assumptions. The first was the number of buildings that would be required to make improvements in order to meet the performance requirements. We assumed that each city's performance requirement would be designed such that the poorer performing 50% of building units would be required to make improvements. We based this assumption on the Washington, DC performance standard that sets the requirement at the median ENERGY STAR score for similar building types. If cities pass similar requirements around a median building performance, then 50% of their units will have to make improvements. This is also about the percentage of apartments needing upgrades in Boulder.

The second assumption we made was the level of energy savings owners would have to achieve to comply with regulations. We assumed 20% energy savings per upgraded unit across all building types. We also based this number on the Washington, DC performance standard that requires a 20% decrease in energy use intensity over a five-year period or predetermined energy efficiency measures that result in at least 20% energy savings.

We calculated total annual residential energy consumption for each city using the Department of Energy's State and Local Energy Data (SLED) tool. SLED provides modeled city-level annual electricity and natural gas consumption data. Due to data limitations, we were unable to account for delivered fuels (e.g., fuel oil, propane).

Findings

Our estimates show that these cities could save between 5% and 35.8% of their total residential energy consumption by setting efficiency requirements for all of their rental housing. Figure 2 illustrates the savings potential for each city.

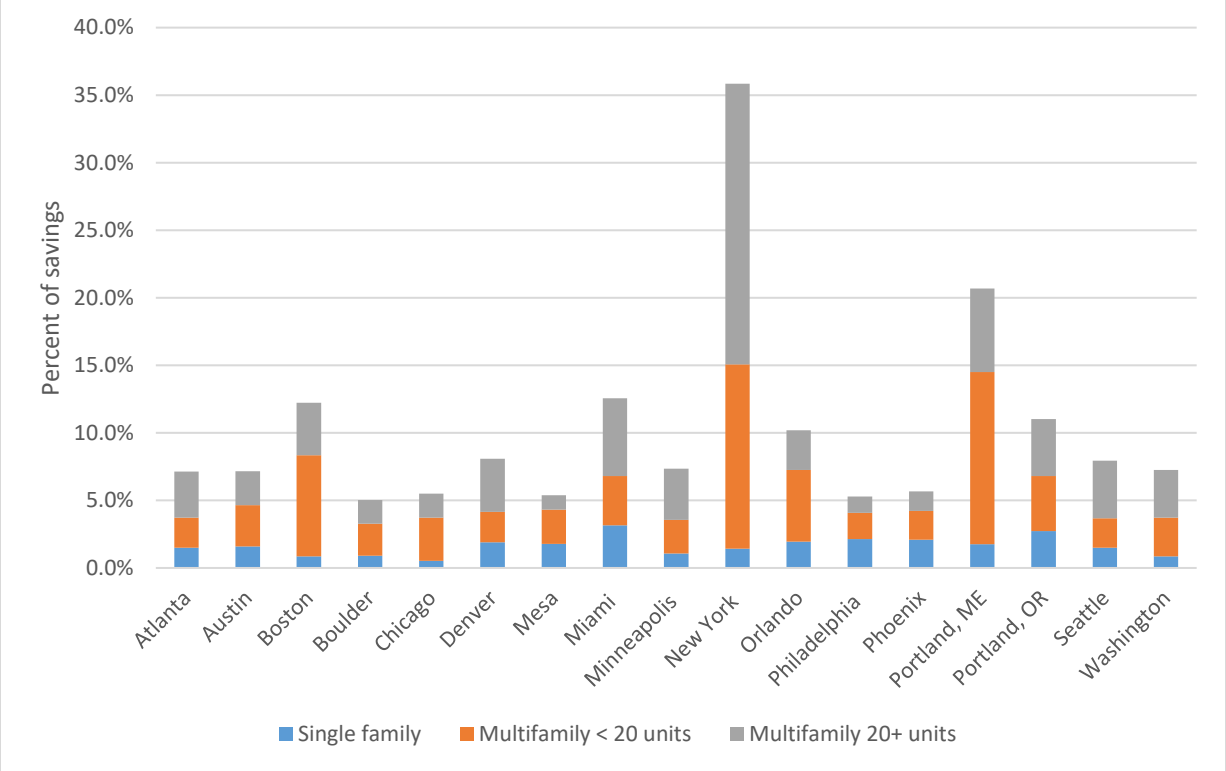

Figure 2. Energy savings potential for units in various rental housing sizes

Our estimates show that multifamily housing with 20 or more units represents the greatest energy saving opportunity in eight cities, multifamily housing with less than 20 units represents the greatest energy saving potential in another eight cities, and single-family housing represented the greatest saving potential in one city. Fourteen cities can save the most energy by targeting multifamily buildings of all sizes, while three cities can save the most energy by targeting single-family housing and small to mid-sized multifamily buildings (less than 20 units). Tables 3 and 4 show the energy savings potential for these cities, respectively.

Table 3. Cities with greatest energy savings potential in multifamily buildings

Geographic area	Total residential energy consumption (mmBTU)	Number of rental units	Savings from targeting single family units	Savings from targeting units in multifamily buildings under 20 units	Savings from targeting units in multifamily over 20 units
New York	14,771,978	2,139,778	1.4%	13.6%	20.8%
Portland, ME	19,746,433	17,062	1.8%	12.8%	6.2%
Boston	16,463,678	180,864	0.9%	7.5%	3.9%
Orlando	2,910,782	72,316	1.9%	5.3%	2.9%
Portland, OR	117,874,352	128,990	2.7%	4.1%	4.2%
Miami	21,539,397	126,726	3.2%	3.6%	5.7%
Chicago	8,933,324	584,797	0.5%	3.2%	1.8%
Austin	6,648,611	215,379	1.6%	3.1%	2.5%
Washington	13,821,232	165,807	0.9%	2.9%	3.5%
Minneapolis	54,589,511	91,450	1.1%	2.5%	3.8%
Boulder	49,770,240	22,413	0.9%	2.4%	1.8%
Denver	30,964,115	157,266	1.9%	2.2%	4.0%
Atlanta	914,762	115,789	1.5%	2.2%	3.4%
Seattle	7,766,866	186,920	1.5%	2.2%	4.3%

Table 4. Cities with greatest energy savings potential in multifamily buildings under 20 units and single-family buildings

Geographic area	Total residential energy consumption (mmBTU)	Number of rentals	Savings from targeting single family units	Savings from targeting units in multifamily buildings under 20 units	Savings from targeting units in multifamily buildings with over 20 units
Mesa	4,660,949	73,796	1.8%	2.5%	1.1%
Phoenix	15,661,713	266,540	2.1%	2.1%	1.5%
Philadelphia	20,892,077	287,384	2.1%	1.9%	1.2%

We also broke down the energy savings potential for multifamily housing under 20 units since this grouping showed significant savings potential. Figure 3 shows the energy savings potential from 2 to 4 units, 5 to 9 units, and 10 to 19 units.

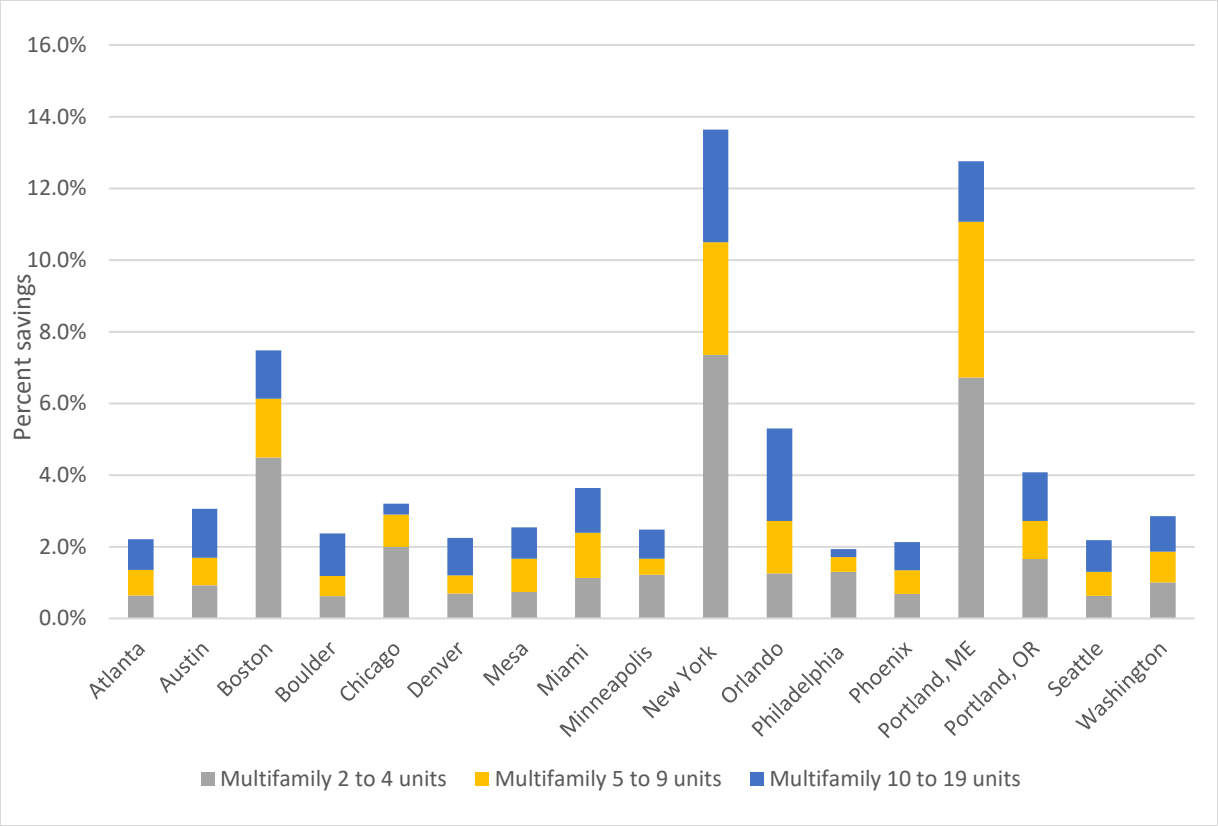

Figure 3. Energy savings potential for multifamily housing with fewer than 20 units

Discussion

Cities can implement different policies depending on whether their greatest energy savings come from targeting small or large rental buildings. In the following sections, we will outline the cities that should consider implementing policies for large buildings (20+ units) or small to mid-sized buildings (less than 20 units), as well as the opportunity for cities to target both.

Passing Building Performance Standards for Large Buildings

Some cities can have a significant energy savings impact from just targeting large multifamily buildings through building performance standards. For example, in New York, 57.9% of all rental units are in large multifamily buildings. Our analysis shows the city could save 20.8% of its total residential energy consumption from targeting just these buildings.

Meanwhile, some cities would have little impact from a building performance standard that targets only large multifamily buildings. For example, in Philadelphia and Mesa less than 25% of rental units are in large multifamily buildings. These cities would only save 1.2% and 1.1% of their total residential energy use, respectively. While these savings impacts are still potentially worth pursuing, these cities would be leaving another 4% and 4.4% savings, respectively, on the table by not addressing the remainder of their rental housing stock.

Passing a Rental Certificate Policy for Small to Mid-sized Buildings

In theory, cities can design rental certificate policies to target all housing sizes. However, in this analysis, we will assume these policies will target buildings with fewer than 20 units. Assuming the rental certificate polices have a narrower scope allows us to more easily compare their impact with BPS for large buildings.

Many cities could save significant energy by implementing rental certificate policies designed around multifamily buildings with fewer than 20 units. We estimate New York, Portland (ME), and Boston could save 13.6%, 12.8%, and 7.5% of their residential energy use by targeting these buildings. Of the small and mid-size multifamily buildings, all three cities could save the most energy by targeting 2- to 4-unit buildings.

Some cities may find savings from single-family rentals worth pursuing. Philadelphia, for example, could save the most by targeting single-family buildings, a savings of 2.1%. Similarly, Miami could save 3.2% by targeting single-family units.

Pursuing Both or a Hybrid Policy

Some cities may want to consider pursuing both policies if the energy savings potential is significant enough. For example, New York has already added building performance standards to its benchmarking ordinance to drive savings in its larger rental buildings. The city could also implement a rental certificate policy to target small and mid-sized multifamily buildings. Even if the city just targeted rental buildings with two to four units, it could save another 7.4%.

Cities with an existing benchmarking ordinance may have the most to gain from pursuing both policies, particularly if a significant proportion of their rental units are in smaller buildings. For example, Boston can save 7.5% of its residential energy use from targeting small and mid-sized multifamily buildings, and another 3.9% from large multifamily buildings. The city already has a multifamily benchmarking ordinance that requires audits or retrocommissioning every five years. The city could add performance requirements to the ordinance and pursue a rental certificate policy to capture the remaining 7.5% savings from smaller multifamily rental buildings.

In reality, weighing the energy savings against the administrative effort and costs of pursuing both policies is more complicated. For example, neither Portland (ME) nor Portland (OR) have multifamily benchmarking ordinances. Portland (OR) could expand its commercial benchmarking ordinance to include multifamily buildings but this would still take considerable effort to launch a building performance standard. Portland (ME), on the other hand, has no benchmarking ordinance. In this case, it might make most sense for the city to pursue a rental certificate policy that includes requirements for large multifamily buildings, especially because the city already has a rental certificate policy in place (City of Maine 2020).

Limitations and Considerations

Our analysis and estimates have several limitations. The greatest limitation is the lack of information about energy consumption in rental housing. More data on the typical energy consumption in rental units could help refine our energy saving estimates. For example, we used RECS data for energy use per unit, but this number is derived from both owner- and renter-occupied units, as well as urban and rural metropolitan areas.

Our policy assumptions also included limitations. For one, while many cities may set the requirements around a median efficiency rating, some policies may require more or less than 50% of buildings to make upgrades. Many cities will likely include exemptions in their policies. For example, New York's BPS exempts any rent-controlled buildings from the full policy; instead, such buildings are given a much easier way to meet the prescriptive checklist with lower energy savings and emissions reductions. Furthermore, our assumption of 20% energy savings per unit will likely vary greatly from city to city depending on building age, climate, and the presence of incentives or other programs driving investment in energy efficiency.

Our high-level analysis left out many key considerations that cities should make when choosing to pursue either of these policies. Cities will need to undertake surveys and analyses to gain a better understanding of their unique rental housing markets and design effective policies. Cities should research the following:

- Building stock. Each city has a unique rental building stock. Data on the typical buildings within a city are necessary for designing effective performance requirements. For example, most of the two- to four-unit rental buildings in Boston were built before 1939. These buildings will likely require more intensive improvements to meet modern efficiency levels. Cities should conduct a market segmentation study to inform their program design to better meet the needs of their building stock.
- Affordable housing. Across the United States, cities are facing growing affordable housing crises. These cities should analyze how efficiency policies can impact rental housing prices and incorporate policy mechanisms to ensure their policies help alleviate the crisis rather than exacerbate it. The National Housing Trust's report *Recommendations for Implementing the District's Building Energy Performance Standard in Affordable Multifamily Housing* provides numerous considerations and recommendations for how to design minimum efficiency requirements to best serve affordable housing (National Housing Trust 2019).
- Workforce development. Cities should also factor in their existing workforce gaps when designing their policies. Both policies will require owners to hire building professionals to help them understand the regulations and make cost-effective decisions. When setting compliance deadlines, cities should ensure there are enough professionals to provide services at an acceptable cost.
- Supportive programs. Along with designing regulations, cities should also consider voluntary programs that can help support owners with compliance. For example, the Boulder Energy Smart program provides owners free technical assistance and directs them to utility-run incentives programs. Cities should survey their existing rental energy efficiency programs and potentially launch new ones to fill any remaining gaps.

Conclusion and Recommendations

All cities can do more to drive energy efficiency in their rental buildings. Rental certificate and BPS policies show promise for improving the least-efficient rental buildings in a city. More cities should consider these policies, particularly as they pursue both environmental and affordable housing goals. Our high-level analysis shows that all cities have unique rental housing markets and that each city should survey its building stock to identify the greatest opportunity for savings to inform its policy approach.

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Appendix E

Boulder City Council
STUDY SESSION

April 8, 2008
6:00-9:00 p.m.

Climate Action Plan, Transportation and Renewable Energy Strategies to Reduce Greenhouse Gas Emissions

1777 Broadway
Municipal Building
City Council Chambers

This Study Session will be televised on Municipal Channel 8

Submit Written Comments to City Council
ATTN: Alisa Lewis, City Clerk
1777 Broadway, 2nd Floor
P.O. Box 791
Boulder, CO 80306
or Fax to 303-441-4478
or E-mail: council@bouldercolorado.gov

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MEMORANDUM

TO: Mayor and Members of City Council

FROM: Frank Bruno, City Manager
Stephanie Grainger, Deputy City Manager

Office of Environmental Affairs
Jonathan Koehn, Manager
Sarah Van Pelt, Environmental Sustainability Coordinator

Public Works Department/Transportation Division
Tracy Winfree, Director of Public Works for Transportation
Mike Sweeney, Transportation Planning and Operations Coordinator
Martha Roskowski, GO Boulder Program Manager
Randall Rutsch, Senior Transportation Planner
Noreen Walsh, Senior Transportation Planner

DATE: April 8, 2008

SUBJECT: **Study Session: Climate Action Plan, Transportation and Renewable Energy Strategies to Reduce Greenhouse Gas Emissions**

I. PURPOSE:

This study session provides City Council with updated information on the Climate Action Plan (CAP) and the Transportation Master Plan FasTracks Local Optimization (FLO) initiatives. A number of potential strategies are presented and council has the opportunity to discuss enhancing CAP implementation to reduce greenhouse gas (GHG) emissions and how to more aggressively reduce vehicle miles of travel (VMT) through the CAP and Transportation activities. Additionally, a draft renewable energy strategy for the city organization will be introduced.

At City Council's annual retreat in January 2008, council identified a list of potential work items that were categorized as "Climate Action Plan" and indicated an interest in "accelerating" or being more aggressive in achieving the CAP goals. Further, council expressed interest in addressing existing home and commercial building efficiency through further regulations and incentives, including low interest financing. Council also discussed the role of the Transportation Master Plan (TMP) in helping to achieve CAP goals and considered establishing a path to move the city organization towards energy independence.

This memo provides background information on the items suggested by council along with an overview of work items currently in the CAP work program, and the associated

impacts to the reduction goals of various strategies. While the 2012 GHG goal is aggressive it is achievable. The options for the next phase of CAP implementation described in this memo are estimated to achieve 85 percent of the existing GHG goal. Additional enhancements to CAP implementation will likely need to be made in the next couple of years to meet or exceed the GHG goal. Information on setting additional and longer term GHG goals that build on the 2012 goal is also presented in this memo.

Although staff cannot complete all of the items suggested by City Council in 2008, we have included background information, and in some cases, options for scope and timing for the remaining initiatives.

In addition, previous council direction supported amending the TMP with a (FasTracks Local Optimization) FLO-modified Action Plan project list and developing funding options for FLO-Modified TMP Action Plan implementation. This study session is a check-in with the current council to confirm that we should continue on this course of action. As the previous FLO work focused on infrastructure and programs, council is asked to consider additional potential policy changes that could also achieve transportation and climate benefits.

The purpose of this study session is to:

- Review the CAP programs, strategies, and estimated results of the current work program;
- Present options, including potential regulatory options, for the next steps needed to enhance the existing CAP and GHG emissions reductions to move the city closer to achieving the 2012 GHG goal;
- Present a draft renewable energy strategy for city operations;
- Receive council feedback on potentially more aggressive and longer-term emission reduction goals – beyond the Kyoto goal; and
- Consider additional policy implementation activities that could be pursued as part of the FLO activities to reduce VMT and GHG emissions.

