

**Boulder City Council
STUDY SESSION**

**Tuesday
July 24, 2012**

**6-9 PM
Boulder's Energy and Climate Future**

**City Council Chambers
Municipal Building
1777 Broadway**

Submit Written Comments to City Council
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MEMORANDUM

TO: Members of City Council

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DATE: July 24, 2012

SUBJECT: Study Session: Energy Future Work in Progress

I. EXECUTIVE SUMMARY

Boulder's Energy Future and Climate Action efforts are a major focus of the city's work plan in 2012 and beyond. City Council has held two study sessions this year to:

- Provide direction on the overall work plan for these efforts (Jan. 31); and
- Provide input on the evaluation of Climate Action Plan (CAP) programs to date from RMI; a new climate action commitment that would include short-term targets and benchmarks; the potential extension of the existing Climate Action Plan tax; and Commercial Energy Efficiency Strategy work in progress (May 22).
- Receive updates about the work that has been occurring as part of the city's exploration of municipalization as a path to achieving the community's energy goals (Jan. 31 and May 22).

The purpose of this study session is to discuss and seek council feedback on work that has been done since the May 22 Energy Future study session. This includes an update on energy-related work in progress and a request for council feedback on:

- City staff's understanding of the municipalization requirements and guiding principles in the charter and an outline of key work items necessary to determine if creating a city electric utility is feasible;

- Work in progress related to Boulder’s Climate Action Commitment;
- Results of a survey about Boulder voters’ willingness to extend the current Climate Action Plan tax (to be sent to council prior to the study session).
- Findings from a consultant report on the projected effectiveness of various near term demand-side programs and service options, along with a staff recommendation on 2013 program investments and initiatives under two funding/ tax scenarios: 1) The city CAP tax extension passes in November 2012; and 2) The city CAP tax does not pass in November 2012;
- Work in progress on the benchmarking and disclosure portions of the city’s Commercial Energy Strategy; and
- Options for residential and commercial building code updates for new construction.

To help frame the discussion, staff is seeking feedback on the following items:

Municipalization

1. Municipalization requirements and guidelines, and general work areas (to be detailed and further discussed at a study session on Aug. 28th).

Energy Action Plan (EAP)

2. If the CAP tax is extended, move forward with the energy efficiency programs and initiatives described on pages 18 – 20, monitor the effectiveness of these programs and regularly refine or modify them to ensure continuous improvement. Rely on the Environmental Advisory Board to provide input on program changes and refinements through regularly scheduled check-ins on CAP-tax funded programs.
3. If the CAP tax is not extended, scale back 2013 CAP tax-funded efforts to only include ongoing policy initiatives (e.g., development and implementation of a Commercial Energy Efficiency benchmarking/disclosure ordinance, administration of residential SmartRegs, and data tracking). These policy initiatives will be re-evaluated as part of the 2014 priority based budgeting process.
4. Move forward with the Commercial Energy Efficiency benchmarking pilot program and stakeholder outreach outlined on pages 24 – 25.
5. For the 2012 energy code update: continue the current residential energy efficiency levels to maintain an above-code energy efficiency requirement for houses larger than 3,000 square feet. For commercial construction, continue to examine the three options presented on page 25-26 to develop a proposal for council consideration in 2012.

II. QUESTIONS FOR COUNCIL

Does council have any questions or feedback about:

1. *The municipalization requirements and guidelines spelled out in the charter that will define the project’s parameters, or the general work areas to include in a more detailed municipalization exploration work plan in August? Are the charter requirements and guidelines adequate for purposes of defining criteria and parameters to guide the development of municipalization strategies or are there additions that council wishes to include?*
2. *The update to work in progress on Boulder’s Climate Action Commitment for 2013 and beyond?*
3. *The Climate Action Plan tax survey results (to be sent prior to the study session)?*

4. *The options and recommendations for 2013 energy efficiency investment packages if the city CAP tax extension passes or if it does not pass?*
5. *The proposed Commercial Energy Strategy benchmarking pilot and stakeholder process to inform the development of ordinance options?*
6. *The energy efficiency recommendations and options being considered for the 2012 building code update?*

III. CONTINUED EXPLORATION OF MUNICIPALIZATION AND SUPPLY OPTIONS

INTRODUCTION

In November 2011, City of Boulder voters agreed to allow the city to continue exploring the possibility of purchasing Xcel Energy's (Xcel's) distribution system and forming a city-owned electric utility. Since then, the city has taken several specific steps, including hiring consultants and an executive director of Energy Strategy and Electric Utility Development, to move forward with this effort. Building on the analysis and tasks completed to date, additional work with more rigueur is anticipated between now and the end of 2012.

This portion of the memo reminds council and the public about the charter requirements and principles that must guide the city's continued exploration of municipalization, discusses the work that has been done to date, and provides an overview of the work areas that are planned for this fall. Staff is scheduled to present more details on the work plan, including itemized tasks, refined criteria, resources, and timelines, at an Aug. 28 study session.

With the creation of an integrated legal team and the arrival of Executive Director Heather Bailey last month, the city is positioned to perform the necessary analysis and take concrete steps in court and before relevant regulatory bodies to determine if municipalization is achievable.

Over the next several months, city staff will be analyzing legal, financial and technical strategies to achieve the requirements and guiding principles in the charter related to the possible creation of a local electric utility. These strategies will be geared toward accomplishing a successful and feasible municipalization effort, keeping in mind that there may be variations to traditional municipalization that meet the community's energy objectives.

The development of strategies will include more than just legal work tied to a desired outcome related to acquiring Xcel's system at a reasonable price. An objective exploration must include other factors. Specifically, the financial strategy work includes developing charter driven criteria and parameters that the strategies must achieve, rate-making parameters; and the successful procurement of necessary funding. The technical review incorporates determining the possible and optimal resource mix; strategies for increasing renewable sources; the ability to meet or exceed reliability standards and valuing assets. A careful study of each of these areas is essential if the city hopes to succeed in the creation of a municipal electric utility, or in any other alternatives should municipalization prove to be too costly or unable to satisfy other voter-approved requirements.

The city is committed to a complete evaluation that includes a rigorous public process both during strategy development and to provide feedback on the draft recommendations. Consideration of a variety of perspectives on the best ways to achieve the community's goals,

will be part of insuring the integrity of the process. The work plan that will be presented to council in August will take all of these considerations into account and will aim to position council to be able to make a first round of key decisions in late 2012 or early 2013.

COMMUNITY GOALS

As council likely recalls, much of last year's discussion about energy supply options was framed around a specific set of community goals:

- Ensure a stable, safe and reliable energy supply
- Ensure competitive rates, balancing short-term and long-term interests
- Significantly reduce carbon emissions and pollutants
- Provide energy customers with a greater say about their energy supply
- Promote local and economic vitality
- Promote social and environmental justice

These goals remain very much in the forefront of city staff's work, as the ultimate task is to develop a coordinated and viable strategy that meets these objectives. However, when voters agreed to continue exploration of municipalization, they (and City Council) set some detailed parameters that must be met, at least as part of any effort to create a local electric utility.

CHARTER REQUIREMENTS AND GUIDELINES SPECIFIC TO POSSIBLE MUNICIPALIZATION

The charter provision related to a possible Light and Power Utility (Article XIII, Section 178 of the charter) is included as **Attachment A** of this memo. The following section is a summary.

Boulder voters authorized City Council to establish a light and power utility *only* if it can demonstrate that the utility can:

- Acquire the electrical distribution system in Boulder and charge rates that do not exceed those rates charged by Xcel at the time of acquisition
- Maintain rates that will produce revenues sufficient to pay for operating expenses and debt payments, plus an amount equal to twenty-five percent (25%) of the debt payments
- Ensure reliability comparable to Xcel; and
- Include a plan for reduced greenhouse gas emissions and other pollutants and increased renewable energy.

In addition, the city's ability to meet each of these criteria must be verified by a third-party independent expert.