Study Session Questions:

As the CAP and FLO efforts have similar questions of council, questions from both have been grouped together under the headings of *Initiatives, Policy implementation and Funding*. Council will likely choose to address each question separately, but it is hoped that grouping them together will promote consideration of the interrelationships and mutually supportive nature of these activities.

The following questions are provided for council's consideration.

Initiatives

1. Does council have questions or comments about the draft renewable energy strategy to achieve energy independence for the city organization?

2. Should staff proceed with the proposed levels and distribution of funding in the FLO-modified Current Funding and Action Plan list of projects and programs?
   - If so, does council continue to support staff returning to City Council to amend the TMP with the FLO-modified Current Funding/Action Plan project and program list?

Policy implementation

3. Would council like staff to proceed with further evaluation of regulatory options to improve energy efficiency in existing residential buildings? For commercial buildings?

4. For new construction, does council want to see a full scale commercial green building code, or an interim code that addresses energy? If a full scale program, does council want staff to begin the process before the third quarter of 2008?

5. Should staff proceed with implementing the enhancements to CAP programs and services (that require increased CAP funding) as the next phase of CAP implementation to move the city closer to the 2012 GHG goal?

6. Does city council want to set additional and longer-term greenhouse gas reduction goals, building on the current 2012 goal?

7. Does council have any questions or comments regarding the set of transportation demand management policy initiatives; and where on the "dial" should staff explore further to support the CAP and VMT reductions?

Funding

8. Does council have any questions or comments about increasing the CAP tax in order to enhance CAP programs and services (to implement the next phase of the CAP, estimated to achieve 85 percent of the Kyoto goal)?

9. Does council have questions or comments on transportation funding; and does council still support staff's exploration of options for additional funding for Transportation to pursue GHG and VMT reduction goals, create community connections and to optimize the benefits of FasTracks improvements?
   - Does council agree with staff further investigating the range of "Action" Plan level of funding as represented by the Blue Ribbon Commission example(s) and the FLO-modified Action Plan?

II. OVERVIEW:

As there are a number of overlaps between the activities to reduce GHG emissions through the CAP and efforts to reduce VMT in the TMP, these combined efforts are being presented for council discussion at this study session. While the FLO work has

been oriented to preparing the community for the arrival of the FasTracks service, improving these connections to regional transit services will directly support reductions in GHG emissions. The FLO work considered by the previous council was focused on funding, facilities and programs. That information is included here along with new material related to potential policy initiatives that the city could also pursue in support of CAP and TMP goals.

Following the background overview of both the CAP and FLO efforts, the *Opportunities Analysis* section of this memo is organized around the program areas of the CAP, with the FLO materials contained within the Transportation program area of the CAP. Additional background materials are contained in the attachments.

Based on previous discussions by council, staff is also assuming that when applicable, the city organization is expected to serve as a model for community efforts in these areas. Consequently, pilots or other programs will be implemented simultaneously within the city organization and out in the general community.

III. BACKGROUND:

This section provides a brief description of activities to date for both the CAP and the FLO programs.

Climate Action Plan (CAP)

The following information provides a very broad background on the development of the CAP, the city's GHG inventory and goal, and estimated results from the existing work program. Because there is such extensive information on the development and implementation of the CAP, staff has attached this detailed background information at Attachment A. The 2007 Progress Report for Climate and Energy Programs is included as Attachment B.

City Council passed a resolution to develop and implement a local action plan to reduce the community's greenhouse gas emissions in May 2002. The resolution also set an initial GHG target equivalent to the Kyoto Protocol goals which call for 2012 emissions levels that are 7 percent below 1990 levels. The CAP was approved in June, 2006 and established the strategies for reducing emissions. The initial phase of CAP implementation began in 2007. It was anticipated that over time the CAP programs and budget will be increased to meet or exceed the 2012 goal.

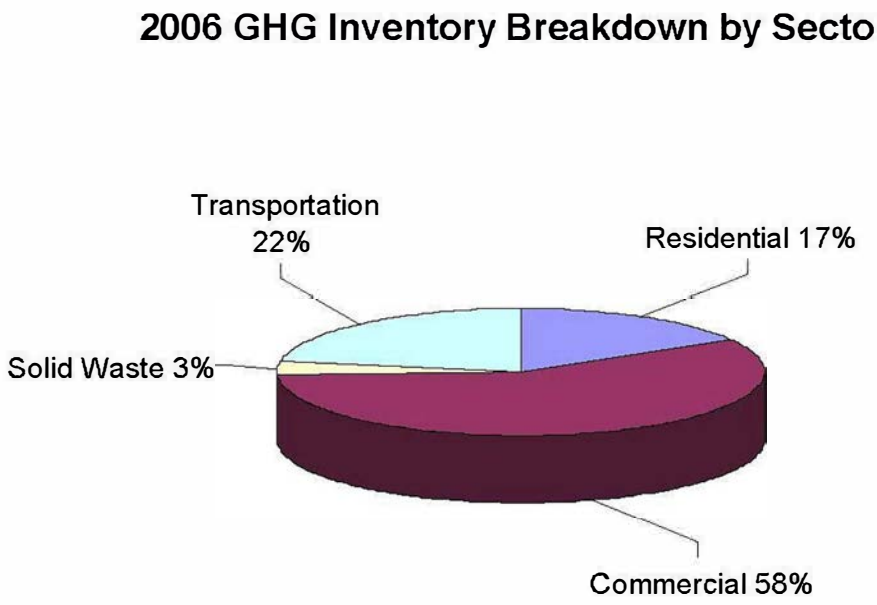
The following information forms the basis of the CAP and indicates the baseline from which the program started and the reduction goals.

Baseline and target emissions in metric tons carbon dioxide equivalent (mtCO2)

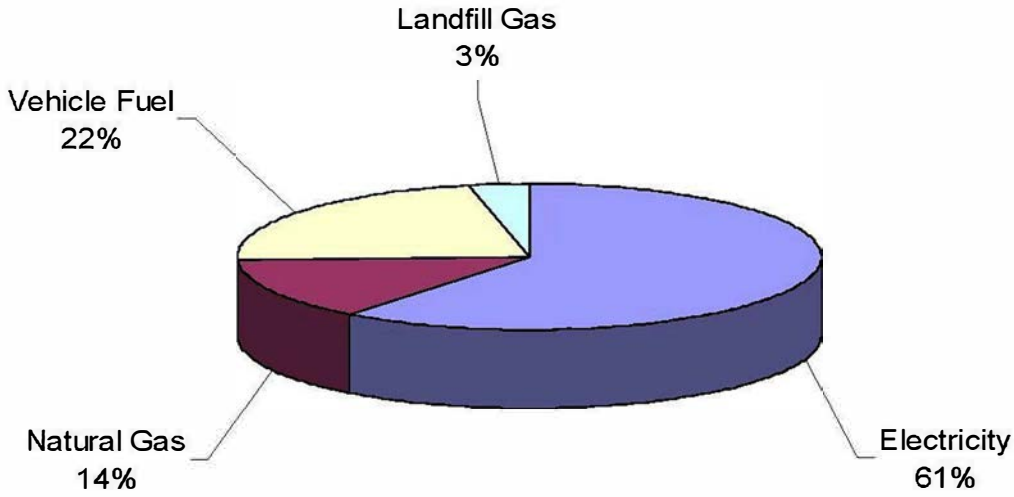
1990 Emissions	1,580,942 mtCO2
2006 Emissions	1,887,596 mtCO2
2012 Emissions target	1,470,276 mtCO2

Reduction needed from 2006 to achieve target	407,320 mtCO2

The following charts illustrate the city's 2006 GHG inventory, broken down by sectors and by source of emissions.



2006 GHG Inventory Breakdown by Energy



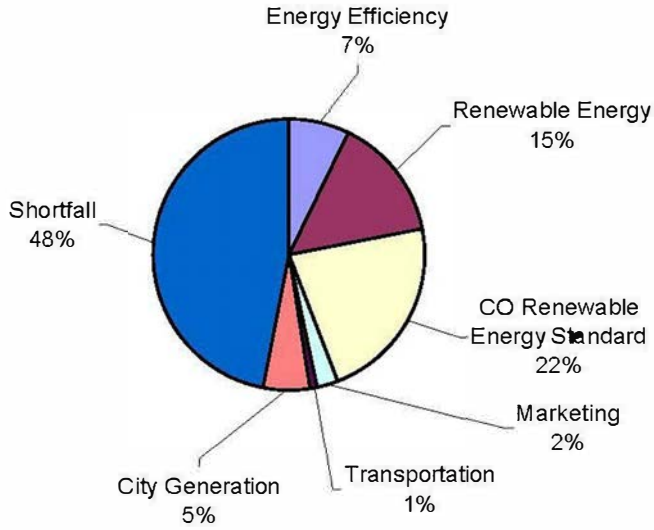
CAP implementation is funded from a CAP tax on electricity use that is collected by Xcel Energy. The 2007 budget was $860,265. The 2008 budget is $875,000.
The main CAP strategies are:

- Reduce energy use through conservation and efficiency
- Shift to renewable energy and fuel sources
- Reduce vehicle miles of travel (VMT)

Through the CAP, the city will facilitate emissions reductions by businesses and residents. The CAP programs and services are designed to complement programs and incentives offered by other entities like Xcel Energy, Boulder County and the Governor's Energy Office (GEO).

The CAP assumed programs and services would be expanded over time to enhance progress toward the goal. In order to achieve the goal by 2012, the community will need to achieve a 22 percent reduction from 2006 emissions levels. If we continue with the current programs, services and funding levels, it is estimated that emissions reduction levels will fall short of the 2012 goal by about half (48 percent) which is in line with original estimates of what could be accomplished with the current budget and associated programs. The following chart shows the percentage of emissions reduction from the current CAP strategies and other sources like the Colorado renewable energy standard (RES).

Breakdown of GHG reductions - Current Strategies



When the CAP was approved, it was known that achieving emissions reductions through energy efficiency and renewable energy would require valuable programs and services and extensive marketing and outreach efforts to fully engage residents and businesses to consider investing in these strategies and therefore would take time to realize results. The CAP also called out and recommended that we would need to increase programs and services and funding levels (the CAP tax) over time to generate the level of community participation needed to achieve the GHG goal by 2012. It was anticipated that staff would check in annually with council on the CAP results and would make recommendations for increasing services and programs and funding as needed to help the city achieve its GHG emission reduction goals.

In the *Opportunities Analysis* section of this memo, staff outlines areas for enhancing CAP programs and services as the next phase of implementation in order to increase emissions reductions. These enhancements to the CAP are estimated to get the city much closer to the 2012 goal – to 85 percent (and possibly beyond). Future adjustments will be made based on results achieved to ensure the 2012 GHG is met or exceeded.

Transportation Master Plan - FasTracks Local Optimization (FLO)

The transportation sector contributes 22 percent of the GHG emissions. It is because of this substantial impact that the CAP closely coordinates with transportation efforts and integrates with the work of both FLO and the TMP.

The FasTracks Local Optimization (FLO) process was initiated to ensure that the city of Boulder and its community partners fully respond to the coming FasTracks regional transit investments. The process brought together representatives from Boulder City Council, Transportation Advisory Board, city staff, RTD, Boulder County, University of

Colorado, interest groups and property owners and residents representing the downtown, Boulder Valley Regional Center and University Hill to identify the services, programs and facilities needed to fully take advantage of the arrival of regional Bus Rapid Transit (BRT) and commuter rail in Boulder. The FLO committee met five times to develop these materials, and three open houses where held to solicit public comment in 2006 and 2007. The FLO work is a community-based effort that:

- took a more strategic look at creating community connections and maximizing the benefits of FasTracks and
- modified TMP costs to better reflect unprecedented cost escalation in the transportation sector.

While the initial FLO process had a narrow focus on integrating the adjacent local transportation system with the coming FasTracks regional transit services, the process gradually grew into a broader look at providing connections to the FasTracks facilities from throughout the community. The resulting project lists and financial projections encompass transportation improvements in Boulder, including supportive connections during redevelopment and transportation demand management programs, which would guide transportation investments prior to completing other projects in the 2003 TMP Action Plan. Not yet included are the final recommended operations and maintenance (O&M) costs that will come out of the ongoing O&M study.

At the May 29, 2007 City Council study session, the FLO project list, cost estimates and updated transportation financial situation was presented and discussed by the council. Key conclusions from the FLO work presented at the study session included:

- Analysis by both Transportation and the Blue Ribbon Commission show that the ability of the Transportation Fund to make capital investments is greatly reduced or eliminated due to increased material costs and increasing operations and maintenance costs.
- Very limited transportation funds, estimated at $3.5 million, are available to make any system improvements, including FLO-related capital investments between 2010 and 2015.
- The FLO-Modified Action Plan project list identifies a total of $60 to $88.3 million in priority projects through the year 2025 and guides community-wide transportation investments during this period.

The materials used at the May 29, 2007 City Council study session as well as the study session summary were provided to council in a WIP on Jan. 17, 2008. The study session packet can be accessed at:
http://www.ci.boulder.co.us/index.php?option=com_content&task=view&id=7191&Itemid=399.

Financial Update

The FLO work found that the fiscal realities of transportation funding and the increasing cost of materials and operations significantly restrict our ability to fund additional improvements to the system. Updated revenue and budget estimates show that increasing costs for operations and maintenance will consume the vast majority of the

Transportation Fund in the near future. The rapid increase in construction material costs was documented in the FLO materials and the most recent cost information shows that material costs have continued to increase. The Colorado Construction Cost Index for 2007 shows more than a 6 percent increase in material costs.

Since Council considered the FLO materials in May of 2007, the Blue Ribbon Commission (BRC) on Revenue Stabilization has released its final report. The BRC Report identified transportation funding issues and focused on the need to keep up with continuing construction material cost escalations. There was a recognition by the BRC of the cost-escalation challenges that the Transportation Fund is facing and the loss of buying power being experienced. The BRC ideas included potential sources of funding for transportation projects and needs such as a Transportation Utility Fee and Development Excise Tax increases.

Transportation Activities

Since the adoption of the first TMP in 1989, the city has had a policy direction to develop a complete and balanced transportation system that can accommodate travel by all modes. This policy direction was accompanied by goals that placed transportation activities within the broader goals and visions of the Boulder Valley Comprehensive Plan (BVCP) and established objectives for maintaining the existing system, achieving mode shift away from the single-occupant auto, controlling congestion and reducing air pollution. Under this policy direction, the city has made significant progress in building the multimodal transportation system envisioned in the TMP. Major activities accomplished since 1990 include:

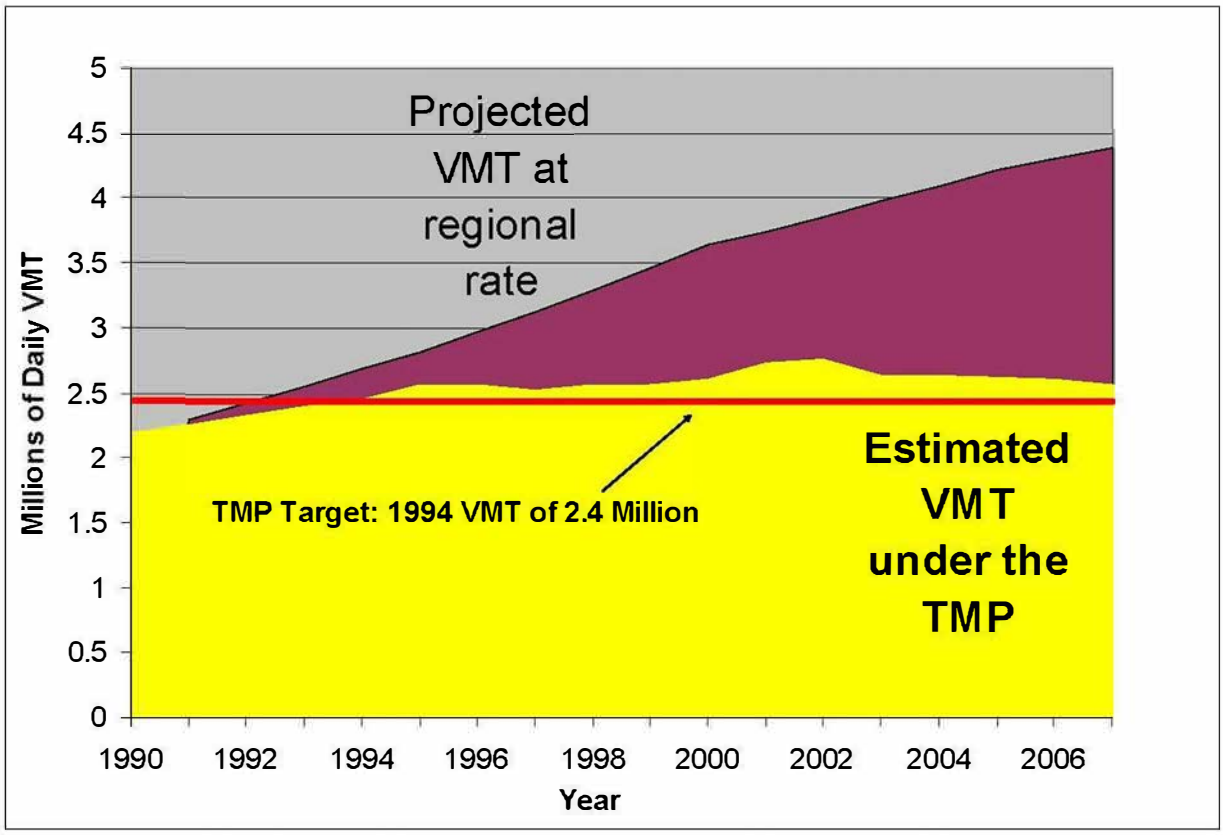
- Creation and expansion of the Community Transit Network, providing five high-frequency transit routes within Boulder and three routes providing connections to other Boulder communities;
- Establishment of the business, student and neighborhood Eco Pass programs, with more than 60,000 passes being purchased in the community;
- Completion of a majority of the bicycle system to form a connected system of more than 330 miles of bicycle facilities and 74 underpasses;
- Transit ridership increased more than 200 percent since 1990 within the city.
- Completion of the transformation of 28th Street, south of Arapahoe, into a complete street with facilities for all modes of travel and improved connections to the adjoining land use.

A more detailed and comprehensive discussion of the results of the city's transportation policy is available through the Transportation Metrics presentation. This presentation is available on the TMP Web site at: www.bouldertmp.net, go to"How are we Doing? – Performance," "Measurements."

Since 1989, the city has had considerable success in building the balanced transportation system, achieving mode shift and reducing the growth of VMT. In contrast, national and local data indicates that the transportation sector is the most rapidly increasing sector for GHG emissions. GHG emissions from transportation are increasing due to population growth, increased per capita travel and a decline in vehicle fleet efficiency since the late

1980s. Continuing to limit the growth in Boulder's VMT is the foundation for achieving the CAP GHG emission reduction objectives in the transportation sector and a primary objective of the city's transportation work program.

The estimated trend in VMT for the Boulder Valley, relative to regional trends, is shown in the following graphic. The area in purple is the VMT that Boulder has avoided through travel behavior that differs from the region. If VMT in the Boulder Valley had followed regional trends, the CAP would need to address GHG emissions from an additional 1.83 million daily VMT.