The charter also includes other limiting language, phrased in the form of guiding principles, which include:

1. **Reliable Energy:** Community safety, convenience, and prosperity all depend on the reliable delivery of electric power. The utility will deliver reliable electric power. The utility's foremost responsibilities will be to provide electric power that is high quality and dependable, support economic vitality, prevent service outages, and respond promptly to any service outage.
2. **Fiscal Responsibility:** The cost of electric power is a significant portion of business and household budgets. The utility will operate in a fiscally responsible manner, always being mindful that expenditures will be reflected in customers' rates and will affect household budgets and business profitability. The utility will, while always honoring its obligations

to bondholders, strive to maintain rate parity with any investor-owned utility whose service area would include the City of Boulder.

3. **Clean Energy:** Climate change and diminishing fossil fuel supplies, combined with the high cost of those fuels, are significant factors leading to the creation of the utility. The utility will strive to reduce reliance on fossil fuels, focus on sustainable alternatives, and seek new opportunities for producing clean energy.
4. **Ratepayer Equity:** The utility will direct its efforts to promote ratepayer equity in all aspects of its operations. Rates charged by the utility will be designed to create a fair and equitable distribution among all users of the costs, replacement, maintenance, expansion, operations of facilities, energy, and energy conservation programs for the safe and efficient delivery of electric power to city residents and other customers. The utility will consider the effects of its programs, policies, and rates in the development of programs for low-income customers.
5. **Environmental Stewardship:** Preserving and protecting our natural environment goes well beyond producing clean energy. The utility will be a good environmental steward by working to reduce the environmental impact of its operations, including working to reduce the demand for electricity. Energy and power that is produced in an environmentally responsible manner requires that the city balance environmental factors as an integral component of planning, design, construction, and operational decisions.
6. **Enterprise:** The city will deliver electric power services by means of an enterprise, as that term is defined by Colorado law. Essentially, this means that a city utility must raise at least 90 percent of its own operating income.

WORK AREAS, COMPLETED TASKS AND TO-DO ITEMS

Balancing all of these goals, principles and prerequisites, the anticipated work plan can be described in three phases. Each phase will include several major tasks, some of which may overlap so that the city can meet the aggressive timeline set for this effort. The phases are as follows:

- **Phase 1:** Develop strategies that would achieve the defined goals and detail the different timeframes, risk factors, and organizational structures associated with each. Phase I work has begun and will culminate with council consideration about the best strategy for Boulder. This is also anticipated to be the first place where council could choose to take an off-ramp if creating a local utility no longer appears feasible.
This phase is expected take approximately five to six months with a decision in late 2012 or early 2013.
- **Phase 2:** To build on council's selected strategy or strategies, staff will commence negotiations, initiate legal filings as necessary, and implement the actions required to implement the strategy.
This phase is expected to have several milestones, including possible off-ramp decisions tied to legal outcomes, culminating in the final decision to either form the utility or enter into some other contract to meet Boulder's electricity needs.
This phase is expected to last from 24 to 60 months depending on litigation progress.
- **Phase 3:** Implement whatever is determined to be the outcome of Phase 2, which could include establishing governance, obtaining financing and entering into power purchase contracts – all in support of a new approach to the provision of electric service in Boulder.

This phase will be dependent on the results of the previous phase. As such, the schedule will be driven by the outcome of Phase 2.

It is anticipated that Phase 1 will be the primary focus of the rest of this year. While these areas will be summarized in much greater detail at the Aug. 28 study session, the following is an overview of each:

Legal

What's been done to date:

- ✓ Participate in regulatory proceedings that impact Boulder's future
 - Boulder Docket (decision was made on June 27): The PUC agreed to delay any action by Xcel with regard to discontinuing specific energy efficiency, solar incentives and other programs that reduce the need for Boulder residents to consume power from the grid. This was a positive resolution. The commission recognized the timing was not right but has left the docket open for future review.
 - Electric Resource Plan
 - Ten others (12 total dockets)
- ✓ Hire outside counsel and create an integrated legal team
- ✓ Identify legal requirements under Federal, State and PUC law
 - Conduct an initial assessment and begin developing and vetting possible strategies
 - Research legal strategies associated with creating a utility with the objective of avoiding or minimizing costs and time
 - Understand FERC and condemnation processes, including the importance of the timing of each of these

What still needs to be done:

- Acquisition Process
 - Hire an appraiser
 - Coordinate the asset valuation process and assure those participating can serve as witnesses, if necessary
 - Define electric system components and real property that need to be acquired to implement selected strategy
 - Have appraisal finalized to initiate negotiations with Xcel
 - Negotiate with Xcel to acquire defined components and property
 - If negotiations are not successful, initiate condemnation proceedings to acquire defined components and property
- Determine how much public vetting of legal strategy is appropriate to maintain transparency with the community while also protecting the city's negotiating and legal positions
- Seek approval of a coordinated legal strategy from City Council and begin filing appropriate actions

Financial

What's been done to date:

- ✓ Create a base cost model as well as several alternatives based on a variety of resource, interest rate and acquisition cost variables
- ✓ Conduct independent, third-party vetting of the cost model

- ✓ Conduct preliminary exploration and evaluation of bond opportunities, structures, rates, etc.

What still needs to be done:

- Review existing cost model(s) and identify any gaps in assumptions
- Convert information to a database and begin adding capabilities to transform into a decision-making model for evaluating strategies
- Define data needs, for example:
 - Parameters and goal metrics
 - Customer load/growth
 - Resource requirements
 - Debt assumptions
 - Risk ranking
 - Asset values
 - Stranded costs
 - Operating cost and organizational costs
- Run variations of strategies to determine which ones meet the criteria established by council
- Develop options for financing selected strategy

Criteria Development and Refinement

What's been done to date:

- ✓ Adopt community goals
- ✓ Create and approve charter language related specifically to possible municipalization

What still needs to be done:

- Develop specific criteria or metrics associated with the goals, guiding principles and charter recommendations to help define parameters and aid in narrowing the focus on recommended strategies

Technical

Resource Mix

What's been done to date:

- ✓ Initiate a modeling effort to evaluate various fuel mix scenarios that are both cost effective, reduce GHG emissions, and positively impact load reduction efforts
- ✓ Build on the model developed by RBI in 2011 to run additional scenarios related to resource mix
- ✓ Create a Resource Modeling Technical Team

What still needs to be done:

- Re-engage the Resource Modeling Technical Team to provide feedback on resource portfolio scenarios
- Develop possible resource mixes that achieve council goals, as quantified by established metrics
- Identify any system constraints or opportunities (for both transmission and distribution)

Asset Valuation

What's been done so far:

- ✓ Hire legal counsel
- ✓ Review legal requirements related to this step in the condemnation process
- ✓ Define the factors for determining which assets would be acquired

What still needs to be done:

- Inventory the portions of the electric system that the city would need to acquire
- Inventory the real property owned by Xcel in the City
- Develop separation plan options
 - Annexation
 - Service agreements
 - System configuration
- Identify data needs/gaps and resolve
- Value the real property and the system components necessary to acquire
- Compile lists of components to be acquired and corresponding valuations to input into potential strategies

Public Process

What's been done to date (in 2012)

- Create a monthly newsletter that includes municipalization updates, as well as climate change programs and information
- Enhance website and listserv functions for interested individuals to receive information
- Participate in key community and business forums
- Facilitate focus groups with key business and large-utility customer stakeholders
- Outreach to the business community to identify and implement the preferred method of engagement to hear their perspective on priorities and concerns
- Conduct one-on-one meetings involving Heather Bailey and key business and community leaders, heads of large utility customer entities, facilities maintenance specialists and CU
- Organize and host a climate-related Speaker Series
- Provide updates on Channel 8 and social media sites

What still needs to be done:

- Refine the methods by which strategies are presented to the public and vetted prior to taking to council, with a goal of ensuring the integrity of the process
- Update communication plan
- Recruit and organize individuals with specific expertise to serve in the resource mix evaluation and strategic model assumptions review
- Target communications to inform and update the community on the process
- Develop advisory boards (potential for business and other special interest groups, perhaps a group of facilities maintenance specialists who could advise on this and other issues that require their level of expertise)
- Host public input sessions to provide feedback on strategies developed, prior to going to council, using a variety of media to reach a larger segment of the public.