Continued progress in maintaining a VMT trend that is significantly different from the region's and in reducing VMT is essential to achieve the goals of the CAP and the Governor's Colorado Climate Action Plan. However, the erosion of purchasing power for transportation materials and supplies and the forecasted decline in the ability to invest in additional enhancements in the transportation system threaten the ability to maintain this trend. It is likely that without additional funding, the VMT graph of the future will more closely parallel the VMT growth of the region.

IV. OPPORTUNITIES ANALYSIS:

This section reviews the primary strategies for reducing GHG emissions and provides an analysis of current and proposed enhancements and potential regulatory options including green building codes.

CAP Programs and Services

Since the CAP began being implemented in 2007, staff has also been reviewing and analyzing the ability of the CAP to achieve the Kyoto target and has been exploring ways to come closer to meeting the 2012 goal. Staff has looked at the suite of programs and services offered through the CAP and believes the city should continue to focus its efforts and resources in the following areas:

- Energy efficiency (including the Green Points Program)
- Renewable energy
- Transportation sector reductions
- Marketing (ClimateSmart information and outreach)
- City operations and renewable energy strategy

The following sections review the primary CAP strategies for reducing GHG emissions and provide an analysis of current and proposed enhancements and potential regulatory options as the next phase of CAP implementation. By expanding CAP programs and implementing the regulatory measures as described the city can achieve 85 percent of the 2012 target. The enhancements may appear somewhat modest, and council may wonder why staff is not presenting options to achieve 100 percent of the goal. Staff did not set out to develop options to achieve a certain percentage of the GHG goal. Rather, staff evaluated existing programs and new programs and policies to identify the best options for the next phase of CAP implementation to work toward the goal while minimizing additional budget and burden on the community. Staff believes that the proposed enhancements are consistent with the overarching CAP strategies and represent a good set of next steps to move the city closer to the 2012 goal. Additional enhancements can be made in future years to achieve 100 percent of the GHG goal.

The financial and regulatory options described offer the city opportunities to further increase emissions reductions by involving a larger segment of the population and including more homes and commercial buildings. By expanding CAP programs and implementing the regulatory measures as described the city would take the next set of interim steps that will achieve 85 percent of the 2012 target (and possibly more). Staff will continue to evaluate on an annual basis the CAP programs, services and funding levels and will return to council over the next several years with the next steps needed to achieve the 2012 GHG goal.

The majority of the 2007 operating budget was dedicated to reducing energy use through energy audits and related services that were conducted throughout the year. Data on actual results of the implementation will be gathered in 2008, and will be an ongoing activity. Because actual implementation results for 2007 are not available yet, staff has made conservative estimates of programmatic GHG reduction impact using industry standards, the original CAP analysis and other sources like the Boulder County Sustainable Energy Plan (SEP).

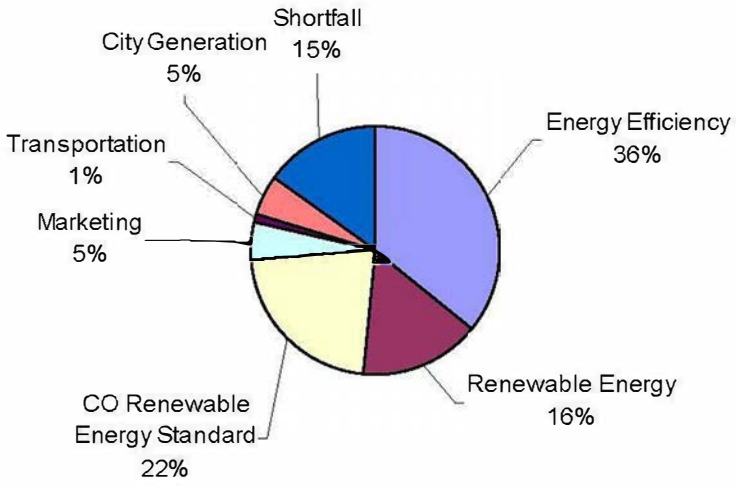
The following table summarizes the GHG reductions associated with each CAP strategy, along with the annual budget and percentage of the 2012 goal achieved. The energy efficiency strategies include both residential and commercial programs, Xcel Demand Side Management (DSM) reductions, and both residential and commercial codes (i.e. Green Points Program). The renewable energy section includes wind power purchases, rooftop solar photovolatics (PV), the expanded Colorado renewable energy standard (RES), and city-generated renewable energy. The transportation category includes reductions from biofuels; additional VMT reductions associated with potential TMP implementation are not included. These strategies are detailed in the corresponding sections of the memo. Because internal and external costs are not included in the table, the costs provided to do not allow for an accurate cost per ton GHG comparison.

Summary of Current and Proposed CAP Program Impact and Costs

	Current			Proposed		
Strategy	**Annual Budget**	**mtCO2e by 2012**	**Percent of GHG Goal**	**Annual Budget**	**mtCO2e by 2012**	**Percent of GHG Goal**
Energy Efficiency	$ 560,957	29,049	7	$ 978,913	145,829	36
Renewable Energy	$ 54,723	172,366	42	$ 54,723	176,147	43
Marketing	$ 229,625	10,150	2	$ 279,625	20,300	5
Transportation	$ 29,873	3,940	1	$ 29,873	3,940	1
TOTAL	**$ 875,177**	**215,505**	**53%**	**$1,343,133**	**346,217**	**85%**

The pie chart below illustrates the contributions of each strategy to achieve 85 percent of the city goal.

Breakdown of GHG Reductions - Proposed Strategies



The following table summarizes the CAP tax rates and estimated revenue for the current level of CAP implementation and the enhanced implementation levels. When the Boulder voters approved the CAP tax, they approved minimum and maximum sector rates. Minimum rates are in use at this time. The CAP tax ordinance allows council to increase the rates up to the voter-approved maximums; an ordinance is required to adjust the rates. The proposed budget for more aggressive emissions reductions is $467,956 per year (a 53 percent increase) and would require increases in the residential and commercial rates to the approximate mid-point of their ranges. The industrial rate increase is less than 2 percent with the average annual cost increasing by $100. While the budget increase is not insubstantial, the city's programs generate economic benefits through energy cost savings and DSM rebates.

Summary of Current and Proposed CAP tax rates

	Current Rates		2009 Proposed Rates	
	$/kWh	Average Annual Cost	$/kWh	Average Annual Cost
Residential	$ 0.0022	$ 13	$ 0.0035	$ 19
Commercial	$ 0.0004	$ 45	$ 0.0007	$ 71
Industrial	$ 0.0002	$ 5,532	$ 0.0002	$ 5,632
Estimated Revenue *	**$ 897,114**		**$ 1,343,133**	

* Based on estimated electricity use. 2008 budget is $875,000.

Council has several options for enhancing CAP implementation and the tax rates:

- Council can adjust the rates right away so that programs can be expanded this year; following the study session, staff would return with an ordinance for council consideration
- Rate changes and CAP enhancements can be initiated in January 2009 (and approved through the 2009 budget process); or
- Council can decide to continue with the current level of CAP implementation and make no changes to the CAP tax rates.

Because there is heightened awareness and interest in energy and climate issues, new ideas and opportunities to more aggressively reduce GHG emissions surface on a regular basis. City Council mentioned an interest in being more aggressive at its 2008 retreat, and ideas like a solar farm were mentioned. Staff believes that a high level of flexibility and responsiveness are needed, while maintaining a focus on core CAP strategies that are in place to maximize results. For example, the city must be prepared to evaluate and incorporate the impact of options like *Smart Grid* and Xcel's Resource Plan as they arise. The upcoming franchise agreement with Xcel presents obvious opportunities for innovation. Staff welcomes council suggestions for pursuing the existing GHG goal. Later in the memorandum, longer term and more aggressive GHG emissions goals that build on the 2012 GHG goal are discussed.

Energy Efficiency

Energy efficiency is the primary strategy for reducing emissions in the commercial, industrial and residential sectors. Energy efficiency provides a solid return on investment and makes lasting improvements to the comfort, reliability and marketability of Boulder's building stock. It also has the potential to create new jobs, strengthen the local energy services industry and increase direct and indirect sales tax revenue, thereby complementing the city's economic vitality efforts. Similarly, energy efficiency programs targeting lower-income households can often serve as social programs by lowering energy costs and the percentage of income spent on energy bills. There is also significant outside funding available, such as Xcel's rebates, to support energy efficiency.

Meeting the CAP energy efficiency goals is heavily dependent on Xcel Energy programs and rebates. In 2006, Xcel launched new DSM programs that focus on commercial sector energy efficiency rebates to reduce electricity use. Residential programs have been limited to rebates associated with air conditioning and lighting discounts. In late 2007, Xcel began offering commercial energy audits and also proposed to approximately double their investment and energy use reduction targets for the DSM programs. Details have not been released, but rebates for natural gas efficiency and additional residential rebates are anticipated to begin in 2009. Rebates received by Boulder commercial customers since 2006 total $350,000 and provide nearly 7,000 tons of emissions reductions.

It is important to note that while investments in energy efficiency often have quick paybacks and improve the comfort of existing buildings, market barriers exist that limit the installation of many efficiency measures. Market barriers include, but are not limited

to, lack of information, transaction costs, performance uncertainties, product or service unavailability, and split incentives. Split incentives exist in leased property where neither party is incentivized to invest in property improvements. In other words, though it very often makes financial sense to invest in energy efficiency, there are reasons and factors why people do not invest. The city's programs and services attempt to overcome these market barriers and realize higher market implementation rates than otherwise would have been achieved without the presence of the city's programs.

Methods for addressing barriers include financial assistance, or incentives, and regulatory options. Combining these methods may improve public support while significantly enhancing energy performance and emissions reductions.

The following sections describe the specific energy efficiency programs of the CAP and proposed enhancements for the next phase of CAP implementation. Most programs and outreach use the CAP campaign name, ClimateSmart.

ClimateSmart at Home

As described in the CAP and 2007 Progress Report, a variety of programs and services are offered to address barriers and increase voluntary energy efficiency investment in existing residential and commercial buildings. The CAP proposed that about 58 percent of the annual budget be directed toward programs and services for the residential sector, which contributes 17 percent of community GHG emissions. Most of the budget is devoted to improving energy efficiency because Xcel's DSM programs for residents are limited to reducing energy use from air conditioners, incentivizing evaporative cooling, and converting to energy efficient light bulbs. The wide varieties of programs that are currently offered by the city include reduced-cost energy audits, income-qualified weatherization services, neighborhood sweeps, whole house energy meter loan program, and contractor trainings. The residential program includes grassroots elements, where actions are promoted and implemented on a neighborhood or block-by-block level. The city is currently supporting organized neighborhoods and developing a plan for a recognition or competition program to be released in 2008. The current suite of residential sector energy efficiency programs will contribute about 4 percent of the city goal. These estimates are likely conservative. Staff will revisit the estimates later in 2008 when a full year's program results (2007) are available.

To reach this level of reduction, the service levels will be increased each year. Last year, 224 home audits were completed and 450 audits are planned for 2008, with an estimated 300 being required under the new Green Points Program (based on historical permit information). Most of the residential strategies included in this analysis are currently in place with the exception of a few programs that are under development for implementation in 2008. One program, a refrigerator retirement and recycling service, is contingent upon securing funding through grants. Matching funds for many of these programs are awarded through various partners such as Boulder County and the Governor's Energy Office. In 2008, these funds equal over $165,000.

Enhanced ClimateSmart at Home Program

Staff has completed analysis for expanding the current strategies and implementing new ideas that have the potential of reducing GHG emissions in the residential sector. Examples of program expansion include increasing the number of home energy audits (450 in 2008, 700 in 2009) and installing energy efficiency improvements during the neighborhood sweeps and in multifamily residences. New programs include:

- enhancing services that support implementation of audit recommendations;
- funding the ongoing refrigerator retirement program (which provides guaranteed energy savings and emissions reductions); and
- funding for programs that support market transformation and grassroots initiatives such as neighborhood programs, University of Colorado Green Teams and working with Boulder Green Building Guild to develop trainings and contractor networks.

The proposed enhancements in the residential energy efficiency programs would provide a 92 percent increase in impact from the current level of implementation. This level of reduction would achieve about 7 percent of the total CAP GHG reduction goal. Increasing services to this proposed level would increase the CAP residential budget by approximately $383,000 in 2009 or 44 percent of the current CAP budget.

	Budget	GHG Reductions	Percent of 2012 Goal
Current	$346,257	15,341	4
Proposed	$729,213	26,409	7
Net Increase	$382,956	11,068	3

ClimateSmart at Work

Commercial buildings and industrial facilities represent the largest source of emissions at 58 percent of the community's total. Barriers to improving efficiency in commercial space include a lack of information on the most cost-effective improvements, knowledgeable contractors to perform the work, and information on rebates and incentives to reduce the upfront costs.

The city has offered programs to reduce energy use in the commercial sector since 2004, primarily offering free energy audits and technical assistance. Other services include a preliminary assessment of solar PV potential and support of a trade ally network of contractors to improve the energy efficiency of commercial properties. The number of audits provided increased from 15 in 2006 to 42 in 2007, with a total of close to 80 commercial facilities served by the ClimateSmart at Work program.

The main costs associated with the ClimateSmart at Work program are the costs of the energy assessments. In 2005-2007, the city covered the entire cost of the assessment program. In 2008, the city is partnering with Xcel Energy because Xcel is offering a low-cost energy assessment as one of its DSM programs. The Xcel audit is not as

comprehensive as the city's assessment; it does not include assessments of natural gas use or renewable energy potential, and follow-up services are not included. The city's customized follow up and technical assistance is an essential service in maximizing implementation of audit recommendations. Businesses receiving an Xcel audit have an option to add on the city's services at no additional charge. The city is able to leverage the Xcel audit contribution and provide more audits than planned. As mentioned earlier, Xcel DSM rebates are critical to achieving a high level of energy efficiency improvement implementation, both in existing buildings and new construction. Significant rebates are available and offerings will be expanded in 2009.

Interest in most of the city's programs exceeded capacity in 2007, resulting in a waiting list for services in 2008. In addition, the annual target for energy savings measures installed in audited properties was met. The CAP assumed the expansion of programs and service levels depending on participation rates.

Enhanced ClimateSmart at Work Program

Staff proposes to:

- increase the number of audits to 105 in 2009 (from 70 in 2008);
- to expand the menu of follow-up services offered including rebate assistance, equipment efficiency analysis, bid evaluation, contractor recommendations, employee trainings/workshops, and tenant improvement design plan review;
- free installation of LED exit signs;
- launch a ClimateSmart recognition program; and
- assist with "green teams" development within companies

Staff estimates that the proposed services would achieve about four percent of the total CAP GHG reduction goal. Estimates are conservative, especially because continued improvements in Xcel's DSM programs will increase the emissions reductions from the commercial and industrial sectors.

	Budget	GHG Reductions	Percent of 2012 Goal
Current	$214,700	9,486	2
Proposed	$249,000	18,069	4
Net Increase	$35,000	8,583	2

Demand Side Management Programs and Financial Assistance Options

The CAP assumed that Xcel's DSM programs and rebates would be integral to voluntary investment in energy efficiency. Xcel launched a suite of programs in 2006 that primarily targeted commercial and industrial users. The following table summarizes rebates received by Boulder commercial customers.

Xcel Rebate Program

Year Completed	Number of Projects	kWh reduction	GHG Reduction	Rebate Amount
2006	29	2,295,970	2,120	$87,537
2007	40	3,202,302	2,957	$205,929
2008	15	1,948,521	1,799	$56,402
Total	**84**	**7,446,793**	**6,876**	**$349,867**

In 2007, Xcel submitted a proposal to nearly double the energy use reduction impact. The city is involved in the Public Utilities Commission proceedings for the proposal to support a high level of future investment and targets for DSM. If approved as proposed, expanded DSM offerings would be implemented in 2009 with new electricity use incentives, as well as rebates for reducing natural gas consumption. Staff has used Xcel and SEP estimates to project a GHG impact of 22,208 tons in 2012, representing 5.5 percent of the GHG target. This estimate may be overly conservative since the city's programs are designed to complement and maximize use of DSM programs and rebates across the community. By working with Xcel and promoting their rebate programs, we anticipate greater reductions.

Many residential and commercial audit recipients report financial reasons for not improving the energy efficiency of their properties. Various financial assistance tools could be used, ranging from direct incentives to low-interest financing. The city could offer assistance after further study of the specific tools that are desired, the level of demand, and whether the resources are already available through existing avenues. Staff has yet to complete detailed research and analysis on financing options; although, it is a priority for 2008. If regulatory options are added for energy efficiency improvements and renewable energy systems, facilitating financing may be especially important to limit the burden associated with the new requirements.

City and County Financing Program

City staff has been involved in preliminary work to provide low-interest financing for energy efficiency improvements and renewable energy systems, in partnership with Boulder County and the city of Longmont. A Weekly Information Packet (WIP) on this financing model was submitted to City Council on Feb. 21, 2008 (can be found at www.bouldercolorado.gov/files/City%20Council/WIPS/2008/02-21-08/2C.pdf). The concept is similar to the Berkeley program that has received a great deal of attention. The approach under consideration would use local governments' tax-exempt bond capacity to create a fund from which all residents and potentially businesses in Boulder, Longmont and unincorporated Boulder County would be eligible to receive a loan for energy efficiency or renewable energy projects. The loan would be attached to the property and be paid back through property tax assessments. Legislation to create authority for municipalities, Boulder County and the state to offer loans for energy efficiency and renewable energy systems was introduced in the first week of March (HB 08-1350).

If the bill passes, staff will return to council to discuss use of the city's private activity bond allocation ($4 million in 2008) for this purpose. To give a rough idea of what could be accomplished if $4 million in loans were available, 500 $8,000 loans could be provided. This amount of money should be adequate for most energy efficiency improvements and the homeowner cost of a small PV system. If council decides to move forward then staff will initiate work on design and implementation of the loan process. If this approach does not work out for some reason, staff will continue to evaluate financing options with the CAP Advisory Group and present an assessment to council.

Policy Options to Improve Energy Efficiency for New Construction

1. **Expanded Residential Green Building Code**
2. **Development of a Commercial Green Building Code**

Questions

4. ***For new construction, does council want to see a full scale commercial green building code, or an interim code that addresses energy? If a full scale program, does council want staff to begin the process before the third quarter of 2008***

The 2006 International Energy Conservation Code (IECC) was adopted by the city on Oct. 30, 2007 (and became effective Jan. 2, 2008) and applies to both commercial and residential construction. Updates to the (Residential) Green Points Program were adopted on Nov. 13, 2007 (and became effective Feb. 1, 2008). The mandatory requirements of Green Points establish energy efficiency baselines above the 2006 IECC. City Council also increased energy performance of new residential construction and larger additions and remodeling projects through the amendments to the Green Points Program.

While some outstanding issues remain, staff suggests evaluating the impact of the changes over the next six months or so and to return to council in the fall to discuss results and revisit the outstanding issues. Staff is also requesting council feedback on the establishment of a future energy efficiency goal beyond the 2012 established Kyoto targets relative to the residential green building program.

In addition, at the Jan. 25, 2008 City Council Retreat, members identified enhancing the energy performance of new commercial construction in the short term, and designing a comprehensive commercial code by year end. Staff is working with the Consortium of Cities on development of model commercial green building code that is anticipated by the end of the year. In order to continue the evolution of the codes that influence energy efficiency, staff proposes the following approach for the development of energy efficiency guidelines for residential and commercial buildings.