A more detailed discussion of work program priorities for the remainder of 2012 and 2013 will be the focus of a separate study session on Aug. 28. At the August study session staff will present the work plan and key milestones, schedule, resources, criteria and metrics for evaluating the strategies, and a plan for public involvement.

IV. BOULDER'S CLIMATE COMMITMENT

INTRODUCTION

The purpose of this section is to update council on the process that will guide Boulder's post-2012 greenhouse gas (GHG) emission reduction efforts. Tentatively called Boulder's Climate Commitment, this process builds on the successes of the current Climate Action Plan (CAP); includes an aggressive carbon neutrality goal; institutes a coordinated, citywide implementation approach; and emphasizes transparency and meaningful reporting. The Climate Commitment will encompass a broader range of climate action initiatives than the current CAP, with implementation of those initiatives guided by relevant city master plans and work programs.

Staff will continue to refine Boulder's Climate Commitment through 2012 and into early 2013. Additional upcoming work includes:

- Tapping into local climate expertise and engaging the public to identify community values around the definition and timing of carbon neutrality.
- Coordinating with other departments to develop the appropriate process for calculating and prioritizing GHG reduction efforts within master plans.
- Enhancing sustainability data tracking and analysis within the city organization and improving the quality and frequency of reporting to the public.

The Environmental Advisory Board (EAB), other relevant boards and City Council will continue to be involved and updated throughout the project.

THE CLIMATE COMMITMENT GRAPHIC

The draft Climate Commitment graphic, depicted in Fig. 1 on the following page, shows the next generation of community climate action as a process of continual improvement, rather than a static plan document. A cornerstone of the Climate Commitment is achieving carbon neutrality as quickly as possible (described in more detail below). The six focus areas for reducing GHG emissions are represented by the icons in the top row of Fig. 1. They have been adapted from those currently identified in the CAP, and the titles and focus areas will continue to be refined. Notably, "Reduce Use" (which addressed energy efficiency in existing buildings) and "Build Better" (which addressed energy-efficient construction of new buildings) have been combined into a single "Better Buildings" focus area that looks at the energy impacts of buildings; "Every Drop" adds water use and conservation considerations as a core focus of the Climate Commitment going forward.

Each focus area is shown as connected to one or more master plans, within which strategies and policies will be developed and implemented to reduce GHG emissions in the community and the city organization. Staff research has found that the latest generation of climate action initiatives are moving away from "siloed," stand-alone plans led by one department or even by one staff member toward more integrated approaches. This approach, embodied by the proposed Climate Commitment, acknowledges emissions reduction as a priority for the entire community and city organization. Because each focus area concentrates on a limited number of GHG sources, and connects with one or more master plans, the master plans will include one-year targets and five-year goals based on strategies to reduce GHG emissions. This will support the process of checking in with the community by tracking things that are more understandable than just "emissions."

Boulder's Climate Commitment will be:

- **Action-oriented** – including strategies, goals and programs
- **Coordinated** – establishing GHG goals and methodologies across all relevant master plans and programs, including the new Energy Action Plan
- **Vertically integrated by focus area** – to link programs with results
- **Dynamic and adaptable** – with the ability to be continually improved as new information emerges, and as the city evaluates programs and progress
- **Strategic** – focusing first on the actions and opportunities that make the biggest difference—such as energy and transportation emissions, which comprise 97 percent of the community GHGs currently measured—while guiding action in other areas as well
- **Supportive of Community Resiliency** – including climate adaptation and resiliency¹ measures to make Boulder a more resilient city in the face of climate change.
- **Transparent and Web-based** – a clear, simple, and easy-to-use hyperlinked series of pages, potentially built from the concept in Fig. 1. The pages will be in reproducible printable format, but the intent is to move to a more interactive system for conveying both policy and results.

THE CONCEPT OF NEUTRALITY AND NEXT STEPS

On May 22, council discussed “climate neutrality by 2050 or sooner” as a proposed post-Kyoto Protocol goal for Boulder in 2013 and beyond. The neutrality concept involves reducing GHG emissions as much as possible and then offsetting them to a limited extent (see Fig. 2, below). According to research summarized by the International Panel on Climate Change (“IPCC”), developed nations must reduce their GHGs by as much as 95 percent below 1990 levels by 2050 at the latest to minimize dangerous global temperature increase. In practice, this means that climate action efforts should incorporate two considerations:

1. They must account for and mitigate anthropogenic emissions—those from human activities, like energy consumption and waste production, which are controllable.
2. They must account for and mitigate the six main greenhouse gases identified by the Kyoto Protocol as contributing to climate change².

Reducing 1990 emissions levels by 95 percent—the equivalent of having the entire Boulder community emit GHGs equal to half what residential natural gas emissions were in 2010—is a challenge of an enormous magnitude. However, in recognition that even 95 percent may not be sufficient, staff, council, and the Boulder community have begun to think about how to do as much good as harm, by pursuing strategies that reduce emissions as well as, where appropriate, strategies that offset them (see Fig. 2, below). Please note that the GHG-negative side of the scale is depicted as including both emissions mitigation efforts (like installing CFLs) and emissions offsets (like tree-planting). There does not yet seem to be a universal term for emissions neutrality that conveys these concepts. Staff initially selected “climate neutral;” however, based on community feedback at the June 13 public open house (see page 29) the term “carbon neutrality” seems to be more readily identifiable and definable.³ Carbon neutral is a

¹ Climate adaptation refers to “efforts to respond to the impacts of climate change – adjustments in natural or human systems to actual or expected climate changes to minimize harm or take advantage of beneficial opportunities.” (see www.bouldercolorado.gov/index.php?option=com_content&task=view&id=12258&Itemid=4215).

² CO₂, CH₄, N₂O, HFCs, PFCs, and SF₆

³ For example, the six “Kyoto gases” are often measured in terms of CO₂-equivalent, so “carbon neutral” does not eliminate accounting for them.

more commonly used term, and carbon is a unit that can be measured, whereas climate is a dynamic system. Additionally, consistent feedback has been that Boulder must continue to take aggressive action now to reduce emissions as quickly as possible; and a long-term goal like carbon neutrality that is set far into the future seems to communicate a deferral of action.

To further refine the commitment, staff proposes convening a panel of climate experts in September or October to help frame the discussion about:

- What is a meaningful and achievable timeframe for reaching carbon neutrality in Boulder?
- How can the goal of carbon neutrality be defined and communicated in a meaningful way?
- What strategies, in addition to those already underway, should be considered to put the community on that path?
- What can or should be the role of local government in these efforts, as well as the roles of other governmental entities, businesses, research institutions, and individuals?
- How can the city more effectively measure and report on progress?

Staff will notify council about the panel timing and will summarize feedback from the event.

NEXT STEPS IN REFINING BOULDER'S CLIMATE COMMITMENT

Staff proposes to return to council in the fourth quarter of this year with further information on the Climate Commitment. The immediate next steps include:

- Continue to coordinate with master plans, in particular the Transportation Master Plan and Energy Action Plan, to identify strategies, programs and consistent climate action goals. (For example: what should be the GHG emissions reduction goal for each focus area? Are they values-based or science-driven? What is the community willing to do to achieve carbon neutrality? What will it cost? What are the benefits?)
- Refine the methodology used to account for the Boulder community's GHG emissions.
- Prepare GHG inventory models to project emissions for each focus area.
- Develop an automated system for tracking and reporting GHG emissions outcomes, beginning with city operations.
- Continue community engagement to address questions related to community values and the costs/benefits of alternative strategies.

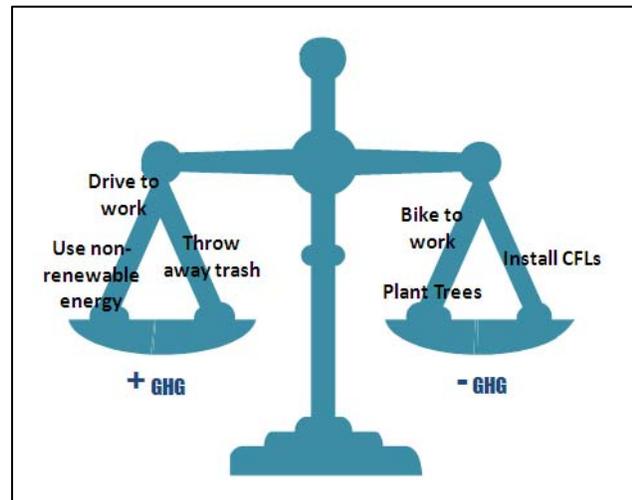


Figure 2: Carbon Neutral "Scale"

V. ENERGY ACTION PLAN

INTRODUCTION

Since 2007, Boulder’s Climate Action Plan (CAP) has implemented an aggressive set of strategies and programs to reduce local greenhouse gas emissions. These strategies were re-tooled in 2009 based on lessons learned in the first two years of action, and in 2010 revised programs and new regulations were developed in collaboration with community partners. The outcome of those efforts included “SmartRegs” for rental properties; new EnergySmart services for homes, apartments and businesses; and pilot programs to improve energy efficiency in commercial properties. These efforts have significantly increased the number of property owners investing in energy efficiency in Boulder.

The 2009 re-tooling effort also highlighted the need to change the source of Boulder’s electricity supply, while maintaining aggressive demand-side efforts (energy efficiency and conservation). Given that 76 percent of Boulder’s greenhouse gas emissions are derived from electricity, cleaner energy sources are needed in addition to making buildings highly energy-efficient. The effort to analyze options for Boulder’s Energy Future—which in turn, led to a focused effort to explore the feasibility of a municipal utility—emerged from this recognition.

While the majority of Boulder’s greenhouse gas emissions come from energy-related activities, the city does not have a comprehensive energy strategy or action plan. To address this need, the city is in the initial stages of developing an Energy Action Plan. It is intended to be a master plan that will articulate Boulder’s energy goals in the near- and long-term, establish GHG reduction targets, and define implementation strategies and action priorities. The plan will consist of three parts, as follows:

1. **Near Term Programs and Initiatives** This section of the Energy Action Plan will identify programs and services that achieve the maximum possible energy efficiency in Boulder through demand-side management (DSM) and conservation, but also support additional objectives such as economic vitality and green jobs. It will look at near-term supply-side efforts that are possible under current regulatory structures. The Climate Action Plan tax, if continued, would be a funding source for implementing this part of the Energy Action Plan. If a municipal utility is formed, the programs and services will likely be incorporated at some point into the operations of the utility.
2. **Next Generation Actions** This section will define additional actions beyond current efforts to develop local clean energy sources and “next generation” energy efficiency solutions that may require investment and/or partnership beyond those currently in place.
3. **Creating a Local Utility** This section will lay out the implementation (business and operations plan; resource plan; etc.) of a new electric utility dedicated to Boulder’s Energy Future goals, and will be developed as part of the municipalization work program.

Staff’s 2012 work program is focused on defining Near Term Programs and Initiatives (part 1 of the Energy Action Plan) to guide energy efficiency and related efforts for the remainder of 2012 and 2013, in addition to continued work in evaluating options for a local utility.

Recommendations for near-term programs and initiatives are outlined below, including priorities

for 2013 energy efficiency efforts; next steps in development of the city's commercial energy efficiency strategy (including a benchmarking and disclosure ordinance); and the planned 2012 update to Boulder's residential and commercial building codes.

STAFF RECOMMENDATIONS

Staff is seeking feedback on the following recommendations:

2013 Initial Program Priorities for energy efficiency programs and initiatives:

1. If Climate Action Plan Tax extension passes:
 - Move forward with the recommended programs and priorities outlined on pages 18 - 20 that build on key findings from two consultants, public feedback, staff experience and previous council direction.
 - Develop an annual planning, data tracking and reporting function to ensure that the city's program investment is agile, and can be quickly modified as necessary.
 - Utilize the Environmental Advisory Board to evaluate program effectiveness and suggest refinements and modifications through regularly scheduled Board check-ins.
2. If the Climate Action Plan tax extension does not pass:
 - Scale back 2013 CAP tax-funded efforts to include only ongoing policy initiatives (e.g., development and implementation of Commercial Energy Efficiency ordinance, administration of residential SmartRegs and development of the Climate Action framework and Energy Action Plan). These policy initiatives would need to be re-evaluated as part of the 2014 priority based budgeting process.

Commercial Energy Efficiency Strategy:

3. Design and implement a benchmarking pilot with stakeholder input that will provide necessary information for the development of ordinance options.

Building Code Updates:

4. Continue the current residential energy efficiency levels to maintain an above-code energy efficiency requirement for houses larger than 3,000 square feet. For commercial construction, continue to examine the following options and develop a proposal for council consideration in 2012:
 - base energy code compliance;
 - thermal envelope 10 percent more efficient than base code;
 - 20 percent more efficient than the base code.

ANALYSIS

This section includes:

- A. Key Findings from Consultant Reports on Boulder's Energy Efficiency Programs
- B. Near-term Program Priorities & 2013 Recommendations
- C. Commercial Energy Efficiency Strategy Update
- D. Residential and Commercial Building Code Update Options

A. Key Findings from Consultant Reports

The aim of the first part of the Energy Action Plan (near-term programs and services) is to involve the maximum number of Boulder residents and businesses in reducing energy

consumption, thus reducing carbon emissions, saving money on energy costs over time, and minimizing reliance on external energy sources.

To assist in this work, the city commissioned two studies for an independent analysis to: 1) evaluate the effectiveness of CAP tax programs to date (i.e., “looking back,” a report prepared by Rocky Mountain Institute); and 2) assess which programs should continue or be refined if the CAP tax is extended and what programs or initiatives not currently funded should be considered for inclusion moving forward (i.e., “looking forward,” a report prepared by the Brendle Group). The Brendle Group’s report is discussed below and provided in **Attachment B**.

Council reviewed RMI’s key findings at the May 22 Study Session. The report was somewhat complicated and technical. Based on feedback from the Environmental Advisory Board and council, city staff worked with RMI to prepare an at-a-glance sheet that summarizes the findings. RMI also revised its executive summary. These are both available as attachments to this memo (see **Attachment C**) and can also be found on the city’s website (boulderenergyfuture.com).

RMI’s Key Findings

RMI’s analysis demonstrated that investments in energy efficiency and renewable energy are outliving the CAP tax dollars spent to leverage them. In other words, a one-time rebate that incentivizes a building owner to invest in an efficient HVAC system can generate energy savings for the building for as many as 25 years. This contrasts with purchases of renewable energy credits (RECs), which are annual investments for which the energy and carbon impacts only have a one-time impact.

Additional key findings of RMI’s analysis included:

1. As compared to previous city calculations of savings, which have typically been annual, the life-cycle assessment of program savings projected considerably more savings for each program.
2. Within the current portfolio of CAP programs, those above average in cost effectiveness include Commercial and Residential Energy efficiency efforts (EnergySmart).
3. Ongoing programs should continue to be comprehensive (such as the existing Commercial and Residential EnergySmart), and become increasingly coordinated across sectors (i.e., recognizing interrelationships between emissions reductions from energy efficiency, renewable energy systems, and transportation technologies).
4. The city should include an annual planning, data management and verification function to the program administration.
5. Commercial and Residential EnergySmart are still maturing as programs, and can be expected to improve over time. A sensitivity analysis of the likely future of these programs predicts improved cost effectiveness, which would make Boulder’s programs significantly more cost effective.
6. While residential programs originally out-performed commercial programs, Commercial EnergySmart should dramatically improve due to learning curves and procedural efficiency as the programs mature. Therefore, commercial efforts represent an important and cost-effective approach for Boulder’s future climate action efforts.