2008 Updates to the Residential Green Points Program

As mentioned previously, a revised Green Points Program became effective Feb. 1, 2008. The new ordinance identifies Green Building mandates and Green Points options as the two aspects of the program. For new construction, the new residential program establishes energy efficiency baselines above the 2006 IECC and requires construction waste recycling. Remodels and additions are required to have an energy audit and

incorporate efficient lighting, plus deconstruction is required on remodels removing 50 percent or more of the exterior walls. The Green Points component remains similar to the prior program, requiring a specific amount of points, determined by project type and size, to be obtained by choosing green point options outlined in a menu of green practices, technologies and products in the Green Points Guideline Booklet.

This update focused on more stringent requirements for new construction. Increasing requirements through building codes is an appropriate first step to reduce energy use and address other resource issues that are valued by the community. They also have proven results and a reasonable one-time cost. Yet, the vast majority of the city's construction projects fall into the remodel and addition category. The housing stock is a much more difficult situation to remedy through building codes, as each project is different in size, scope and alteration.

As part of the 2007 Green Points adoption process, council requested staff to do more research on remodel and addition thresholds that may be applied in an equitable manner to the majority of these construction projects. Staff will return to council this fall with case studies that demonstrate retrofitting energy efficiency measures into existing houses in Boulder, calculating costs per measure and associated energy savings.

While substantial changes can be done at the local level, staff is careful to consider the impacts of future IECC code revisions. The International Code Council (ICC) updates their codes every three years, and they are developing the 2009 International Energy Conservation Code (IECC). Of the code changes recommended for adoption by the code development committee to date, none would result in substantial changes in the energy efficiency required for commercial construction. Most of the changes that have been approved by the code change committee are to make the 2009 IECC more consistent with ASHRAE 90.1 2007.

While not recommended for approval by the code change committee, a code change proposed by the Energy Efficiency Codes Coalition (EECC), an energy efficiency advocacy group, would increase residential energy efficiency requirements by at least 30 percent.

EECC's 30 percent more efficient code change proposal will be decided by the ICC membership when building officials representing local governments debate and vote on the code change at the final code hearings set for this September in Minneapolis, Minnesota.

This raising of the "floor" needs to consider the cumulative impact of new national standards with additional above code local requirement. For example, if the new IECC changes result in a 20 percent increase for energy efficiency requirements, that when paired with a local requirement of 30 percent above code could result in a net 50 percent above code requirement from today's standard. Staff will continue to monitor potential code changes and consider local implications.

Commercial Green Code Development

The development of a commercial counterpart to Green Points (for exceeding the 2006 IECC) was scheduled to begin the third quarter of 2008; however, if council is interested in accelerating the development of a green commercial code, staff asks that council provide staff with this feedback at the study session.

With that said, staff from both the Office of Environmental Affairs and Planning and Development Services have stimulated conversation, interest and some research in the recent past with the development community on commercial green codes. More recently, city staff has joined efforts with the Consortium of Cities Energy Strategy Task Forces' Codes Committee. The consortium is organizing a prominent group of stakeholders of commercial building professionals and code officials to participate in a countywide process to develop a commercial green building code and/or recommendations. The group's goal is to meet once every three weeks and produce a regional commercial code recommendation by late fall.

Staff is hoping to understand if it is council's desire to have a full scale green building code, similar to Green Points or LEED for commercial construction or just an increase in energy efficiency requirements above the standard energy code. Among the projects that are currently in the city's review process, staff has seen a 4-14 percent better than code energy performance on numerous projects. This is verified through ComCheck (U.S. Department of Energy's free commercial modeling software currently used for energy code compliance) documents for mixed-use types of projects.

Research done by the Southwest Energy Efficiency Project (SWEEP) (Attachment C) reveals that across the country, state and local governments are pursuing commercial green building programs for new and substantially renovated building to exceed commercial energy codes by 30 percent or more. The professional consensus is that 30 percent above-code performance is the most cost-effective approach for regulating new commercial construction that contributes to effective energy savings and a reduction in associated GHG emissions. Incorporating best practices and increasing efficiency levels in the building envelope, mechanical systems, lighting and domestic hot water, a building's performance can achieve 30 percent above code.

Policy Question: Increased Commercial Performance Requirements

If council wants to increase performance requirements above 30 percent, such as 50 percent above code performance, the city will need to employ enhanced strategies such as advanced building design, controls, and on-site renewable energy, which could result in higher project costs.

Staff has been exploring options implemented in other jurisdictions. An example of Albuquerque, New Mexico's new commercial energy code is briefly described below to provide council with a snapshot of what other local governments are enacting.

Cited by the Albuquerque ordinance, "The 2007 Albuquerque Energy Conservation Code is one element of the Mayor's effort to achieve the goals of the 2030 Challenge ensuring new buildings are carbon neutral by the year 2030."

Albuquerque's code was adopted Sept. 25, 2007 and goes into effect April 1, 2008. The new code adopts and amends ASHRAE 90.1 – 2004, which creates standards and guidelines relating to HVAC (heating, ventilation and air conditioning) systems. These standards are typically referenced in most building codes and green building programs.

Albuquerque's new conservation code is used in conjunction with ASHRAE 90.1 – 2004. As in Boulder's Green Points Program, this code also exempts LEED Silver certified buildings (4 energy points or greater) from the new standard. Additionally, designated historic buildings are exempted from the standard.

Office and retail spaces of 20,000 square feet or less can use the prescriptive standard set in the energy code based on a detailed set of requirements for the envelope, HVAC, service water heater, lighting and power. However, buildings larger than 20,000 square feet are required to be designed to an ASHRAE 90.1 - 2004 standard that is at least 30 percent more efficient than standard.

As the city of Albuquerque has similar GHG and environmental goals as Boulder, it plans to develop incentives through its Green Building Program to encourage building designs that will exceed the level set by the 2007 Albuquerque Energy Conservation Code. And, with guidance from its Green Ribbon Task Force, the 2007 Albuquerque Energy Conservation Code will be amended, at regular intervals, to keep pace with the new energy conservation technologies.

Two Examples of Recent Boulder Commercial Projects Employing Green Building and Energy Efficiency Performance

As a local comparison, staff has analyzed two recent projects to determine how a new energy efficiency standard could be applied. Both of these commercial projects utilized green building design, and energy efficiency performance was calculated using ComCheck.

The newly remodeled Boulder REI store incorporated passive solar design and active solar technologies resulting in a 20 percent increase in energy efficiency above code. Photovoltaic (PV), solar water heating and day lighting have all been successfully used. Water fixtures were selected that use 30 percent less water than standard fixtures and many environmentally preferable products were used in this project.

In addition, the new mixed-use 1155 Canyon building pursued a LEED Core and Shell certification with highlighted features such as passive solar design and solar hot water and PV systems, efficient mechanical equipment with pollution reductions, occupancy sensors, low-E glass and white roof membrane. Water efficiency, sustainable product choices and local and regional materials, construction waste recycling and indoor air

quality and pollution control efforts. This project achieved at least a 14 percent energy performance above code with just under 10 percent contribution from on-site renewable energy.

Staff Recommendation: Relative to Green Building several potential initiatives have been identified to date (see Attachment C) and staff would like council to help prioritize these initiatives in order to best leverage partnership opportunities and city resources. Given recent research, staff believes that the city should proceed with a more aggressive goal of 30 percent above code for new commercial construction immediately. If council believes this is the appropriate level, staff will return to council with proposed options and a prioritization of additional commercial code work for existing buildings as part of the commercial code update.

Additionally, staff proposes to return to council in fall 2008, with recommendations and options for updates to the residential Green Points Program, specifically areas which address energy efficiency in existing homes. Staff further proposes to develop a plan which incorporates new resources which would need to be allocated to this effort to educate, provide technical assistance and guidance in receiving Xcel rebates for increasing building performances.

Policy Options to Improve Energy Efficiency - Existing Buildings

Questions

3. Would council like staff to proceed with further evaluation of regulatory options to improve energy efficiency in existing residential buildings? For commercial buildings?

Because the current approach of facilitating voluntary investment in efficiency may not provide desired emissions reductions levels, regulatory policy approaches may be necessary. The CAP outlined several potential regulatory options, however, at the time the plan was adopted council did not approve a regulatory approach to require energy efficiency for existing buildings. Options described in the CAP included requiring annual energy use disclosure to tenants during the leasing process, requiring energy assessments and providing a report to prospective tenants, and requiring specific energy performance enhancing measures be installed in a property over time. Each of the options has pros and cons with the first two options serving as largely educational or awareness building tools. The third option that is in place in several similar communities similar to Boulder is a residential energy conservation ordinance or RECO. Because fewer utility incentives are available to the residential sector, a regulatory approach - likely complemented with financial assistance - may be desirable. A summary of available RECO information is provided below.

Staff Recommendation: Staff recommends that the city evaluate the benefits and impacts of local implementation of this type of ordinance.

A RECO is a policy tool for upgrading the energy efficiency and water usage of existing housing. RECOs require building owners (landlords and/or homeowners) to implement specific, prescriptive energy and water efficiency measures if their property doesn't meet a minimum standard. Some communities are exploring using energy performance based requirements in addition to or as an alternative to prescriptive requirements.

RECOs are especially relevant in the rental property sector, where there exists a disincentive for landlords to incur the costs of efficiency improvements when they do not directly reap the benefits. These properties are often the ones with the greatest need of upgrades. In addition, a RECO offers an avenue for addressing the energy efficiency of existing rental and multifamily housing sectors which benefits to the lower-income portion of the community as the city pursues energy and GHG goals. Typically, RECOs take effect either when the property changes hands (time of sale) or during the rental license inspection and renewal process. Another possibility would be to establish a date when all properties must reach the minimum standard. The date could be several years in the future to phase in compliance. In developing a RECO for Boulder, the city should balance factors such as how to realize maximum energy efficiency, how to minimize the cost and administrative burden on the city, and how to minimize inconvenience and cost to the building owners.

The cost to the city of a RECO program relates to administration; although, these costs are typically recovered through an inspection fee borne by the property owner. The cost of the required improvements that would be borne by the property owner varies depending on the existing condition of the building, but average costs in other programs range from $650–$1,000 to comply with the ordinance. This cost would be in addition to the cost of the inspection, also borne by the property owner. Many RECOs institute a maximum limit to the expenditures by the property owner. Energy savings would likely be on the order of 10-20 percent per building, depending on the stringency of the standards. The city may consider offering incentives to early adopters. Energy education for tenants would also enhance effectiveness.

Since RECOs are usually enforced when a property changes tenants or owners, it is difficult to measure actual energy savings since energy use can vary greatly by occupant. Berkeley, CA, has not attributed energy savings directly to the RECO it has implemented, but it has recorded 13 percent energy savings in the residential sector from 2000-2005. Initial analysis by staff estimates that by initiating a RECO in 2009, applied to all housing - rental and owner-occupied - GHG reductions would equal 29,772 mtCO2e by 2012. This level of GHG reductions represents 9 percent of current residential energy consumption.
Implementing a RECO in Boulder could provide economic, social and environmental benefits. The political and financial barriers may be addressed by phasing in the required measures over time and offering financial assistance through rebates and low-interest financing.

Suggested Process: Staff suggests a public dialogue/process with homeowners and rental property owners to get their input on benefits and impacts from a local RECO and to examine how best to structure a RECO program for Boulder. Specific issues to be

addressed include the trigger for compliance, required efficiency measures, compliance process, educational needs, and preferred incentives.

Policy tools to address commercial energy use, especially in existing and leased property were mentioned above. An energy use disclosure requirement or energy rating at the time of lease could complement CAP and Xcel Energy programs and begin to shift existing commercial space toward more sustainable energy consumption. Staff proposes evaluating the impact and effort required to implement these options.

Staff is also investigating the possibility of establishing a set of commercial codes for existing commercial buildings. While commercial codes for existing buildings are not common for cities, staff believes this could be a viable option to improve the energy efficiency of existing buildings. One option that was recently implemented in San Francisco is a code to improve the efficiency of commercial lighting by eliminating the use of T-12 fluorescent lights and requiring the replacement with T-8 lights. This option was analyzed for its potential in Boulder County's SEP, and the estimated GHG emissions reductions, scaled for the city of Boulder, would be approximately 23,831 tons or six percent of the GHG goal.

	GHG Reductions	Percent of 2012 Goal
Green Points - Current	4,222	1
RECO - Proposed	29,772	7
Net Increase	**25,550**	**6**
Commercial Codes Existing Buildings - Proposed *	23,831	6
Commercial Codes New Construction - Proposed *	21,319	5
Net Increase	**45,150**	**11**

* SEP - Countywide estimates scaled for the city of Boulder

Transportation – Climate Action Connection

The CAP outlines three overarching strategies to reduce transportation-related GHG; reduce vehicle use, increase the use of biofuels and increase the fuel economy of vehicles in Boulder.

Vehicle Use

Vehicle use, or vehicle miles of travel (VMT) is addressed through implementation of the Transportation Master Plan (TMP). Reducing VMT requires that adequate infrastructure is in place for people to use other modes with corresponding education on how to use the infrastructure and reduce vehicle use. The city's success at managing VMT growth has

helped in the management of GHG emissions growth from this sector. Estimates suggest that implementing the TMP at the Action funding level would achieve two percent of the total GHG reductions needed by 2012 and the Vision funding level would achieve nine percent of the city's GHG goal. The topic is discussed in more detail under the Mobile Source Contribution section.

Biofuels

There is a national debate taking place over ethanol that covers a broad range of economic, social, political and environmental issues. It is not likely that this debate will be decided in the near future. The city could allow ethanol to slowly expand into our community through ambient market forces. The city could also begin to actively promote E85 (85 percent ethanol and 15 percent gasoline) infrastructure and compatible vehicles. The city runs the risk of being put in the intractable position of promoting a fuel that has questionable sustainability characteristics. The city also has the opportunity to help create a market for future biofuels technologies that could provide a realistic alternative to petroleum fuels and improve public perception of even less carbon-intensive alternative fuels as they are developed and deployed.

Increasing the use of biofuels requires a three-pronged strategy. One prong is to increase the infrastructure for biofuels, another is to increase the population of vehicles that can operate on biofuels and the third is to educate the owners of those vehicles.

Currently, there are several thousand E85 compatible vehicles in Boulder, accounting for less than one percent of the vehicle fleet. In 2008, eight percent of domestically produced automobiles will be E85 compatible. These vehicles are expected to penetrate the Boulder market.

The nearest E85 fueling station is located in Gunbarrel. Staff has visited in-person approximately 75 percent of the retail gas stations in Boulder to encourage the installation of E85 pumps. Private gas station owners are averse to taking the financial risk, even with substantial state and federal incentives. Corporately-owned stations have been unresponsive to staff outreach. With proper infrastructure, E85 is projected to account for less than one percent of the city's GHG goal.

Biodiesel is available at publicly accessible pumps in Boulder and approximately 1,500 diesel vehicles are registered in Boulder. Increasing the population of diesel vehicles could increase the use of biodiesel; however, conversations with dealerships revealed that the vast majority of customers seeking a diesel vehicle do so for fuel economy or torque, not biodiesel compatibility. It is projected that if all the diesel vehicles in Boulder use biodiesel, it would account for less than one percent of the total GHG reductions needed by 2012.

Staff will continue to evaluate the sustainability of biofuels, to work with local retailers to offer fuels and to educate the community about the benefits of biofuels as an alternative to petroleum based fuels. No enhancements are proposed for the CAP biofuels programs.

Vehicle Efficiency

Without federal fuel efficiency mandates, the ability to increase the fuel economy of vehicles in Boulder is dependant on the frequency of vehicle purchases and the willingness of residents to change their perception of what they need in a car. Local car dealerships have been interviewed to determine buying motives. It was found that it is difficult to change perceptions at the dealership. When a customer arrives at the auto dealership, they know what they want in a vehicle. The education has to take place while the customer is forming their idea of what their needs are. Therefore, education on how the fuel economy of a vehicle will affect its owner's carbon footprint is infused into our outreach messaging.

Future Transportation/GHG Options

There are several other options for reducing transportation emissions.

Clean Cars Standard

Colorado is one of 14 states to propose enactment of a Clean Car Standard modeled after California's program. Currently, California is pursuing legal action against the Environmental Protection Agency to enact the standard. If a waiver is granted, other states will be able to adopt the program. Fuel cost savings due to the fuel economy increase associated with this program are projected to exceed any added vehicle costs and would achieve approximately six percent of the city's GHG goal.

Vehicle Registration Fees Linked to Efficiency - Feebate

Boulder County has proposed, as part of the SEP, a vehicle registration system that rewards ownership of high fuel-efficient vehicles. The general approach involves setting registration fees to correspond to fuel efficiency; a higher fee for poor fuel-efficiency vehicles and lower or no fee for high fuel-efficiency vehicles. The county would be responsible for administration; although, the city may want to provide additional marketing and education about the link between fuel economy and GHG emissions. A local feebate is estimated to achieve approximately six percent of the total GHG reductions needed by 2012.

Emerging Technologies

There are emerging vehicle technologies which are expected to penetrate the marketplace in the next five years. Plug-in hybrid electric vehicle (PHEV) technology is gaining footing and is in the spotlight as utility providers work to meet peak energy demand in an environment where new power plants are being blocked. This vehicle-to-grid (V2G) technology allows the vehicle's battery to store off-peak power and provide peak-shaving when demand exceeds power supply. V2G technology requires a sophisticated power supply such as *Smart Grid*. Supporting V2G technology in Boulder is expected to provide up to five percent of the GHG goal.

Staff will continue to work with local dealerships to educate the community about the importance of vehicle efficiency to reduce GHG emissions. Additional CAP tax funding is not proposed for the CAP transportation options; although, additional staff resources

and potentially additional budget may be needed to maximize the emissions reduction opportunity presented by the future options described above.

	Budget	GHG Reductions by 2012	Percent of 2012 Goal
CAP Current	$29,873	3,940	1
CAP Proposed	$29,873	3,940	1
TMP – Action**	$104 M	10,000	2
TMP – Vision**	$281M	36,900	9
Clean Cars Standard*	$10,000	24,563	6
PHEV/V2G*	$70,000	18,531	5
Feebate*	$20,000	25,839	6

* SEP - Countywide estimates scaled for city of Boulder

** TMP estimates include all costs related to these investment packages, including increased maintenance, expanded services and infrastructure projects. These investments would be made over the period from 2008 to 2025. Annualized cost of the TMP Action Plan is approximately $5 million per year.

Mobile Source Contribution

Vehicle transportation is the second largest sector contributing to Boulder's GHG emissions. The Transportation sector produced 22 percent of total 2006 emissions, totaling 442,895 mtCO2e. The emissions estimates are based on vehicle miles of travel (VMT) in the Boulder Valley planning area. The initial CAP objective for GHG emission reductions in the transportation sector is a reduction of 40,000 mtCO2e. If possible, staff would like to increase the reduction target for this sector. Primary strategies for achieving this reduction are:

- Reduce VMT
- Improve fuel economy
- Use lower carbon fuels

Implementing the TMP Action Plan would achieve approximately a quarter of the sector's GHG emissions reduction objective by reducing expected vehicle miles of travel (VMT) by 3 percent from 2001 over the Current Funding investment program. The CAP notes that the VMT reduction expected from implementing the Vision program of the TMP would achieve more than 90 percent of the GHG emissions reduction for the transportation sector and 9 percent of the total GHG goal. The potential GHG emissions reduction from reducing VMT as predicted in the adopted CAP is shown in the following table.

TMP Funding Level	2001 Daily VMT (mil)	2012 Daily VMT (mil)	2012 Percent Below Current Funding VMT Level	2012 mtCO2e Reduction	2012 Percent of Trans Sector GHG Goal	2012 Percent of city's Overall GHG Goal	2025 Daily VMT (mil)
Current Funding	2.694	3.218	0%	0	0%	0%	3.769
Action Plan	2.694	3.124	3%	10,000	25%	2%	3.673
Vision Plan	2.694	3.041	5.5%	36,900	92%	9%	3.576

The remaining GHG emission reductions would come from fleet efficiency increases and the increased use of alternative fuels. While the expected VMT reductions are relatively small, it is important to note that the CAP is heavily dependent on continuing the policy direction of the TMP. This policy direction has helped control the growth in city VMT, relative to the broader trends of the region and nation.

Transportation Initiatives

FLO areas of potential action:

The previous FLO materials considered by council focused on the areas of funding and prioritized investments in additional facilities and programs. The area of policy implementation is an important addition for staff to work on in order to achieve progress toward the VMT reduction objectives of the CAP and TMP. Council will have to opportunity to consider the interplay between additional funding and additional policy initiatives in achieving the VMT reduction objectives of the TMP.

Additional Funding

Questions

2. ***Should staff still proceed with the proposed levels and distribution of funding in the FLO-modified Current Funding and Action Plan list of projects and programs?***
   - ***If so, does council continue to support staff returning to City Council to amend the TMP with the FLO-modified Current Funding/Action Plan project and program list?***

9. ***Does council have questions or comments on transportation funding; and does council still support staff's exploration of options for additional funding for Transportation to pursue GHG and VMT reduction goals, create community connections and optimize the benefits of FasTracks improvements?***
   - ***Does council agree with staff further investigating the range of "Action" Plan level of funding as represented by the Blue Ribbon Commission example(s) and the FLO-modified Action Plan?***

The results of the FLO and the BRC efforts suggest additional funding is needed for transportation, both to maintain the existing system and to provide the enhancements that will connect to FasTracks and provide travel options community-wide. The FLO-

Modified Action Plan is contained in **Table 1** at the end of this section and calls for additional transportation investment of $84 to $108 million by 2025. This would be equivalent to an annual additional investment of $4.67 to $6 million. This amount includes the current staff estimate for the increased cost of operations and maintenance activities of $20 million through 2025, but this number is still being refined by the ongoing transportation O&M study. Without the operations and maintenance increase, the FLO funding range is similar to the additional funding for transportation suggested by the BRC, which included an annual $2.9 million from a transportation maintenance fee in its first funding sample and $2.33 in additional essential enhancements as part of the "Winnowed" Essential Services for 2009-2019 Action Plan. While the additional funding needs are significant for both the FLO-modified Action Plan and the TMP Action Plan, staff believes that the FLO process provides a more focused and strategic set of improvements. Consequently, the FLO-modified Action Plan is a sound foundation of achievable projects, programs and policies that will make significant progress toward the goals of the TMP and the CAP.

Infrastructure, Programs and Services Investments

Table 1 at the end of this section is the proposed Transportation Action Plan project list as modified by the FLO process. Staff has been working on the initiatives from the Bike Summit but does not yet have a cost estimate for these. Consequently, a line item for this initiative has been added but the projected costs are not included. Previous council discussion indicated that this package of achievable projects, programs and policies should become a refined action plan for the TMP. This would be consistent with the ideal of the TMP as a "living" plan. Staff believes that amending the TMP to reflect the FLO-modified Action Plan list of projects is still the appropriate action.

Policy implementation

Questions

7. ***Does council have any questions or comments regarding the set of transportation demand management policy initiatives; and where on the "dial" should staff explore further to support the CAP and VMT reductions?***

The initial FLO process was focused on facility, program and service investments. However, in numerous discussions on FLO and in light of the current funding realities, staff believes there are policy implementation actions that could be considered that would support the CAP and TMP objectives of VMT reduction. There are policy choices that the city could pursue at little cost that would make significant contributions to achieving the goals of the TMP and the CAP. Examples would be a trip reduction ordinance or parking policy changes reflecting the true cost of parking.

The second table at the end of this section is a Policy Implementation Matrix containing a number of potential actions that the city could consider taking. Staff has provided a brief description of each action and summarized its area of application, likely effects, difficulty level for implementation and pro/con arguments. Some of these policy actions also have the potential to raise revenue for transportation activities. These policy initiatives would

have the advantage of directly influencing travel behavior while raising revenue for the city. This revenue could be used to provide additional funding for transportation investments or to replace existing revenues from sources that do not directly influence travel behavior.

Graphics 1 and 2 at the end of this section provide examples of the funding and policy options that the city could take. Both graphics are illustrated as dials with a series of actions grouped together ranging from relatively easy, with low impacts on the lower part of the dial, to the more difficult, with greater impacts at the top of the dial. There is interplay between the action areas of greater funding to invest in additional programs and facilities and increased policy initiatives to achieve the same level of VMT and GHG reductions. In the past, the city has largely "turned up" the dial on the funding piece by investing in additional facilities and programs to encourage travel by modes other than single-occupant vehicles.

The Transportation Advisory Board (TAB), Planning Board (PB) and FLO Committee utilized the regulatory options graphic to facilitate a productive discussion of where on the dial the city should begin to explore policy initiatives. The TAB used the graphic as a starting point for discussion, with each board member indicating where they would initially set the dial and then discussing the reasons for their decision. The PB also had a similar conversation about which quadrant of the dial the city should be working in. The FLO committee was broken up into workgroups of seven to eight members with a large dial graphic at each table. Members started by indicating their preference for setting the dial by placing dots on the graphic. They then discussed their rational for their initial preferences, how the community might respond and how the package could be modified to make it more acceptable. A summary of each group's results is contained in the Public and Board Input section.

draft Transportation Action Plan project list 2008 thru 2025 (as modified by FLO)

Cost estimates (City of Boulder costs only) March 2008

Important notes:

* This chart does not include any projects that are included in the 2007 to 2012 CIP. All projects are beyond the scope of that document. Most projects are already in the current funding, action plan or vision plan project lists of the TMP, though some, such as enhancements to FasTracks stations and Transit Village investments, are new.
* These figures assume maximum leverage from other funding sources, including FasTracks, other RTD funding, CDOT, community partners such as CU, Boulder County, federal funds, private investment during development review, etc.
* Most projects with matches will only move forward if the matching money is available.
* Shaded cells denote a range of options with different costs
* Costs include both capital expenses and operating funds (such as for transit services) from start-up through 2025

Project Themes	Cost in millions, city share only	Notes
Capital Projects: Providing transportation choices throughout the community		
Provide safe, attractive and plentiful multimodal connections		
Complete strategic missing links:		Various bike routes, bike lanes, and pathway connections. Assumes a 100% local share of all projects, though a few may be eligible for TIP funding or matched from Greenways.
Along Broadway and 28th Street multimodal corridors	$3.2	
Between downtown and Transit Village	$0.0	
Between north Boulder and Transit Village	$5.0	
Additional bicycle and pedestrian connections throughout the community	$4.8	
Improve transit amenities along BRT corridors	$1.0	Benches, shelters, maps, schedule and transfer info, ticket kiosks, in addition to RTD's basics
Complete 28th Street improvements	$7.7	The final phase of 28th Street improvements: Transit widening from Pine to Valmont and multi-use paths from Walnut to Glenwood
Complete strategic, high-priority connections during redevelopment	$8.0	Create a pool of funding to achieve a finer grid of connections during the redevelopment process, augmenting the proportional cost that can be exacted from property owners ($0.5 per year)
Subtotal Multimodal connections	**$29.7**	
Capital Projects: Making the most of FasTracks		
Upgrade our intermodal centers		
BRT intermodal center improvements:		
14th & Walnut (downtown) bus station (3 options)		
Low end: on-street "band aid" solution	*$0.0*	Park additional buses on surrounding streets, assumes full cost covered by RTD
Medium: supplemental station with pedestrian tunnel under Canyon	*$6.0*	Acquire property south of Canyon for additional bus parking. Assumes 20% city match of RTD and federal funds
High end: relocate station south of Canyon	*$10.0*	Relocate station south of Canyon, sell existing property, build new bus station and parking garage (1). Assumes 20% city match of RTD and federal funds
Broadway at CU/Euclid (2 options)		
Option 1: improved bus facilities and pedestrian underpass	*$0.3*	Assumes 10% city match of CU, RTD and federal funds
Option 2: CU gateway new bus facilities, roundabout and pedestrian underpass	*$0.5*	Assumes 10% city match of CU, RTD and federal funds
"Stations enhancements" including adjacent bike/ped improvements (2)		Project listed below assume 100% city funding, as these are the projects RTD is unlikely to fund through FasTracks
Table Mesa park-n-Ride	$4.5	Bike/ped underpass under Table Mesa at BRT station, other connections to US 36 bikeway plus "enhancements". Assumes 100% city funding
Gunbarrel multimodal connections	$1.5	Various connections plus "enhancements"
63rd & Arapahoe (potential)	$1.5	Extend path along Arapahoe plus "enhancements"
Subtotal Intermodal Center Improvements (low end)	**$7.8**	
Subtotal Intermodal Center Improvements (high end)	**$18.0**	
Invigorate the Boulder Transit Village Area		
Multimodal connections and additional transportation improvements (broad range of potential costs):		Low end is estimate of Phase 1A highest priority improvements as identified in the Transit Village Area Plan process. High end is a very rough estimate of all priority transportation improvements in the area through 2025. The scope of improvements will be identified through future phases of planning for TVAP. The city's share of costs likewise has not been determined. We anticipate that RTD and property owners who are redeveloping will pay for some portion of some projects, to be determined through the TVAP process and RTD's Northwest Rail planning process.
Low end: city share of Phase 1 highest priority improvements	*$2.4*	
High end: total cost for all transportation improvements through 2025	*$13.0*	
"station enhancements"	$1.0	
Subtotal Transit Village area (low end)	**$3.4**	
Subtotal Transit Village area (high end)	**$14.0**	

Budget the local match for FasTracks		
Estimated contribution from Boulder		RTD requires a 2.5% local match to FasTracks. The Northwest Rail has a budget of $416 million, FasTracks share of BRT is $66 million, requiring a combined local match of $12 million. It has not yet been determined how the local match will be divided between local jurisdictions (per station, per mile of track, based on ridership, etc), so the city has identified a range between 20% and 50%
Subtotal FasTracks Local Match (low end)	**$2.5**	
Subtotal FasTracks Local Match (high end)	**$6.0**	
Programs and Services: Expand the options available		
Provide better bus service		
Improve local Transit Services:		Assumes 2014 start date for new services
Start "HOP Express" to meet trains	$2.8	Purchase two new buses, assumes 50% RTD match on operations
Turn northern leg of 204 into high frequency CTN service	$3.5	Assumes CMAQ funding with RTD local match on initial phase, $.25/year city buy-up in future years
Enhance 206 and 208 services	$0.0	Assumes full RTD funding
Establish local service on 28th Street	$2.6	Assumes 80% CMAQ start-up and RTD buy-up of productive service
Increase Special Transit funding	$2.4	Increase city contribution by $150K/year as per TMP Action Plan
Improve transit stop maintenance	$1.5	Additional $100,000/ year for improved sweeping, plowing, etc at shelters
Subtotal local transit services	**$12.8**	
Make it easy to leave the car behind: Transportation Demand Management programs		
Increase local transit passes from 60,000 to 75,000	$2.2	Expand GO Boulder's Eco Pass subsidy program to support neighborhoods, businesses, at-risk youth, etc
Expand outreach and business community involvement	$2.4	Marketing, ETC outreach and measurements
Implement Bike Summit initiatives		
Bike rentals, car share, etc.	$1.1	Assumes some CMAQ start-up funds, local partnerships
Effective wayfinding and signage	$0.5	Assist drivers, transit users, bicyclists and pedestrians in finding stations and key destinations
Offer alternatives during construction	$0.0	Assumes robust program as part of US 36 and Northwest Rail construction projects
Subtotal TDM programs	**$6.2**	
Operations and Maintenance		
Achieve a state of good repair		
Adequate funding to ensure safety, system integrity and preserve infrastructure investments.	**$20.0**	This figure incorporates both the O&M costs of the projects in the FLO list and address potential shortfalls in on-going O&M city-wide. These costs are very preliminary results from an in-progress O&M study, so may be revised.
Planning and Policy Refinements		
Change codes and regulations to encourage mode shift		
Explore land use changes along transit corridors and near intennodal centers	$0.8	Additional staff and planning efforts
Revisit parking policies, development review standards and other demand management strategies	$0.8	Additional staff and planning efforts
Subtotal planning and policy refinements	**$1.6**	
TOTALS		
LOW END FLO TOTAL	***$83.9***	Assumes lowest cost for intermodal centers, Transit Village and FasTracks local match.
HIGH END FLO TOTAL	***$108.3***	Assumes highest cost for intermodal centers, Transit Village and FasTracks local match.
(1) This option may offer opportunities for public/private development partnerships.		
(2) RTD designs call for very basic FasTracks stations. The city will have financial responsibility for any "enhancements," including bringing stations to city standards, adding public art, better shelters, additional pedestrian connections, improved access, etc.		
updated March, 2008		

Table 2. Policy Implementation

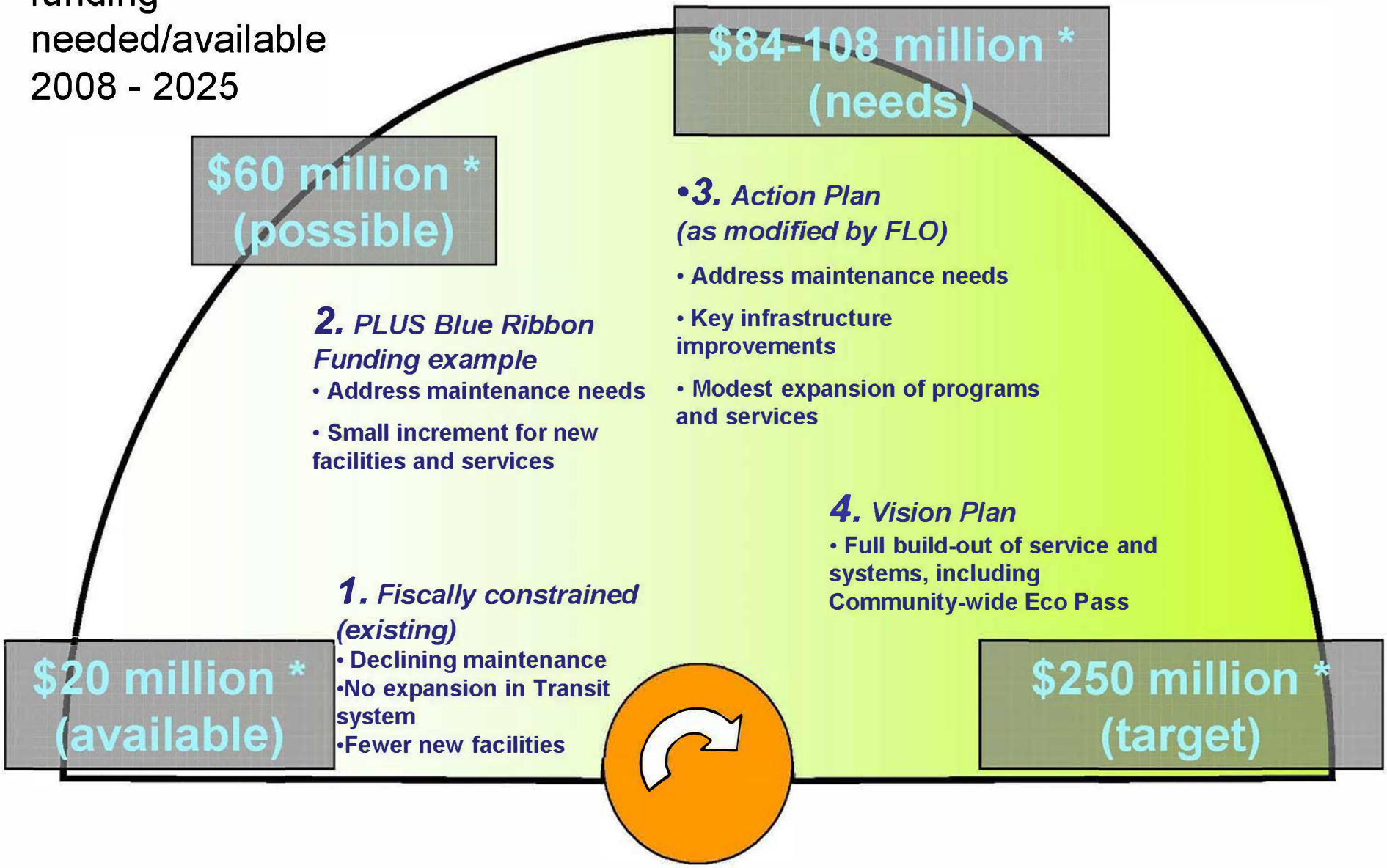
Policy Implementa-tion	*Description*	*Supporting Conditions*	*Area of Application*	*Pro*	*Con*	*Impact*	*Difficulty*	*Dial Setting (1=low, 5=high)*
Parking Maximums versus Parking Minimums	The current code only contains parking minimums with the assumptions that parking will be provided on site. Parking maximums would limit the amount of on site parking allowed.	• Opportunities for shared parking or off site parking • Priced and managed parking • Available transportation options • Additional bicycle parking	• New development and redevelopment • Transit corridors and other areas with available options	• Can be implemented by local government through land use regulation • Standard parking ratios have little empirical basis • Parking is expensive to provide • Encourages parking efficiency • Supports TDM efforts	• Resistance from business owners • Lenders may require more parking • Concerns with spill over parking • Seasonal parking demands may need to be accommodated other ways	Low to Moderate	Low	1
Residential Parking Requirement Modifications	Current policy requires residential that parking is provided on site. Credit could be given for on street parking such as when driveway removal adds curb space.	• Area without existing parking pressure	• Lower density residential areas	• Can be implemented by local government through land use regulation • Improves the pedestrian environment	• Neighbor concerns with parking availability • Could be problematic in high rental areas with multiple vehicles per household	Low	Low	1
Employee Parking Cash Out	Employer provides the employee with the cash value of the provided parking and allows the employee to buy parking on a daily basis or retain the cash if they do not use a car to get to work.	• Available transportation options • On site ETC and TDM programs • Area wide parking management to control spill over effects	• City wide • New and existing commercial development	• Very efficient and well studied • Can be seen as an employee benefit • Minimal administrative requirements • Successful local examples	• Requires some level of parking enforcement • Unused parking may not be utilized in other ways under existing codes • Value of parking needs to be determined	Moderate to High	Moderate	3
Unbundled Parking	Separates the value of parking from the leased or sold space and allows the tenant to choose how much parking to either buy or lease. This creates a separate real estate market for parking and allows for efficient pricing of the resource.	• Parking brokerage service to facilitate the market • Available transportation options • Supportive TDM program • Area wide parking management to control spill over effects • Carshare program	• Transit corridors • New and redevelopment of mixed use, commercial and residential projects	• Increases parking efficiency • Reduces the amount of required parking • Allows for changes in parking needs over time • Could likely be required by the city • Limited oversight or enforcement needed • Parking needs becomes an tangible economic decision	• Requires some initial effort to price the parking • Requires parking enforcement • Unused parking may not be utilized in other ways under existing codes	Moderate to High	Low to Moderate	4
Paid/Variable Priced Parking	Parking is paid for based on the amount of time used and the level of demand. Cost to park will be highest during peak demand	• Parking district or parking management association • Available transportation options	• Existing and future parking districts • Transit Village	• Is a user pays system providing direct price signals that maximize efficiency • Maximizes parking efficiency	• Requires parking enforcement • Businesses may see paid parking as a competitive disadvantage	High	High	5