Brendle Group's Analysis

Methodology

The Brendle Group's analysis is provided in **Attachment B**. The analysis included a process of evaluating existing programs and known gaps as described in detail in its report. In short, this included:

1. Identifying individual energy efficiency programs and initiatives to evaluate. Based on the Brendle Group's analysis and input from a stakeholder group, an initial list of 80 programs was narrowed to 15 worthy of further evaluation. The list included existing, refined, and new initiatives. The initial and final lists can be found in **Attachment B**, pages 22 and 27.
2. Developing quantitative and qualitative criteria against which to evaluate these programs and initiatives.
3. Evaluating each program against the criteria.
4. Putting together packages of programs and initiatives based on funding of up to \$1.8 million annually (the estimated revenue generated if the CAP tax passes). Six investment packages were developed to test and determine the boundaries of what's possible under the projected funding level if the CAP tax extension passes⁴. Some packages are meant to answer the most common "what if" questions, such as: "*what if we invested all of the available tax revenue in solar or Renewable Energy Credits?*" Other packages seek to maximize certain benefits such as optimizing for emission reductions or focusing on specific sectors. The packages evaluated include:
 - Package 1: High Greenhouse Gas Reductions
 - Package 2: Residential Focus
 - Package 3: Commercial Focus
 - Package 4: Multiple Benefits (Maximize Evaluation Criteria Benefits)
 - Package 5: Solar Focus
 - Package 6: Renewable Energy Credits (RECs) Focus

Each package assumes a maximum \$1.8 million funding level (i.e. estimated 2013 Climate Action funding if the tax passes). The summary of each package and the detailed analysis of each can be found in **Attachment B**. Projected greenhouse gas emission reductions for each program range from a high of 177,000 mtCO_{2e} as a "snapshot of year 10" in Package 1 to a low of 6,400 mtCO_{2e} in Package 5⁵.

Brendle's Key Findings

Brendle's report and its appendices describe in detail the background for and process of evaluating existing and new programs and developing investment packages that maximize

⁴ The Climate Action Tax currently generates approximately \$1.8 million each year. The investment packages assume the continuation of the tax revenue at the same sector rates.

⁵ This represents GHG emissions reductions at the end of Year 10 and does not represent cumulative reductions.

Boulder's progress to GHG reduction goals within CAP tax funding constraints. The key findings of the analysis are:

1. Integrate program management (including planning, tracking, measurement and verification, and program evolution) to maximize flexibility, efficiency and create cohesion among the suite of programs; include dedicated funding to ensure program performance and continuous improvement (e.g., staffing commensurate to required results) to successfully leverage lessons learned from previous and current programs.
2. Create a mix of mandatory and voluntary approaches where mandatory programs take advantage of program maturity and lessons learned and voluntary programs encourage market innovation.
3. Include renewable energy generation aspects in both residential and commercial programs.
4. Ensure commercial energy efficiency programs serve as the cornerstone of spending as these programs have the strongest performance for both cost effectiveness and carbon savings.
5. Continue to include residential programs as a critical component since the residential sector contributes strongly to CAP tax funding.
6. Dedicate a significant portion of CAP tax funding to flexible market innovation mechanisms.

B. Near-Term Program Priorities and Resource Allocation

Guiding Principles Moving Forward

Based on the findings of the RMI Report and Brendle Group's analysis, staff's experience, previous feedback from the EAB and direction from council, the following guiding principles have been used in determining the recommended program investments and related priorities for 2013 and beyond:

1. Build on successes; discontinue efforts that are not working; and add new programs that have been shown to be cost and carbon-competitive based on the program analysis.
2. Make commercial energy efficiency programs the cornerstone as they are predicted to have the strongest performance for both cost effectiveness and carbon savings in the long-run.⁶
3. Continue to include a residential component. The residential sector is the main funding source of the programs and has the best opportunity to improve behavior related to energy efficiency and conservation.
4. Continue to support a mix of mandatory and voluntary approaches based on the experience of SmartRegs (which has incentivized action above annual targets and beyond minimum requirements).

⁶ RMI's analysis concluded that the Commercial EnergySmart program is still maturing as and can be expected to improve over time. The sensitivity analysis projects that Commercial Energy Smart will improve from 69.1 to 13.9 \$/mton CO₂e. The report can be found at: www.bouldercolorado.gov/files/Energy/2012/May22/May22_SS.pdf

5. Ensure that programs spur local market innovation and economic vitality.
6. Include renewable energy (local) generation (in EnergySmart services) rather than invest in renewable energy credits (RECs) because credits do not result in ongoing or cumulative savings.
7. Include the following “base level” components to ensure continuous improvement and implementation of previous council direction:
 - An enhanced program management function that includes stronger data management, tracking and reporting;
 - A well-developed commercial efficiency ordinance; and
 - Continued administration and management of the SmartRegs program.
8. Provide ongoing program monitoring and oversight to respond to changing circumstances and opportunities and continually improve program delivery and effectiveness. To this end, staff recommends instituting regularly scheduled check-ins with the Environmental Advisory Board on CAP-tax funded programs and modifying programs and services based on what we learn.⁷
9. Use CAP tax-funded city staff resources efficiently and effectively, focusing the staff role primarily on:
 - Policy and program analysis, and development of appropriate regulations
 - Research and development for new initiatives and improved program effectiveness
 - Contract administration for private sector or third-party delivery of energy efficiency programs and services
 - Data management, including tracking, analysis and reporting
 - Coordination with others in the city organization, Boulder County and partner institutions to identify opportunities for resource-sharing. This could result in additional resources for climate action initiatives (e.g., data tracking systems)
 - Identification of organization-wide opportunities for climate action to be implemented by others (e.g., Master Plan coordination).

Recommended Initial 2013 Initiatives

Below are recommended 2013 energy efficiency initiatives for the two potential funding scenarios:

1. Passage of the Climate Action Plan tax with existing rate structure (estimated \$1.8 million in 2013 revenues); and
2. Climate Action Plan tax does not pass

The Boulder County Commissioners decided not to pursue a County Sustainability tax in 2012. Therefore, a scenario that includes a second tax was not considered in this analysis.

1: If the Climate Action tax is extended in November

If the CAP tax is extended, staff recommends an initial set of programs that is largely based on Brendle’s conclusion package on page 19 in **Attachment B**, as it does the best job of addressing the guiding principles above. It includes the following key strategies:

- Ramp Up Commercial Energy Efficiency Initiatives
- Enhance Residential Programs

⁷ The Brendle Report refers to this function as “program performance and continuous improvement”

- Stimulate Market Innovation
- Improve Tracking, Reporting, and Evaluation

Overall, the programs in these key strategies result in a mix of mandatory and voluntary approaches, renewables for both commercial and residential sectors, and a market innovation component. It also includes the “base level” components that are essential to ensure continuous monitoring of program effectiveness and implement previous council direction. This recommendation assumes maintaining current staffing levels with an estimated CAP tax revenue of \$1.8 million. The recommended programs in each strategy are described below.

Ramp Up Commercial Energy Efficiency Initiatives

This strategy focuses on the Commercial sector, since analysis shows it to be the most cost effective with the highest potential carbon and cost savings in the long-run.