Policy Implementa-tion	*Description*	*Supporting Conditions*	*Area of Application*	*Pro*	*Con*	*Impact*	*Difficulty*	*Dial Setting (1=low, 5=high)*
	periods. Variable pricing would aim to keep one parking space available per block face	• Comprehensive TDM program • Real time parking occupancy data and traveler information system		• Assures patrons of available parking • Spreads peak period trips • Maximizes potential revenue • Revenue can support enhancements in the district area • Can be supported by new kiosk system (???)	• Inconvenience to patrons if payments options are limited			
Preferential Parking	Reserves the closest, most accessible parking spaces for multiple occupant vehicles, i.e. carpools and vanpools Preferential parking spaces can be open to all users or reserved for specific, approved vanpool or carpool arrangements	• Supportive employer or property manager	• City wide • New and existing developments	• Easy to implement and very low cost • Highly visible sign of commitment to alternative transportation • High profile benefit to participating employees	• Generally relies on honor system • May need enforcement if abused • Unused spaces may generate employee dissatisfaction	Low	Low	1
Parking Brokerage Service	Allows member businesses or residents to share, trade, lease, rent and sell parking facilities on the open market. The brokerage establishes and facilitates the market in parking spaces	• Parking district or parking management association • Available transportation options • Comprehensive TDM program	• Transit corridors • New and redevelopment of mixed use, commercial and residential projects	• Maximizes parking efficiency • Reduces parking related expenses • Allows for changes in parking needs over time • Allows for changes in parking supply over time	• Requires parking enforcement • Unused parking may not be utilized in other ways under existing codes	Moderate to High	Moderate to High	4
Trip Reduction Ordinance	Requires employers larger employers (typically 100 or more employees), to plan, implement, and evaluate a commuter trip reduction program. Requirements can vary greatly from voluntary efforts to mandatory reductions.	• Existing congestion issues • Available transportation options • Comprehensive TDM program • Effective ETCs within the companies	• City wide • New and existing developments	• Widely implemented • Generally relies on good faith efforts • Some employers are already achieving similar results	• Requires monitoring, reporting • Could require enforcement • Additional staff needed to implement the ordinance	Low to High	Moderate	2-5
Congestion Pricing	Congestion pricing is a variety of strategies that directly relate use of the road system to price. May be implemented based on mileage (toll roads) or by location(central London or Stockholm).	• Existing congestion issues • Available transportation options • Comprehensive TDM program	• Potentially City wide, corridor or specific area	• Is a user pays system providing direct price signals that maximize efficiency • Can be effectively managed to achieve desired results • Can be a significant revenue source for new funding or revenue offsets	• Technology intensive • High start up costs • Very high profile • Limited US applications beyond toll roads and bridges	High	High	5

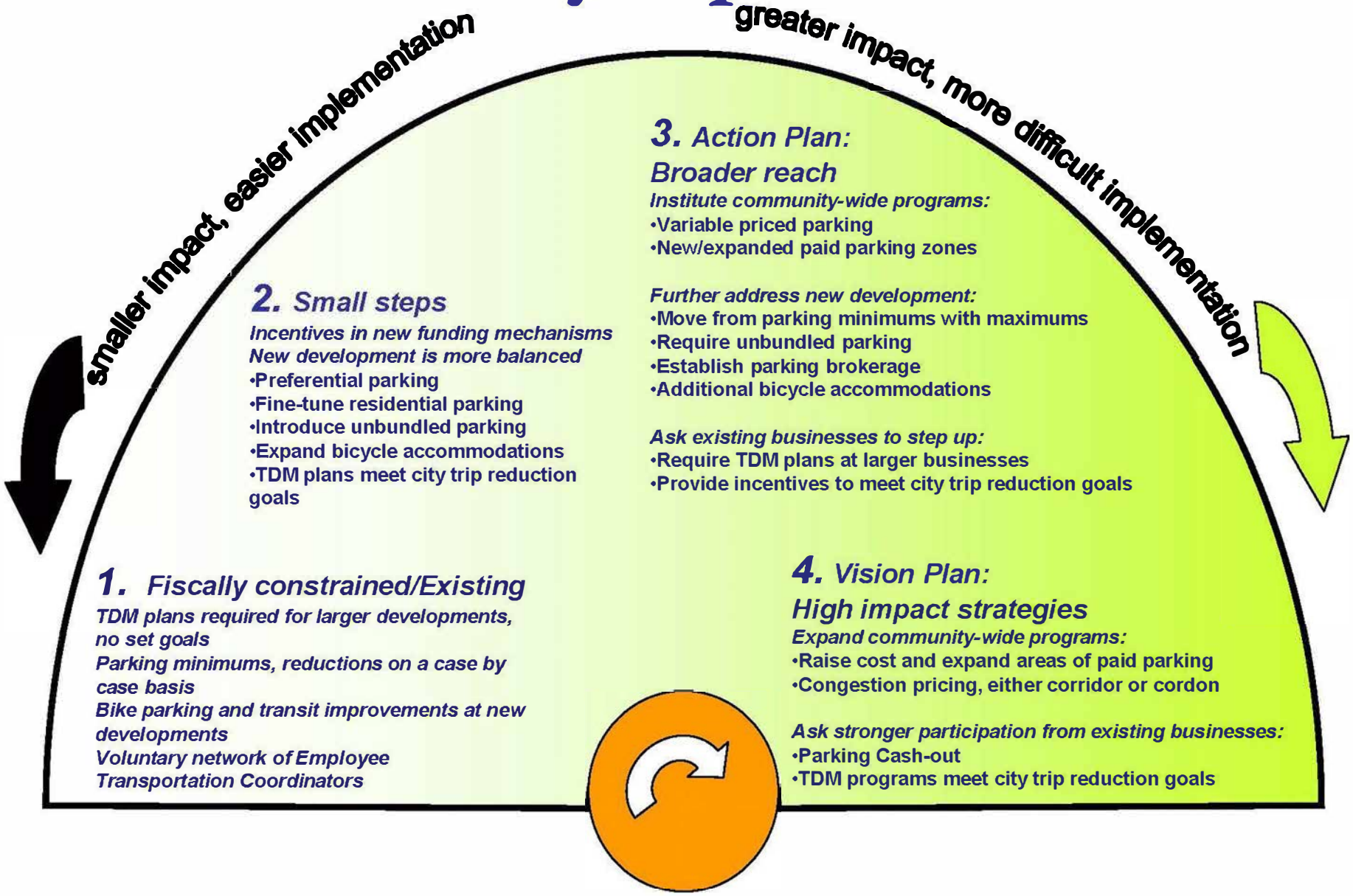
Policy Implementa-tion	*Description*	*Supporting Conditions*	*Area of Application*	*Pro*	*Con*	*Impact*	*Difficulty*	*Dial Setting (1=low, 5=high)*
Location Efficient Mortgages (LEMs)	LEMs recognize the transportation cost savings available by limiting the number of cars in a household and leverage these savings into housing payments	• Transportation alternatives rich environment • Governmental support or guarantees due to limited application	New and existing residential and mixed-use developments in transit corridors	• Financial incentive to shorten commute distance • Affordable housing tool • Potential public/private partnership opportunity	• Reliance on lending institutions to offer LEMs	Moderate	Moderate	3
TDM Effectiveness Monitoring in Development Review	While TDM plans are often required by the city, currently there is no monitoring or reporting requirement.	• Online TDM plan development and evaluation tool • Could be tied to receiving any city funds or subsidies	• New and redevelopment of mixed use, commercial and residential projects	• Identification of most cost-effective TDM strategies • Measuring of progress toward TMP goals • Ability to set goals and thresholds in relation to TMP goals	• Legally defensible requirement? • Up front development cost	Moderate	Low	2
Quantification of Trip Reduction Needs	This development review strategy would establish a standardized modeling methodology for determining expected trip reductions from TDM programs, and establish vehicle trip reduction targets for the development	• To be meaningful, would require a monitoring and reporting requirement with follow up actions if the target is not met.	• New and redevelopment of mixed use, commercial and residential projects	• Quantification of vehicle trip estimates and goals • Model for commercial developments currently available and free • Local data over time can be used to create a Boulder-specific data	• No current model for residential developments or residential components of mixed-use development • Up front development costs and data collection needs	Moderate	Low	2
Employee Transportat-ion Coordinator (ETC)	An ETC is a employee of the company with an interest and training in promoting and educating other employees on travel options. Serves as the point of contact for city TDM programs, evaluations, and marketing campaigns	• One or more employees with a genuine interest. • Supportive employer and some budget. • Required as part of TRO and/or development review process	• City-wide • Employees under TRO • New developments and redevelopments	• ETCs increase the reach of city TDM programs by working with their co-workers • Effective ETCs increase response rate and can increase travel behavior change • Having an ETC can be tied to benefits from the city	• Keeping time spent on ETC duties to a minimum • ETC support has some cost to the employer	Low to Moderate	Low	1

* rough estimates of funding needed/available 2008 - 2025

Funding



Policy Options



CAP Renewable Energy Strategies

As noted above, energy efficiency is the most cost-effective method for achieving emissions reductions. However, it would require significant and likely unrealistic amounts of public and private capital to achieve the city's goal through energy efficiency alone. As a result, renewable energy will have an important role in working toward the GHG goal. The city receives approximately seven percent of its electricity from renewables. Boulder's residents and businesses have the following four renewable energy options:

- Xcel Energy's Windsource Program
- Renewable Energy Credits (RECs)
- Install onsite renewable energy system
- Contribute to emissions offset funds

The primary CAP strategies for increasing renewable energy use involve removing barriers to voluntary investment rather than city investment in renewable energy. The strategies include providing information on how to purchase or install renewable energy and available rebates, promoting renewable energy installers, providing recognition for renewable energy use, holding or co-sponsoring workshops to educate property owners about solar energy systems, and developing a solar mapping resource for city or general public use. The CAP assumed that providing a high level of renewable energy for the community would be addressed through the city's franchise with Xcel Energy or municipalization of the electric utility.

The CAP assumed that the amount of renewable energy purchased through Windsource or RECs will increase each year. Annual Wind Challenge events are designed to increase awareness and use of this simple option for shifting to renewable energy. This year's Wind Challenge goal is to sign up 1,000 new subscribers.

The Colorado Renewable Energy Standard (RES) requires large utilities to reach increasing renewable energy targets over time. Through the RES, Xcel Energy will invest in solar and wind power, and also provide sizable rebates for installing solar electric or PV. The presence of these rebates and a federal tax incentive has resulted in tremendous interest in PV systems and expansion in the solar services market. The amount of PV permitted in Boulder in 2007 was 1,108 kilowatts (kW). The installation of this quantity of PV panels will reduce emissions by more than 1,492 mtCO2 annually. If an equal quantity was installed in Boulder each year through 2012, approximately two percent of the city's current GHG emissions reduction goal would be met.

In 2006, City Council decided to direct a portion of the sales and use tax paid on solar systems to a renewable energy fund. Some of the funds are available for a sales and use tax rebate to support increased solar system installation. The majority of the fund is dedicated for the purpose of providing financial assistance through grants for installation of PV or solar thermal (hot water) systems on housing for low- to moderate-income persons and on the facilities of site-based non-profit entities operating in Boulder. The

grant portion of the renewable energy fund, called the ClimateSmart Solar Grant, is intended to fund a number of projects that will provide education about solar technologies in the community, install systems that will benefit recipients through lower energy costs, and provide visibility and education about the city's renewable energy fund and renewable energy goals.

Staff has developed a process, grant application and selection committee for awarding ClimateSmart Solar Grant funds to qualified organizations or individuals in the community. The grant will have two cycles each year, March 15 and Aug. 15. The application was released to the public in the beginning of 2008, and at that time, approximately $55,000 was available in the grant fund. The first grants from this program will be awarded on May 1, 2008.

The following table summarizes current estimates of GHG reductions from renewable energy. A budget column is not included in this table because renewable energy work relies primarily on staff time other than the Wind Challenge and the budget for this program is included in the CAP marketing budget. Staff is not recommending enhancements to the renewable energy strategies at this time. Although staff believes the renewable strategies are valid and effective, staff is actively pursuing increased renewable capacity from Xcel Energy both through the franchise negotiations and through the implementation of *Smart Grid*. As council is aware the city was recently named as Xcel's *Smart Grid* city. Participation with Xcel as a *Smart Grid* city is expected to have significant impacts on the city's ability to reach its CAP goals in a timely manner. The benefits of *Smart Grid* as they relate to lowered residential peak demand and energy consumption and improved distribution losses are estimated to reduce Boulder's current electricity use by two to ten percent, representing a GHG emissions reduction of 16,000 to 80,000 tons annually or between five and twenty-five percent of the current CAP emission reduction goals. Implementation of the *Smart Grid* will also dramatically enhance the existing electric system efficiency and conservation capabilities. Studies on *Smart Grid* elements have shown that when additional energy efficiency measures and increases in renewable energy capacity are factored into the mix, these emissions reductions could be significantly magnified.

	GHG Reductions by 2012	Percent of 2012 Goal
Wind Power – Current Wind Challenge	49,842	12
Wind Power – Proposed Wind Challenge	53,623	13
Rooftop PV	10,379	3
Colorado Renewable Energy Standard	90,283	22
City Generated (RECs from hydroelectric and cogeneration facilities)	21,862	5
Total (with proposed wind power)	**176,147**	**43**

CAP Marketing

A key strategy of the CAP is effective marketing of programs and initiatives to inspire voluntary behavior change and investment to reduce emissions. Fundamental to this effort is the ability to link personal actions, such as driving and home energy use, to climate change and energy sustainability. The goal is to make this link ubiquitous and sustained in the Boulder community, such that there is a constant reminder that climate action is in large part the responsibility of individuals through their behaviors and purchase decisions.

Robust and sustained marketing, education and outreach programs are necessary to create awareness of the community-wide challenge and to garner widespread support and action. Marketing strategies are included for all CAP programs. Official marketing efforts began in April 2007 when the Marketing and Communications Coordinator funded with the CAP tax was hired (funded with the CAP Tax). A strategic marketing plan was created to identify short-term and long-term needs and priorities; the plan is updated twice each year or as needed. The three main marketing goals for 2007 were campaign branding, program marketing/communications, and community outreach.

Between April and August 2007, staff worked with Vermilion, a local communications firm, to execute campaign branding. ClimateSmart (also the name of the November 2006 ballot measure campaign) was selected as the campaign name, and a color palette and logo were designed. The new branding paved the way for development of the ClimateSmart Web site, program brochures, local print and bus ads, radio and other communications initiatives. Additional communications tools developed were a monthly e-newsletter *(The Changing Times)* and a bi-monthly ClimateSmart Q&A column in the *Daily Camera*. The ClimateSmart brand and programs are intended to symbolize the city of Boulder's response to climate change. Awareness of available programs facilitates residents' and businesses' ability to reduce GHG emissions.

The city of Boulder has embraced Boulder County's participation in ClimateSmart and has worked to develop a regional collaboration through the Consortium of Cities. As of late 2007, six municipalities have expressed interest in using the ClimateSmart brand to market their own local energy sustainability initiatives. Several CAP programs also are available in other communities and unincorporated Boulder County. The county committed funds in 2007 and 2008 for ClimateSmart administrative and implementation costs, and municipalities will pay for their own printing and media costs in 2008.

The ClimateSmart Web site was launched in September 2007 (www.beClimateSmart.com). As of December, the most visited Web pages were the carbon footprint calculator and online pledge (to reduce carbon footprint). The calculator, which allows residents to calculate their annual carbon dioxide (CO2) emissions based on travel habits and home energy and water use, has been used by over 800 people. The calculator tool will be continually updated to improve usability and appeal. The ClimateSmart online pledge page allows businesses or individuals to make a 'public' commitment by signing up to reduce their carbon footprint. A "Who's In" page lists those that have pledged and a map shows a green pin at the participants' address. Approximately 500 individuals and businesses had pledged by the end of 2007.

Community outreach was focused on presentations to civic and business groups (22 presentations to 600 people), a farmer's market display July-September, and financial and technical support to two grassroots neighborhood climate action groups. Outreach priorities include broad community engagement, neighborhood support and recognition programs.

Community engagement

Widespread success in reducing greenhouse gas emissions in Boulder will depend on the viral aspect of the ClimateSmart message, i.e., friends telling friends, kids encouraging parents, company owners supporting action among their employees (and vice versa), and businesses telling other businesses how they benefited from ClimateSmart programs.

Neighborhood support

ClimateSmart staff currently plays a support role to two neighborhood climate action groups in Boulder. In 2008, staff hopes to see up to five neighborhoods organize and will support them with modest printing budgets, presentations at meetings, free prizes, ideas, and press coverage. Staff will evaluate efforts over time to ensure that the needs of the community are being met and that the efforts are facilitating results.

Recognition programs

Developing meaningful ways for local businesses and homeowners to be recognized for their efforts will be important in supporting the view that combined, sustained, community-wide efforts can add up to significant GHG reductions. In 2008 staff will solidify a commercial recognition program that will provide free publicity (and other benefits) to companies displaying a commitment to energy sustainability. A

neighborhood recognition program will be developed to recognize currently active groups for their efforts; the program should also inspire others to take action.

Enhanced ClimateSmart Marketing and Outreach

Recommended strategies, goals and tactics to enhance marketing and outreach initiatives in 2008 and beyond include the following:

1. Identify population sectors most likely to invest in efficiency and renewables; focus creative and effective outreach plans and additional resources on these sectors.
2. Increase regular press promotion of ClimateSmart-funded community initiatives (i.e. Home Energy Makeover, Sweep, Solar Grant Fund PV installations, grassroots activities).
3. Increase community advertising reach (purchase additional radio, theater screen, bus, and print ads).
4. Increase participation in commercial and residential programs.
5. Develop a more diffuse education strategy to promote availability of tax credits and incentives to investors in efficiency.
6. Maximize electronic communications methods (Web site and email communications).

While it is difficult to estimate emissions reductions associated with marketing, education and outreach efforts, a robust program is important to fully engage the community to successfully work toward the city's GHG goal and a sustainable energy future. Staff has estimated that the current investment in ClimateSmart marketing and outreach will achieve 2.5 percent of the 2012 goal and that the enhanced efforts will double the impact to five percent of the 2012 goal.

	Budget	GHG Reductions by 2012	Percent of 2012 Goal
Current	$229,625	10,150	2.5
Proposed	$279,625	20,300	5
Net Increase	$50,000	10,150	2.5

CAP Summary

Questions

5. ***Should staff proceed with implementing the enhancements to CAP programs and services (that require increased CAP funding) as the next phase of CAP implementation to move the city closer to the 2012 GHG goal?***

8. ***Does council have any questions or comments about increasing the CAP tax in order to enhance CAP programs and services (to achieve the next steps that will bring us closer to the 2012 goal – approximately 85 percent of the goal)?***

The following information was provided at the beginning of the *Opportunities Analysis* section is repeated here to provide a summary of the cost and impact of enhancing the CAP. The next table summarizes the GHG reductions associated with each CAP strategy, along with the annual budget and percentage of the 2012 goal achieved. The energy efficiency strategies include both residential and commercial programs, Xcel DSM reductions, and both residential and commercial codes (i.e. Green Points Program). The renewable energy section includes wind power purchases, rooftop PV, the expanded Colorado RES, and city-generated renewable energy. The transportation category includes reductions from biofuels; additional VMT reductions associated with potential TMP implementation are not included (as these costs would be significant and is addressed elsewhere in this memo, these costs should be considered as part of new funding strategies for the TMP). The following cost summaries are best estimates on cost per ton GHG comparison among the strategies.

Summary of Current and Proposed CAP Program Impact and Costs

	Current			Proposed		
Strategy	**Annual Budget**	**mtCO2e by 2012**	**Percent of GHG Goal**	**Annual Budget**	**mtCO2e by 2012**	**Percent of GHG Goal**
Energy Efficiency	$ 560,957	29,049	7	$ 978,913	145,829	36
Renewable Energy	$ 54,723	172,366	42	$ 54,723	176,147	43
Marketing	$ 229,625	10,150	2	$ 279,625	20,300	5
Transportation	$ 29,873	3,940	1	$ 29,873	3,940	1
TOTAL	**$ 875,177**	**215,505**	**53%**	**$1,343,133**	**346,217**	**85%**

The following table summarizes the CAP tax rates and estimated revenue for the current level of CAP implementation and the enhanced implementation levels. When the Boulder voters approved the CAP tax, they approved minimum and maximum sector rates. Minimum rates are in use at this time. The CAP tax ordinance allows council to increase the rates up to the voter-approved maximums; an ordinance is required to adjust the rates. The proposed budget for more aggressive emissions reductions is $467,956 per year (a 53 percent increase) and would require increases in the residential and commercial rates to the approximate mid-point of their ranges. The industrial rate increase is less than two percent with the average annual cost increasing by $100. While the budget increase is not insubstantial, the city's programs generate economic benefits through energy cost savings and DSM rebates.

Summary of Current and Proposed CAP tax rates

	Current Rates		2009 Proposed Rates	
	$/kWh	Average Annual Cost	$/kWh	Average Annual Cost
Residential	$ 0.0022	$ 13	$ 0.0035	$ 19
Commercial	$ 0.0004	$ 45	$ 0.0007	$ 71
Industrial	$ 0.0002	$ 5,532	$ 0.0002	$ 5,632
Estimated Revenue *	**$ 897,114**		**$ 1,343,133**	

* Based on estimated electricity use. 2008 budget is $875,000.

Council has several options for enhancing CAP implementation and the tax rates:

- Council can adjust the rates right away so that programs can be expanded this year; following the study session, staff would return with an ordinance for council consideration
- Rate changes and CAP enhancements can be initiated in January 2009 (and approved through the 2009 budget process); or
- Council can decide to continue with the current level of CAP implementation and make no changes to the CAP tax rates.

City Operations and Renewable Energy Strategy

The city organization is committed to working toward a healthier environment. In addition to helping the community reduce GHG emissions, it is also critical that the city look at its own operations to ensure that it serves as a model for the community. The sharp rise in electricity and fuel prices continues to strain already limited city budgets - creating an additional incentive and benefit to reducing emissions.

The CAP proposed that the city establish a target of reducing electricity use and natural gas use by 20 percent and 10 percent, respectively, and also suggested a renewable energy goal of 20 percent, all from current levels by 2012. Further, the CAP assumed that investments in energy efficiency would be made from departmental budgets, rather than the CAP budget, and that the renewable energy goal could be met by increasing purchases of Windsource or RECs, paid from the CAP budget. While always considered part of the CAP strategy for city operations, renewable energy options have become increasingly critical as the city's cost for energy continues to rise. Further, the city manager has committed to moving the city organization towards energy independence in the next 10 years. This will only be accomplished through the integration of renewable energy sources, which are discussed in greater detail on the next page.

Energy Efficiency

The Facilities and Asset Management Division (FAM) is continuously evaluating strategies such as conservation, energy efficiency and alternative energy to meet the energy needs of the city organization at the lowest possible cost. The FAM Master Plan outlines investment programs to complete energy-saving projects. Under the current fiscally constrained funding, FAM pursues energy saving projects that have a three-year

(or less) payback period. Energy-saving projects that have a five-year (or less) payback period would be supported with an "Action" plan level of funding.

The city has been engaged in energy reduction initiatives for over 15 years. Over the past 10 years, the city has completed 114 projects and spent approximately $3 million on equipment that improved the efficiency of the city's buildings. In 2007, FAM completed almost $90,000 worth of energy efficiency improvements in city facilities. These improvements included installing more energy-efficient windows, replacement of heating, ventilation and air conditioning (HVAC) units, and installing additional insulation in city buildings. FAM actively pursues methods to reduce energy costs as many departments have difficulty managing increased energy costs.

Staff has created an interdepartmental energy strategy team to help guide the city towards the goal of reducing GHG emissions and managing energy use and costs in city facilities. The team helps engage all departments in city energy management and is responsible for developing an energy management plan to meet the city manager's energy independence and renewable energy goals.

Renewable Energy Strategy

Questions

1. ***Does council have questions or comments about the draft renewable energy strategy to achieve energy independence for the city organization?***

As mentioned previously, there is a strong interest in incorporating additional renewable energy options in order to move to eventual energy independence for the city organization. To determine the most effective path, it is critical to first discuss why and how renewable energy sources should be incorporated.

Fossil fuels have played a pivotal role in the evolution of the city of Boulder– but are also the root cause of many of the most dire problems we face. Not only does the city's current energy use affect the ability to mitigate emissions related to climate change, but the city 's Blue Ribbon Commission on Revenue Stabilization identified facility energy costs as a critical deficiency that adds to a growing gap between revenue and expenditures. While many municipalities are working to address this instability by offsetting utility consumption through renewables, very few have committed to actual investment strategies.

Traditional energy sources, like coal, oil and natural gas currently provide over 95 percent of the energy the city organization uses. The city of Boulder currently uses 3 percent renewable energy in its municipal operations. Renewable energy comes from sources that can be replenished in a short period of time like solar, wind, biomass or hydroelectric. There are a number of advantages to using renewable energy sources:

- Energy costs for Boulder's municipal operations have risen in the last four years from $3 million in FY04 to $3.7 million in FY07; a 23 percent increase.

Renewable energy sources like wind and solar offer the ability to enter into long-term fixed-rate contracts to help stabilize future municipal energy costs.

- Money spent on renewable energy sources often stays in the local economy.
- Renewable energy sources produce less air pollution than fossil fuel based energy and contribute to making our air cleaner and meeting EPA clean air standards.
- Renewable energy sources greatly reduce global warming emissions.
- Increasing reliance on foreign oil threatens our national security and economy.
- Renewable fuels reduce our reliance on imported oil.

Staff has been exploring available technologies for energy efficiency and renewable energy use in municipal operations in order to increase the city's use of renewable energy sources. The purpose of this evolution is twofold: to minimize the instability of rising energy costs and to minimize the city organization's greenhouse gas emissions. At the 2008 City Council retreat, the city manager declared his intention to move the organization towards future energy independence, and further set a course to have the city organization, equipment and facilities become 100 percent energy independent over the next 10 years. This will also result in a significant increase in the Boulder community's overall renewable portfolio over the next 10 years (including negotiating maximum capacity for renewable sources within the Xcel Franchise Agreement and potentially locating a renewable facility within the city).

In order to reach a goal of 100 percent renewable energy for all municipal operations by 2018 with an associated reduction in community GHG, staff has been evaluating options to purchase or produce long-term, fixed-rate "green" electricity from various renewable sources such as facility based, or "on-site," renewables like solar PV or wind power constructed in Colorado. The purpose of this section of the study session packet is to familiarize council with the technological options, financing abilities and viability of various renewable energy options. The full draft renewable strategy is included as Attachment D.

The Plan in Brief

A dramatic shift away from fossil fuels can only happen if the city actively pursues the following strategies:

Energy efficiency and conservation: The city must aggressively increase its energy efficiency by 30-50 percent in buildings, which constitutes the majority of current and projected energy demand.

Energy replacement options: The city will need to produce and purchase large amounts of renewable electricity such as solar and wind in or near our region. Staff has developed a strategy that creates a diverse portfolio of renewable power sources for the city organization.

Next generation vehicles: With the implementation of the *Smart Grid* technology, the city can transition to more efficient vehicles and vehicle fuels, such as plug-in hybrid vehicles, electric-only vehicles and vehicle-to-grid technology, and potentially, hydrogen-fuel-cell or hydrogen-internal-combustion engine vehicles, once they are more readily available and affordable in three to five years.

Staff will continue to evaluate and also consider any other technologies and partnerships to help reach established renewable energy goals. The plan is a wide-ranging initiative, including the collaboration of various entities such as the Governor's Energy Office (GEO), major renewable energy research institutions, Boulder County, CU, and numerous not- for-profit organizations.

Financial Analysis

What will it cost? This is probably the most important question in this strategy. There are, of course, many different ways of measuring cost. Right now, we pay for our fossil fuels, not just in dollars paid for our energy bills, but in the air we breathe and the water we drink, in our national security and, most importantly, in our ability to sustain ourselves on this planet. The good news is, however, that even when you exclude these other costs and consider only traditional economics, the city will actually be in much *better* financial shape by adopting renewable technologies than continuing to burn fossil fuels. A renewable strategy for the city is organized to highlight the most cost-effective solutions first, starting with energy efficiency in buildings, then the lowest cost per watt renewable options last, such as wind power and solar power.

As the demand for fossil fuels from developing nations increases, fossil fuel supplies diminish and the costs continue to rise. It is necessary to reduce our reliance on fossil fuels and begin a transition to renewable energy sources.

Staffs analysis found that the city of Boulder will in fact save substantially by switching to renewable energy. Due to projections from Xcel Energy, fossil fuel prices in our region and elsewhere will continue to trend upward at a rate of four to seven percent annually. Energy efficiency and renewable energy could potentially save the city $15.4 million by 2020[1]. So the city could make a strong argument to make the renewable switch purely on economic reasons.

In tackling the ambitious goal of weaning our city from fossil fuels, we first need to recognize the magnitude of the task. In 2006 for example, the city used 26.4 million kWh (or 26,000 MWh) of electricity and 746,679 therms of natural gas.

City of Boulder Energy Use

	1998	1999	2000	2001	2003	2004	2005	2006
kWh	27,810,662	25,174,357	28,542,567	31,310,888	25,088,913	29,264,861	25,905,343	26,467,078
Therms	702,634	671,696	684,031	666,857	763,573	567,391	784,809	746,679

As can be seen by the above figures, in order to replace 100 percent of the city's annual consumption, the city will need to install or purchase approximately 18 MW of power.[2] The following statistics on city energy use suggests a number of measures that, if implemented, could lead to 100 percent energy replacement or independence by 2018. In order to make appropriate decisions on a future strategy, the following resource evaluation is presented.

While many utility providers offer their customers green energy from one or two sources, the city should strongly implement diversification and the creation of a Renewable Portfolio that properly evaluates all reliability, cost and market issues to ensure an effective implementation. For example, a biomass renewable project has the potential to offer a steady supply of renewable energy 24 hours a day, during peak conditions. Biomass projects offer greater system reliability benefits than other intermittent renewable resources. However, adequate and reliable fuel supply sources are the single most critical factor in determining the economic viability of a potential biomass project, and associated price risks may prohibit such projects from being developed. The result may be an overdependence on any one renewable source, contrary to the goal to increase supply diversity. The city should maintain its current flexibility in the purchase and development of its renewable resources. As mentioned earlier, due to the higher cost nature of renewable projects, it is necessary to consider longer-term contracts to finance projects going forward.

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[1] Savings assumes 7 percent annual growth on both electricity and natural gas costs. Savings was also determined assuming leveling of costs in 2008 through efficiency and renewable projects resulting in a 0 percent growth.

[2] The estimate of 18 MW assumes replacement of city electricity consumption, excluding natural gas and vehicle fuel.

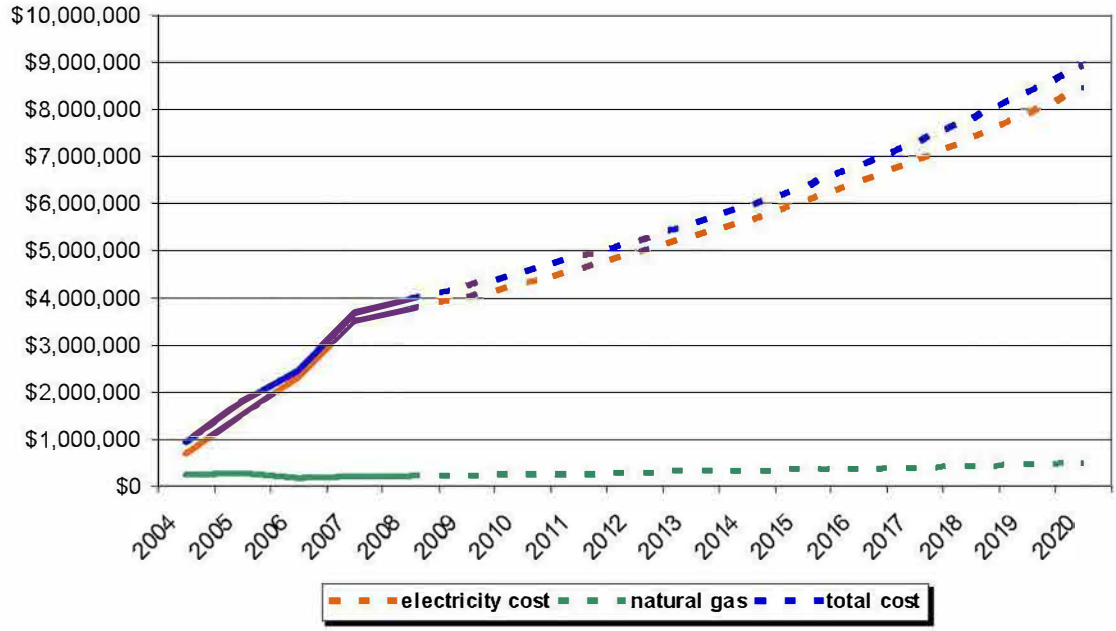
Energy costs for the city organization

Rather than wait until the city is negatively impacted by anticipated rising energy costs, this strategy allows the city to take steps now to manage energy costs and identify actions that will reduce energy use. Staff undertook an energy bill analysis to determine how the city is spending energy dollars. Based on the analysis, the city's energy costs have seen a dramatic increase over the past several years.

As mentioned earlier, staffs analysis found projections from Xcel Energy show fossil fuel prices in our region and elsewhere will continue to trend upward at a rate of four to seven percent annually. In 2006, for example, Facilities Maintenance and Xcel recommended a six percent increase for budgeting purposes. If this trajectory continues over time, the city could expect to see a more than doubling of the city's utility costs from $3.7 million in 2007 to $8 million in 2020. In this scenario, energy efficiency and renewable energy could potentially save the city $13.7 million by 2020[3].

However, the energy bill analysis below is more than a 'snapshot' of current and future energy costs. A renewable strategy paired with strong efficiency measures in city facilities will dramatically limit future energy costs. The graph below illustrates the unsustainable nature of growing energy costs over the past several years.

City Utility Costs
2004-2007 (plus future costs trajectories)



While electricity costs have continued to grow, as well as the city's total energy costs overall, natural gas costs have remained relatively stable, and have even seen a slight decrease in recent years. An announcement by Xcel in mid March 2008; however, suggests that this could be changing dramatically.

[3] Savings assumes 7 percent annual growth on both electricity and natural gas costs. Savings was also determined assuming leveling of costs in 2008 through efficiency and renewable projects resulting in a 0 percent growth.

The Rockies Express pipeline opened in January 2008 and started carrying natural gas out of the region (from Colorado to the eastern United States). Local wholesale natural gas prices will be increasing significantly in April 2008, according to Xcel. Over the last several years, we've enjoyed an extended period where local prices were lower than the national average, but the opening of the pipeline has virtually eliminated that advantage. As a result, Colorado is experiencing higher costs for natural gas. This will translate into a higher Electric Commodity Adjustment (ECA) in 2008, which is a filing by Xcel with the Colorado Public Utilities Commission (CPUC) to recover dollars associated with rising generation fuel and purchased energy costs. Xcel Energy is required by tariff to file adjustments to its ECA whenever its costs are $40 million greater or less than the funds collected under its Electricity Cost Adjustment clause.

Funding Options

In order to finance future renewable projects, municipalities are faced with unique challenges. Because the city is a tax exempt agency, it is unable to take advantage of tax credits to bring the cost of the project down. Additionally, high capital expenses create a barrier for self funding. Below are several creative options for financing municipal renewable projects.

Self-Fund Approach- This would require annual budgeting and heavy capital expenses to implement renewable projects. Additionally, the city would assume the liability, replacement cost and maintenance for the life time of the project.

Existing Bonding- The city could choose to issue a municipal bond for large scale renewables, which would require voter approval.

Clean Renewable Energy Bond-The Energy Policy Act of 2005 provides electric cooperatives and municipalities with Clean Renewable Energy Bonds (CREB). A CREB is a special type of tax credit bond providing municipalities the equivalent of an interest-free loan for financing qualified energy projects. CREBs are largely modeled on the Qualified Zone Academy Bond program that provides tax credit bonds for school renovation and upgrades in certain qualified school districts. They deliver an incentive comparable to the production tax credit that is available to private renewable energy project developers and investor-owned utilities, which the city is unable to take.

Third-Party Financing- Third-party financing for renewable power projects can make the high upfront cost of installation, the major obstacle to the city, much more achievable. For the renewable energy market at large, third-party finance directs large amounts of capital into what is currently a relatively fragmented, inefficient marketplace. In the third-party scenario, the city partners with an investment/operator through a Power Purchase Agreement (PPA) for the sale and purchase of the generated power. This type of arrangement places much of the risk (capital investment, replacement cost, maintenance, production) on the third party rather than the city. This is the model utilized for the 75th Wastewater Treatment Plant one-megawatt solar PV project, scheduled to begin construction in early April 2008. This model allows the third party investor to take

advantage of the tax credits and accelerated depreciation. All of these options will be further evaluated by staff depending on the feedback received from City Council on the strategies for the city organization.

In order to most quickly and efficiently achieve energy independence for the city organization, it is staff's recommendation that we consider "financing suites," or efforts to combine several of the above strategies. This diversification has proven most successful for large organizations implementing renewable projects.

While increased energy efficiency and conservation could substantially cut our current demand for energy, they are not by themselves enough to wean us from fossil fuels. To truly address the supply side of the equation, we will need to generate electricity from renewable sources. The steady sunshine and proximity to other attributes that make our region so attractive to live in also make it ripe for energy independence. Renewable energy technologies that harness power from the wind, sun and hydroelectric power can contribute to regional electricity supplies, and they won't run out. But while the state of Colorado is showing leadership in the area of renewable electricity, to truly generate the amount of energy we will need in this region, this effort must come from within our county. In 2006, only about three percent of the power from Colorado's electricity grid came from renewable sources: wind, solar, and a small amount of hydroelectric. This hasn't changed much in 2007; however, Xcel has committed to increasing its renewable portfolio in its 2007 Least Cost Resource Plan.

The renewable component on the Colorado grid is expected to increase substantially in the coming decades, as state law requires that utilities generate 20 percent of their electricity from renewables by 2020. But with electricity comprising roughly 75 percent (excluding vehicle fuel) of the city's overall energy needs, renewable electricity will, in a business-as-usual scenario, constitute only about 5 percent of our total energy needs. The city's current solar projects scheduled for installation in 2008 will result in a 5.7 percent overall renewable component or our total electricity use by the end of 2008.