- Estimated 2013 Investment: 55% of CAP tax revenues
- Snapshot of Year 5 projected GHGs avoided: 37,704 mtCO₂e
- Snapshot of Year 10 projected GHGs avoided: 146,780 mtCO₂e⁸

The three initiatives in this category include:

- **Continue and Enhance Commercial EnergySmart Programs:** Proposed enhancements include connecting businesses with renewable energy incentives and rebates, expanded contractor engagement to further build a trade ally network, continued support of weatherization efforts, and expanding retrofits to be more extensive. Campaigns within the current EnergySmart program could be used to expand the program to target particular business sectors, particular technologies, or a streamlined approach for implementing a particular retrofit across a large customer group. Additional program details can be found on page 33 of **Attachment B.**
- **Build on the Success of “10 for Change”:** This program engages Boulder businesses in a friendly challenge to save money by integrating sustainability practices into their facilities and operations. Efforts to save energy and water, reduce waste, and use alternative transportation all contribute to Boulder’s community sustainability goals. The proposed expansion of this program would grow it to include tenants and leased spaces. It is envisioned that the funding for this program would sunset over time if prescriptive building retrofit requirements are developed. Additional program details can be found on page 32 of **Attachment B.**
- **Develop a Benchmark and Disclosure Ordinance:** This is described in section C, below. Additional program details can be found on page 27 of **Attachment B.**

Enhance Residential Programs

This strategy focuses on the residential sector, as it is the main funding source of the programs and has the best opportunity to improve behavior related to energy efficiency and conservation. It consists of existing successful programs that would be enhanced to maximize program effectiveness and GHG emissions reductions.

⁸ This supports RMI’s conclusion that commercial EnergySmart is still maturing as a program, and can be expected to improve over time in terms of emission reductions.

- Estimated 2013 Investment: 18% of CAP tax revenues
- Snapshot of Year 5 projected GHGs avoided: 5,554 mtCO_{2e}
- Snapshot of Year 10 projected GHGs avoided: 11,007 mtCO_{2e}

The two programs in this category include:

- **Continue and Enhance Residential EnergySmart Programs:** Potential enhancements include connecting homeowners with renewable energy resources, continued support of weatherization efforts and expanding retrofits to be more extensive. Additional program details can be found on page 34 of **Attachment B**.
- **Continue Implementation of Residential SmartRegs:** This maintains the current SmartRegs program, including all associated fees, trainings, and consulting. However, it would be a lower level of support than that provided in the initial two years of implementation. Services at this level would include general support in answering landlord/inspectors questions, limited troubleshooting, and limited data entry. Additional program details can be found on page 17 of **Attachment B**.

Stimulate Market Innovation

This strategy is intended to ensure that programs spur strong local market innovation and economic vitality.

- Estimated 2013 Investment: 16% of CAP tax revenues
- Snapshot of Year 5 projected GHGs avoided: 25,000 mtCO_{2e}
- Snapshot of Year 10 projected GHGs avoided: 50,000 mtCO_{2e}

The program in this category is:

- **Fund a Competition for GHG Reduction Initiatives.** This program would solicit, through a Request for Proposals (RFP), ideas for reducing GHG emissions at the same or increased cost effectiveness as programs already in place (or about \$5 per ton of reduction over a 10-year lifetime). This approach offers the flexibility to shift funding to higher performing programs or strategies annually if responses do not achieve required conditions of performance. The consultant team identified \$285,000 as the minimum level that will both promote meaningful market innovation and include staff time for program development and implementation. Additional details can be found on page 50 of **Attachment B**.

Improve Program Tracking and Evaluation

This strategy was recommended by both consultants to ensure continuous improvement and successfully leverage lessons learned from previous and current programs.

- Estimated 2013 Investment: 11% of CAP tax revenues
- Snapshot of Year 5 GHGs avoided: N/A

The recommended focus in this category is:

- **Create Better Data Tools to Support Continuous Improvement:** This area of work would focus on developing a more systematic, transparent and consistent data tool for tracking the results and performance of climate action programs and initiatives. It would help inform not only what programs should receive ongoing funding but also how to most efficiently manage and refine programs moving forward. This function was recommended by both RMI and the Brendle Group as an essential function based on lessons learned from CAP performance to

date, as well as best practices from local government and utility demand-side management programs to ensure accountability and continuous improvement. The information generated from this program would be used for regular check-ins with the Environmental Advisory Board to refine and modify programs over time to maximize effectiveness.

Potential Additional Program Funding

Despite the fact that Boulder County decided not to place before the voters a countywide “sustainability tax” in November, the county is nonetheless committed to identifying approximately \$1 million per year county-wide for 2013 and 2014 for a scaled back version of residential EnergySmart services. Over the coming months, the city will identify options for the structure of an ongoing partnership between the city and the county to deliver to Boulder customers, a comprehensive, cost effective suite of energy efficiency services. The final partnership agreement should be solidified in an intergovernmental agreement (IGA) between the City and the County.

Boulder County’s contributions will likely fund some components of residential EnergySmart for owner-occupied properties beyond those provided by the CAP tax (if voters approve the tax extension). Staff will check in with council at the October 23 study session regarding principles that would govern an IGA between the city and the county for the future of EnergySmart.

Staff believes the initial investment package described above will be most effective at achieving energy efficiency and emission reduction goals in 2013, and represents the best allocation of tax revenue should the tax be extended by voters in November 2012. The addition of a robust program tracking component will ensure the package is performing as anticipated, and will allow for course corrections during established check-ins with the EAB and City Council.

2: If the CAP tax is not extended in November

If the CAP tax is not extended, the services described in the preferred investment package will not be delivered. However, three policy initiatives are included in the Brendle Group’s recommendations for which some amount of funding may be needed in the short term. These are considered the “base level” services, which include:

1. SmartRegs: even without advisor services, the ordinance needs to be administered;
2. Council has asked staff to develop a Commercial Energy Efficiency Ordinance that includes a benchmark and disclosure requirement;
3. An enhanced program management function that includes data management, tracking and reporting and an annual planning function to ensure continuous improvement.

To continue these priority policy initiatives absent a CAP tax extension, the city will target the first quarter revenues from the existing CAP tax (before its final expiration date of March 31, 2013) to ensure these policy priorities are accomplished for the year. During the 2014 budget process, council can decide whether to discontinue these policies; look for trade-offs through priority-based budgeting to fund these or other energy efficiency policy or program initiatives; or consider fees to achieve cost recovery for administration of SmartRegs as well as new commercial ordinances that may be developed.

C. Commercial Energy Efficiency Strategy Update

Introduction:

The purpose of this section is to present City Council with a refined work plan for the city's 2012/2013 efforts to develop a new Commercial Energy Efficiency Strategy (CEES), including a report on progress made since the May 22 study session.

On May 22, council discussed moving forward with a three-phase CEES that includes: 1) existing and/or expanded voluntary, incentive-based programs; 2) a regulatory policy that would require benchmarking and annual reporting; and 3) eventually, requiring prescriptive energy efficiency measures and/or performance standards. To review the proposed strategy, view the May 22 study session packet (www.boulderenergyfuture.com).

A description of recommended voluntary, incentive based programs for commercial properties in 2013 and beyond is included earlier in this memo – in Part 1 of the EAP. The next phase of work will focus on developing, adopting and implementing a benchmarking and disclosure ordinance. The ordinance is being considered because it would assist the city in collecting comprehensive commercial building energy use data, information that is currently unavailable. This data would allow the city to quantitatively track changes in commercial energy performance and to measure those changes against the community's energy goals. The data would also facilitate the development of city programs, incentives and/or technical support to encourage property owners to make energy efficiency improvements to their buildings.

The proposed benchmarking and disclosure ordinance would likely include three main parts:

1. Commercial building owners would be required to establish a benchmark for their building's energy performance by entering at least one year of past energy use and building data into a software tool.
2. Owners would then be required to disclose the benchmark information to the city and, potentially, to the broader public. The level of disclosure will be determined with stakeholder input.
3. Finally, owners would be required to enter data annually and disclose information contained within the software-generated energy performance report.