In order to continue to move towards energy independence, we need to find other ways to encourage the use and development of renewable electricity above and beyond what state law requires. Wind power offers the most potential today of any renewable energy technology in our region because of its relatively low cost. Other types of renewable electricity — such as the various types of solar power, technologies that convert biomass or waste to energy, and hydroelectric power — are also very promising.

Promoting renewable energy in our region at such a level will require substantial help from local, state and federal agencies. Fortunately, Smart Grid technology allows for future renewable expansion. For this reason, Xcel will be a key partner for weaning the city off fossil fuels. Further, many states allow "Community Choice" power options, which gives local governments — not the private utilities - control over what type of electricity to use. The city's current Franchise Agreement with Xcel does not allow community choice, and requires that large-scale renewable energy be provided through

Xcel. A key strategy of the future Franchise negotiations will be to allow Boulder to have more choice over the type of power we receive.

The attached draft strategy plan for the city organization attempts to balance opportunities for future renewable projects with cost implications as well as a public awareness aspect. In other words, the recommended option is based on approximately 85 percent of the city's future renewable power coming from "least cost per watt" projects, while the remaining 15 percent, while potentially slightly higher in cost, will take in to account visibility, showcase opportunities and demonstrated commitment by the city.

Vehicle Fleet

In 2007, Fleet Services purchased 36 vehicles Twenty-seven vehicles purchased were alternative fuel or hybrid vehicles. In nine of these cases, no alternative fuel or hybrid vehicle was available that met the city's specifications. Specifically, the city purchased three E85 vehicles, 16 diesel vehicles capable of using B20, and eight Ford Escape Hybrids. Overall, the city purchased an alternative fuel or hybrid vehicle 100 percent of the time when one was available and 75 percent of the time overall. Currently, 36 percent of the city's fleet is made up of alternatively fueled vehicles.

CAP staff has met with employees who regularly drive city vehicles to explain the importance of GHG reductions and will continue to serve in this role as a technical resource to city employees and to Fleet Services staff as new alternative vehicle and fuel technologies become available.

The city fleet could become an early adopter of V2G technology. After alternative fuel vehicle rebates, the cost per vehicle is $8,000, which is projected to pay for itself over the life of the vehicle in fuel cost savings. The potential for Smart Grid technology will allow the city to take full advantage of V2G. Vehicles will have the ability to charge and discharge to the grid depending on peak load and cost of energy. We can set the vehicles up to charge at night when the energy is cheapest and then feed back to the grid when they are plugged in during the afternoon peak when energy is most expensive. Another unique value to the city is that in case of a power outage, vehicles can feed energy back into specific buildings. This allows for 'islanding' of certain key buildings such as police, fire or hospitals, using the city's vehicle fleet as a limited source of uninterrupted emergency power.

Additional Greenhouse Gas Emissions Reduction Goals

Questions

6. Does city council want to set additional and longer-term greenhouse gas reduction goals, building on the current 2012 goal?

The city of Boulder is viewed as a leader in addressing climate change for establishing an aggressive goal for reducing emissions and for committing resources to work toward the

GHG goal. Recent studies suggest that significant reductions and stabilization of emissions in the next few decades may prevent some of the more disastrous impacts. Federal action to address emissions is expected in 2009, if not this year, and will likely result in national emissions reduction targets, a cap and trade for industry, increased use of renewable fuels for electricity, vehicle efficiency and biofuels. While the current goal is achievable, City Council has expressed an interest in being more aggressive with the CAP and may be interested in establishing additional goals for emissions reductions that align the city's work with the goal of emissions stabilization. For example, City Council could set emissions reductions targets that match those set by the state of Colorado, or targets that work toward carbon neutrality could be set. An upside to a longer-term goal is that larger impact strategies become more feasible. A downside is that it seems too far in the future to create ownership or a need for urgency. Interim targets, in addition to the existing 2012 target, may be desired to maintain focus on immediate actions.

The following bullets are examples of targets adopted or proposed by other organizations:

- The Colorado Climate Action Plan (CCAP) has established two targets, 20 percent by 2020 and 80 percent by 2050, both relative to 2005 levels. Achieving the city's 2012 goal will exceed the CCAP 2020 goal.

- The University of Colorado has signed on to the Presidents Climate Commitment, which includes setting interim targets working toward climate neutrality as soon as possible.

- Boulder County is also committed to achieving the Kyoto Protocol target across the county and in their operations, and working toward eventual climate neutrality for county operations.

- Clean Energy Action, a grassroots energy interest group in Colorado promotes a pathway for achieving 80 percent reductions by 2020, primarily through renewable power supplies and shutting down fossil fuel based power plants.

Most of the above targets acknowledge the need to achieve a higher level of GHG emissions reductions to avoid larger-scale impacts from climate change. Staff has not evaluated potential strategies and costs for reaching higher targets although several reports with a national scope have been completed. Clearly federal and state actions would simplify achieving significantly higher reductions in Boulder and it is reasonable to assume that several important decisions will be made within the next two years.

Staff recommends that council maintain the current CAP 2012 goal, as it is both challenging yet achievable. However, staff would like to get council feedback on what potential longer-term goals the city should try to achieve once the Kyoto 2012 goal is met. Based on council feedback, staff will analyze what it would take to achieve these goals and would provide information based on the potential emissions reduction targets on needed policies and services and programs, funding levels, and on potential impacts.

Policy Question: Does council want to establish additional and more aggressive long-term GHG goals? If so, staff suggests that at council provide staff with a sense of what additional targets it would like staff to further analyze for council's consideration.

V. PUBLIC AND BOARD INPUT

CAP Work With the Environmental Advisory Board and CAP Advisory Group

The Environmental Advisory Board (EAB) receives regular updates on the CAP. Input from the EAB regarding this memo will be received at the board's April 2 meeting.

While the CAP was under development, two committees were formed to provide technical and policy guidance. At the request of the Boulder Chamber of Commerce and City Council, staff convened the Climate Action Plan Advisory Group (CAPAG) in January 2007 to serve as a technical review body for the CAP. One EAB member serves on the CAPAG. The CAPAG meets monthly and provides technical and policy expertise regarding program design, development and implementation with the purpose of meeting or exceeding the city's GHG reduction goal. All CAPAG materials are posted on www.environmentalaffairs.com.

Input from the CAP Advisory Group regarding this memo will be received at the March 26 meeting. The EAB and CAPAG feedback and recommendations will be presented to council at the study session.

Transporation Work with EAB, TAB, Planning Board and FLO Committee

The FLO initiatives were presented to the EAB, TAB, and Planning Board along with some background material on the CAP and other climate action efforts. The EAB was the first to review these materials on March 5, 2008 and had an active conversation on the need to continue to control the growth in VMT. The board wanted to highlight to council that "holding the line" on VMT is important to accomplishing the goals of the CAP. The board was also very interested in expanding the Eco Pass program and asked what actions the city could pursue as quick-action items that could be implemented in the near term and have immediate effects in reducing GHG emissions. Staff replied that a number of the policy initiatives related to parking and other transportation demand management (TDM) could be implemented quickly where good transportation alternatives exist and would have immediate effects. The EAB suggested expanding the Eco Pass program, implementing car-sharing, unbundling parking and establishing parking maximums, and increasing incentives as potential quick-action items. The board was also very glad to see the cooperation between the OEA and Transportation divisions in addressing the issue of climate change.

The TAB received a background presentation on climate action plan efforts and the FLO materials on March 10, 2008. The TAB focused its discussion on the policy options dial graphic, as the members were familiar with the earlier FLO materials. Board members provided some initial indications of where they would set the "dial" and then had a discussion on their reasons and concerns. While some board members would initially set

the dial at a four plus, after discussion about the need to be sensitive to business concerns, the board as a whole settled on a setting of up to a three. But with this milder setting, the board felt it was important to get started right away and that some policy actions were not that hard. The board also felt that it was important that the city is seen as a model for GHG reductions and these policy initiatives. The board also asked which policy initiatives had the greatest benefit for the least cost. Staff has provided initial research on the expected effectiveness of each policy initiative in the following Implementation Quantification Table (Table 3).

At its meeting on March 20, 2008, Planning Board members discussed which quadrant of the policy dial would be an appropriate starting place for further staff work, including public outreach. Board member feedback varied. Two members felt that level 2 (small steps) was definitely achievable and that elements of level 3 were possible. Others felt that level 3 was achievable and that some or all elements of level 4 should be explored. The board agreed that it would like to be involved in future work sessions and brainstorming on this issue, especially the interrelationship between land use and transportation. It was noted that several of the topics would be brought back to Planning Board should policy or code changes move forward.

Efforts on climate action and the policy initiatives were the topics of the Mar. 21 FLO Committee meeting. Each organization reported on its climate change plans and mandates and the actions being taken to reduce GHG emissions. The Committee then completed an exercise on the policy implementation options using the policy options dial graphic. Individual preferences ranged from level 2 to level 4 on the dial, with the overall average being around level 3. The groups were asked to provide advice on the likely community response to these ideas, how to approach them and potential red flags relative to these initiatives. Discussions at the group tables provided a number of comments and cautions related to beginning a community discussion. These include being careful with the language used, taking an incremental approach, including the business community early in the process and incorporating its concerns, and being very aware of unintended consequences and impacts. As with TAB, the committee asked for additional information on the potential yield or benefit for each strategy. The initial response to this request is contained in Table 3.

Table 3. Policy Quantification

Policy Implementation	*Description*	*Estimated Range of Vehicle Trip/VMT or Parking Reduction (Not additive)*	*Caveats/Factors*	*Sources*
Parking Maximums versus Parking Minimums	The current code only contains parking minimums with the assumptions that parking will be provided on site. Parking maximums would limit the amount of on site parking allowed.	10-30% in parking required Depends on where levels are set. Parking maximums have contributed to a more than a 20% increase in transit use in Portland.	Parking Maximums send a clear policy signal to the market and are effective when good transportation alternatives exist.	City of Portland Shoup Litman
Residential Parking Requirement Modifications	Current policy requires residential that parking is provided on site. Credit could be given for on street parking such as when driveway removal adds curb space.	10-30% in parking required Limited effect if parking is abundant. Increases parking efficiency and reduces housing cost. Flexible requirements in transit corridors have a significant effect.	Depends on parking demand and other parking management strategies.	Shoup, Litman
Employee Parking Cash Out	Employer provides the employee with the cash value of the provided parking and allows the employee to buy parking on a daily basis or retain the cash if they do not use a car to get to work.	15-25% reduction of vehicle trips. California research shows a 10% reduction even in areas with poor transportation options.	Depends on the value of parking and dollar amount provided to alternative mode users. Generally paired with transit benefits.	Shoup, Litman, TDM Encyclopedia
Unbundled Parking	Separates the value of parking from the leased or sold space and allows the tenant to choose how much parking to either buy or lease. This creates a separate real estate market for parking and allows for efficient pricing of the resource.	10-30% in parking required	For this to function efficiently, building owners must be able to lease or sell excess parking spaces. Other opportunities for using the land no longer required for parking can be a strong incentive.	Shoup, Litman,
Paid/Variable Priced Parking	Parking is paid for based on the amount of time used and the level of demand. Cost to park will be highest during peak demand periods. Variable pricing would aim to keep one parking space available per block face, reducing cruising for parking and ensuring parking is available for business customers.	10-30% reduction in parking demand/vehicle trips	Effectiveness dependent on monitoring the results and the cost of parking and/or timing and length of increased parking charges in a variable priced parking program.	Litman, TDM Encyclopedia

Table 3. Policy Quantification

Policy Implementation	*Description*	*Estimated Range of Vehicle Trip/VMT or Parking Reduction (Not additive)*	*Caveats/Factors*	*Sources*
Preferential Parking	Reserves the closest, most accessible parking spaces for multiple occupant vehicles, i.e. carpools and vanpools Preferential parking spaces can be open to all users or reserved for specific, approved vanpool or carpool arrangements	0-3% vehicle trip reduction	Effectiveness dependent on walk access difference related to placement of SOV and HOV parking.	Implementing Effective TDM Measures (ITE)
Parking Brokerage Service	Allows member businesses or residents to share, trade, lease, rent and sell parking facilities on the open market. The brokerage establishes and facilitates the market in parking spaces.	Supportive service for unbundled parking and other TDM actions that reduce parking demand. 10-30% reduction in parking in conjunction with those actions.	May require a public role to guarantee a market for spaces and to allow credit for exchanged parking under regulatory codes.	UrbanTrans
Trip Reduction Ordinance	Requires employers larger employers (typically 100 or more employees), to plan, implement, and evaluate a commuter trip reduction program. Requirements can vary greatly from voluntary efforts to mandatory reductions.	CTR programs typically see a 5-20% reduction in peak hour vehicle trips. Between 1993 and 2007, Washington state has seen a 7.5% reduction in SOV work trips for all commuters in CTR-affected counties, and a 17.8% reduction in VMT at CTR-affected employers. Bellevue, WA establishes commute reduction goals by years.	The extent of regulation, the inclusion of incentives and/or disincentives, goal-setting, and the level of public and private financial support impact the effectiveness of TROs.	Comsis 1993; Winters and Rudge 1995; Rye 2002 Ed Hillsman, Washington CTR Program
Congestion Pricing (HOT Lanes, Cordon Tolls, Road Tolls, etc.)	Congestion pricing is a variety of strategies that directly relate use of the road system to price. May be implemented based on mileage (toll roads) or by location (central London or Stockholm).	6-30% reduction in vehicle trips.	Difficult to initiate but strongly supported once demonstrated. Electronic toll collection makes a variety of strategies possible. This strategy also has significant benefits in terms of reducing congestion and air pollution.	Litman, FHWA Value Pricing Pilot Program, HHH Institute of Public Policy
Location Efficient	LEMs recognize the transportation cost savings	Up to 80% reduction in driving	Depends on the characteristics of the	Holtzclaw

Table 3. Policy Quantification

Policy Implementation	*Description*	*Estimated Range of Vehicle Trip/VMT or Parking Reduction (Not additive)*	*Caveats/Factors*	*Sources*
Mortgages (LEMs)/ Location Efficient Development	available by limiting the number of cars in a household and leverage these savings into housing payments	15-55% VMT reduction	neighborhood. Reduces household expenditures on transportation.	(2000) Litman
TDM Effectiveness Monitoring in Development Review	While TDM plans are often required by the city, currently there is no monitoring or reporting requirement.	Not applicable relative to reductions. But allows for assessments of success and adjustments to TDM programs.	Requiring periodic evaluations of TDM programs initiated during Development Review does not directly result in reductions, but provides a mechanism of evaluation and program improvement over time.	
Quantification of Trip Reduction Needs	This development review strategy would establish a standardized modeling methodology for determining expected trip reductions from TDM programs, and establish vehicle trip reduction targets for the development	Not applicable	The quantification of trip reduction needs, in terms of employer- or local government-set goals, or modeled estimates of TDM plan impacts, do not directly result in reductions, but provide clear guidelines and expectations and lead to the development of TDM plans appropriate to trip reduction needs.	
Employee Transportation Coordinator (ETC)	An ETC is a employee of the company with an interest and training in promoting and educating other employees on travel options. Serves as the point of contact for city TDM programs, evaluations, and marketing campaigns	5-10% vehicle trip reduction	Internal outreach and marketing of TDM programs by ETCs are an essential component for CTR programs. Reductions resulting from the appointment of an ETC are dependent on the ETC's effectiveness, upper management support, and financial commitment.	Litman, TDM Encyclopedia

VI. QUESTIONS:

Initiatives

1. Does council have questions or comments about the draft renewable energy strategy to achieve energy independence for the city organization?

2. Should staff still proceed with the proposed levels and distribution of funding in the FLO-modified Current Funding and Action Plan list of projects and programs?
   - If so, does council continue to support staff returning to City Council to amend the TMP with the FLO-modified Current Funding/Action Plan project and program list?

Policy implementation

3. Would council like staff to proceed with further evaluation of regulatory options to improve energy efficiency in existing residential buildings? For commercial buildings?

4. For new construction, does council want to see a full scale commercial green building code, or an interim code that addresses energy? If a full scale program, does council want staff to begin the process before the third quarter of 2008?

5. Should staff proceed with implementing the enhancements to CAP programs and services (that require increased CAP funding) as a second phase of CAP implementation to move the city closer to the 2012 GHG goal?

6. Does city council want to set additional and longer-term greenhouse gas reduction goals, building on the current 2012 goal?

7. Does council have any questions or comments regarding the set of transportation demand management policy initiatives; and where on the "dial" should staff explore further to support the CAP and VMT reductions?

Funding

8. Does council have any questions or comments about increasing the CAP tax in order to enhance CAP programs and services (to implement the next phase of the CAP, estimated to achieve 85 percent of the Kyoto goal)?

9. Does council have questions or comments on transportation funding; and does council still support staff's exploration of options for additional funding for Transportation to pursue GHG and VMT reduction goals, create community connections and to optimize the benefits of FasTracks improvements?

- Does council agree with staff further investigating the range of "Action" Plan level of funding as represented by the Blue Ribbon Commission example(s) and the FLO-modified Action Plan?

VII. CONCLUSION:

If council discussion and feedback at the study session indicates that staff should move ahead in the direction suggested by staff in its policy and programs and services recommendations, then staff can pursue the following actions for each question area:.

Initiatives

1. If council generally agrees with moving forward with the city renewable energy strategy staff will begin developing a work plan to implement the strategy.

2. If council generally agrees with the proposed levels and distribution of funding in the FLO-modified Current Funding and Action Plan, staff will return to council with an agenda item to amend the TMP investment programs to reflect the FLO work.

Policy implementation

3. If council would like to further explore regulatory options to improve energy efficiency in residential and commercial buildings, staff will conduct more in depth analysis of the regulatory options to improve energy efficiency in existing buildings and begin a public process to get input from the community before returning to council for consideration of ordinance changes.

4. If council would like to implement an interim commercial green building code that focuses primarily on energy use, specifically above code, staff will return to council in the second quarter of 2008 with options for council's consideration. If council would like to implement a full scale commercial green building program, staff will plan to return to council in the fall of 2008. If council wishes to implement a full scale commercial green building program sooner, staff will evaluate options for certain work items to be put on hold in order to initiate a program sooner.

5. If council generally agrees with implementing the recommended CAP enhancements then staff will proceed with new and expanded programs once the budget is available from additional CAP tax revenue.

6. If council is interested in setting more aggressive and longer term GHG goals, staff will take the next steps to formalize the policy and will incorporate the targets into long-range planning.

7. If council would like staff to explore potential transportation demand management policy options outlined in these materials, staff will return to council with a proposed work plan and time line for beginning a wider community discussion of these initiatives and for bringing more detailed information and analysis on them back to council.

Funding

8. If council generally agrees with implementing the recommended CAP enhancements, staff will develop an ordinance to adjust the tax rates and schedule this item for council consideration at an upcoming regular business meeting.

9. If council generally agrees with pursuing the range of funding for transportation suggested by the FLO-modified Action Plan and the Blue Ribbon Commission examples, staff will coordinate with the city effort pursuing the BRC's recommendations and will return to council with a proposed work plan and time line for bringing more detailed information and analysis on funding options to council.

VIII. ATTACHMENTS:

A - CAP Background
B - City of Boulder 2007 Climate and Energy Programs Progress Report
C - City of Boulder Renewable Energy Strategy
D - SWEEP Energy Efficiency for Commercial Buildings Report