Through review of other cities' ordinance development and the City of Boulder's work leading to SmartRegs, several critical steps were identified as necessary to complete as part of developing an effective benchmarking and disclosure ordinance:

1. Evaluate available property data and identify the commercial buildings that would be impacted by the ordinance.
2. Determine the “trigger” that would prompt building owners to report their data.
3. Confirm that ENERGY STAR Portfolio Manager would be the best reporting tool for completing initial benchmarking and annual reporting.
4. Streamline data access and entry and explore ways to expedite direct data transfer from Xcel to Portfolio Manager.
5. Draft ordinance options that incorporate the best practices from other cities, but are customized to meet the needs of the city's stakeholders and building stock.

Analysis

Property Data

Commercial buildings' energy use varies due to several factors, including building size, geographic location, occupancy and use. Therefore, accurate commercial building information is essential to an efficient benchmarking and disclosure program. This data is also critical for identifying the buildings that would be subject to an ordinance and for contacting those buildings' owners. Once the owners begin reporting, the database serves as a tool for tracking compliance after the ordinance is adopted and reporting begins.

The City of Boulder has access to a variety of business and commercial property information. Commercial water billing records, business and sales/use tax licensing data and property data (Boulder County Assessor's Records) were examined as potential sources of data. Staff found that commercial water billing records as well as business and sales/use tax data did not include enough property information to be a viable source. The Boulder County Assessor's Records appears to provide the most comprehensive source of information on the city's commercial building stock. Boulder County's data includes the most relevant and accurate information on commercial properties, including:

- Ownership
- Location
- Use
- Sales data
- Building measurements

While this information is the most comprehensive, there are challenges with utilizing this data. Boulder County property records are updated every two years, so they do not reflect real-time data. Additionally, information is not always 100 percent accurate. Despite the shortcomings, staff recommends using the county's property tax database as it provides the best currently available information for identifying buildings and contacting property owners.

Trigger for Reporting

Determining how and when commercial property owners would be required to report their energy performance would be another critical piece of a benchmarking and disclosure ordinance. Annual reporting is necessary to measure change and track progress over time. Therefore, it would be ideal if commercial building benchmarking and annual data entry could be tied to an existing city process that involves commercial property owners on a yearly basis.

Water billing, business and sales/use tax licensing, and property taxation are all existing systems through which information is collected from commercial building owners and/or business owners. However, there are challenges to using any of these three methods. For example, not all commercial water bills are directed to property owners, and not all water bills within a building are on the same billing cycle. Business and sales/use tax licensing are required by business owners, not necessarily commercial property owners, unless they happen to be one and the same. Further, business licensing does not recur on a regular, annual basis. Finally, property taxation is administered by Boulder County, not the city.

The best method to trigger annual reporting has not been identified. Staff will continue to research potential processes including the development of a new or hybrid process that could be used for energy performance reporting.

Benchmarking and Reporting Tools

Cities and institutions, including the University of Colorado, have employed a variety of software programs that allow property owners to enter their energy and building data. These programs range from consultant-created software to utility-generated products to federally-developed platforms.

All other cities that have adopted benchmarking and disclosure ordinances use ENERGY STAR Portfolio Manager. Supported by the United States Environmental Protection Agency (EPA) and Department of Energy (DOE), the free online tool generates a Statement of Energy Performance, which includes a performance rating (1-100) and comparisons to similar building uses throughout the country. These building ratings are normalized through analysis of a variety of factors, including: geographic location (and, therefore, weather), building size, use, occupancy and so forth.

Staff is evaluating Portfolio Manager as the reporting and tracking tool for Boulder's benchmarking and disclosure efforts. Portfolio Manager offers other benefits to Boulder commercial property owners and to the city.

1. Portfolio Manager allows for easy data transfer from the property owner to the city. After data is entered, property owners may share their data with the city by simply clicking a button. The program then aggregates the data into a single spreadsheet, making it efficient for cities (or other jurisdictions and organizations) to analyze.
2. The EPA provides free technical support to both property owners and to cities. Regional and national EPA experts are available to help with software troubleshooting, data "scrubbing" (i.e. ridding the database of incomplete or inaccurate data) and information analysis.
3. The ENERGY STAR rating system is nationally recognizable and is being utilized locally on a voluntary basis.
4. Portfolio Manager is set up to interface with other energy reporting databases. Several companies and organizations already use EPA's Automated Benchmarking System (ABS) as part of their commercial energy information tools and services.

Staff is beginning to research ways in which Boulder might utilize the EPA's ABS with automated data transfer from Xcel to Portfolio Manager. The City Attorney's Office is preparing a report to outline the Public Utility Commission's (PUC's) regulatory considerations to expedite this process.

Next Steps:

Next steps include pilot program development, extensive stakeholder outreach and pilot program implementation. Additionally, research will continue to identify feasible processes, tools and regulatory considerations involved in a benchmarking and disclosure program.

Pilot Program

The city will be developing a pilot program with extensive stakeholder input to determine the best way to design a benchmarking and disclosure ordinance. To obtain a broad sample of data, owners of different types and sizes of commercial properties would enter their building's information into Portfolio Manager just as they would if an ordinance were in place. Through this pilot, staff would identify the most valuable energy use data and understand its implications. Additionally, property owners would reveal potential barriers through hands-on data entry experience.

The pilot program would be designed to answer several questions, including the following:

- What trigger will accurately and efficiently facilitate rating and reporting?
- How does Portfolio Manager and its corresponding technical assistance support property owners and the city in data reporting, collection and analysis?
- How does automated data transfer via Xcel impact the timing and accuracy of data reporting?
- Should buildings of a certain size, use, type or other feature be required to comply before others?
- Is the rating and reporting system more effective for buildings with different characteristics?
 - Publicly-owned versus privately-owned
 - Buildings of different sizes
 - Buildings with different uses
- Are there any simple efficiency upgrades with short-term returns on investment that could be included in the benchmarking and disclosure ordinance?

The city is discussing this concept with a variety of commercial property owners to develop the pilot program. In August, staff will continue to engage stakeholders to refine it. Additional stakeholder feedback will be collected during and after the pilot program, from August to November 2012. This input will come from pilot program participants and will be used to assess the time and resources needed for benchmarking and reporting of different size and uses of commercial buildings. Understanding the time and resources needed for property owners to benchmark will inform the city of appropriate paired incentives and compliance deadlines for the energy rating and reporting requirements.

Stakeholder Input

Outreach efforts will be conducted with property owners and other stakeholders in August to share information and seek input about the proposed pilot program, options being considered for the benchmarking and disclosure ordinance, and other commercial energy efficiency efforts.

Stakeholder discussions are scheduled with the following groups:

- Urban Land Institute
- Boulder Tomorrow
- Commercial Brokers of Boulder
- Colorado Companies to Watch
- Boulder Chamber of Commerce

- Boulder Area Rental Association
- Property owners and businesses

The proposed timeline for the city's CEES work in 2012 and 2013 is included as **Attachment D.**

D. Residential and Commercial Building Code Update Options

Building codes are updated on a regular basis to ensure that the regulations keep pace with the changes in the construction industry. In addition to adopting updated codes that address life/safety issues, the city also assesses how code adoptions can contribute to energy action goals. This type of approach led to the successful pairing of the SmartRegs energy efficiency appendix with the International Property Maintenance Code (IPMC).

This year staff is working on the 2012 code update. The base documents from the International Code Council (ICC) have caught up with the locally amended version of the 2006 International Energy Conservation Code (IECC). For the 2012 code update it must be determined if energy efficiency requirements should be increased and if so, by how much.

For residential construction the current Green Building Green Points (GBGP) energy efficiency requirements are tiered according to house size and compare to the 2012 IECC as follows:

- For multifamily dwellings and houses 3,000 square feet and smaller, existing GBGP requirements are equal to the base 2012 IECC requirements;
- GBGP requires that houses between 3,001 and 5,000 square feet in area are 20 percent more efficient than IECC base requirements, and;
- GBGP requires that houses 5,001 square feet and larger are 45 percent more efficient than IECC base requirements.

Input from consultants familiar with the Home Energy Rating System (HERS) of the Residential Energy Services Network (RESNET) would be necessary for changing the current residential energy efficiency levels. Evaluation of input from applicants and energy raters indicate that the current efficiency requirements are still progressive and viable. Energy raters have also expressed concern that recent changes to the HERS program make compliance for smaller homes more difficult than before. Similar issues were raised during the previous GBGP update by a consultant hired to provide analysis of the current GBGP energy efficiency requirement. This information influenced development of the tiered energy efficiency requirements. For houses larger than 5,001 square feet in area the use of renewable energy is typically required to reduce the HERS to the level required by GBGP; therefore, any increases in efficiency for this tier will likely lead to continued purchase of renewable energy components rather than affect any change to the thermal envelope of the building.

The energy efficiency requirements for existing residential buildings established through the SmartRegs ordinance have been applied to more than 1,400 buildings during the incentive phase. The quality assurance features built in to the program have informed staff of potential changes to SmartRegs, as outlined in the April 24 Study Session memo at:

[www.bouldercolorado.gov>Government>City Council>Study Sessions](http://www.bouldercolorado.gov/Government/City_Council/Study_Sessions)

Code changes for the SmartRegs energy efficiency appendix to the IPMC will be proposed concurrently with updates to the GBGP requirements.

For commercial construction, the 2012 IECC achieves parity with the locally amended 2006 IECC. A series of documents called the Advanced Energy Design Guides (AEDG), published by the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE), are designed to achieve energy efficiency 20 percent better than the base 2012 energy code. Based on the city's previous experience enforcing above-code energy provisions, such a set of prescriptive guidelines is critical to being able to make a locally amended energy code viable for improving existing buildings.

A new document available from ICC, the International Green Construction Code (IGCC) combines energy efficiency and sustainable construction requirements in one document. The IGCC will be evaluated to see if it will provide the code framework and support needed to address the "build better" focus area of the community climate action framework. IGCC also features requirements for the building thermal envelope to be 10 percent more efficient than the base code. This provision provides an intermediate step in energy efficiency between the base code and the levels prescribed by the ASHRAE, AEDG.

This summary of the current energy efficiency requirements related to options that can be incorporated into the 2012 code update process are provided to facilitate determining the optimal energy efficiency targets. Staff's recommendation is to maintain the current residential energy efficiency levels which will still result in maintaining an above-code energy efficiency requirement for all but the smallest category of houses and multifamily dwellings. For commercial construction three options are proposed for evaluation: adoption of the base 2012 IECC; a thermal envelope improvement of 10 percent through the use of the IGCC; or a 20 percent total energy efficiency improvement according to the ASHRAE AEDG.

Council's feedback on the recommendation for residential energy efficiency, and the options proposed for further evaluation of potential commercial energy efficiency levels will inform the specific proposals developed for review and consideration in the code update process.

VI. ENVIRONMENTAL ADVISORY BOARD INPUT

The Environmental Advisory Board (EAB) provided feedback on the materials in this memo at its June 21 and July 12 Board meetings. The Board was generally supportive of the staff recommended direction and embraced having a new role in reviewing the effectiveness of programs and initiatives moving forward. Below is a compilation of the Board's comments.

Brendle Report Methodology

- The Board is encouraged by the analysis as it begins to clearly describe where the estimated \$1.8 million in revenue may be spent and what impact each investment will have. The draft selected programs will result in multiple benefits, which can be correlated with job creation and economic development as well as leveraging local investment. In other words, if we receive \$1.8 million in tax revenue, that is going to possibly lead to \$5+ million of local investment. So, this is something to get the ball rolling—the investment we are making through the climate action tax.

- In terms of the qualitative metrics, the Board encourages a close look at the “equity” area to ensure lower income populations are receiving continued weatherization services and other things that would be making the same upgrades that we are trying to do around the community. Also, within the externalities category, we should look to maximize the positive impact on other sustainability priorities.
- Members of the Board supported the economic vitality and private investment focus.
- One member suggested the addition of a community satisfaction metric in the qualitative measures, and suggested polling the public to see how we are doing. She also mentioned that some of the goals are not equal to others, and we may need to think about prioritizing as we move forward.
- One Board member mentioned that well-established companies have been participating in the city’s commercial programs, and the City needs to continue to support these efforts.
- One member mentioned strong support for the externalities category, as a high result in this category creates momentum and helps projects succeed. In other words, if a particular program is given a little money and we look to partner with other entities—(if we start the program), we may see really good results in other sustainability efforts, whether it be job creation or stimulating local innovation.

Guiding Principles Moving Forward

- The Board mentioned the substantial investment made to get the EnergySmart services going, and encouraged staff to leverage the current investments as much as possible. The board agreed that the huge investment that has been made in the Energy Smart program will result in an increased rate of return. Newer programs are expected to need a lot of analysis and discussion on how to design a program before the growth or implementation of the program. Encouraged staff to be mindful of program “ramp-up” costs. The board continued, by mentioning that program maturity should improve return on investment. As staff puts time and effort into programs that may have some uncertainty now, we should see an increase in return on investment.
- One member expressed agreement with the listed goal to “support market innovation’ and agrees that commercial energy efficiency programs have the strongest performance of both cost effectiveness and carbon savings. That member went on to suggest there should be a renewed emphasis on commercial support as we have tapped the savings in commercial sector yet. There should be a good combination of mandatory and voluntary efforts.
- Another member suggested playing more with a “strong hand” in adopting more mandatory programs as we have seen the effectiveness of the SmartRegs program. The City should work towards additional mandatory restrictions particularly in the commercial sector. Studies have shown how critical it is to bring these programs to the commercial sector and putting mandatory restrictions on them is a cost effective way of doing it. Politically it is less personal that putting the mandatory restrictions on people in their homes. Staff clarified that they want to lean away from using the word mandatory or restrictions and move towards “norming” particular behaviors and programs. The board agreed that words are indeed important, and “norming” of certain issues was correct.

Recommended 2013 Initiatives

The Board agreed with staff's recommended investment package discussed during the two meetings. Specific feedback included:

- The Board appreciated a recommended package that included a continuation of the most effective programs (EnergySmart), with enhanced efforts, and new programs (Open RFP). The board also expressed support for the enhanced program management component, and appreciated a role for the EAB in annually evaluating programs effectiveness.
- One member mentioned that the selected programs should be based on which are most effective at reducing emissions. Appreciated that the view was on the effectiveness of the overall package.
- The board supported consolidating the various commercial programs and ramping up these efforts and expressed strong support for market innovation component (Open RFP).
- The board was encouraged to see the various packages and trends aligned with the comments the Board had made previously.
- Staff should reach out to other cities/jurisdictions, universities, venture groups on the Open RFP component
- With regard to commercial codes and incentive structure, the city should require building upgrades if payback is less than 1 year. These types of upgrades do not require rebates/incentives. Business owners will quickly recognize the benefit.
- The board indicated that if the RFP process does not result in effective options dollars, they recognize that it can be re-allocated to other areas (commercial/residential).
- On the Commercial Energy Efficiency Strategy, one member suggested that an effective pilot process in 2013 could result in moving straight to Ordinance. Businesses participating in EnergySmart, 10 for Change, etc could provide statistically valid data on appropriate recommendations.
- One member expressed a strong support for pairing mandatory requirements with voluntary actions. We will ultimately hit a ceiling on effectiveness without a regulatory component.
- The Board appreciated a recommended package that includes a commercial ordinance even if the tax does not pass.
- The board expressed an interest in participating in the design of the Open RFP process. They believe it to be a very exciting and unique addition to the climate action programs, and believe the board can help in its design.

Building Code Updates

- One member expressed a strong interest in the city updating building codes for new construction of larger homes (3,000 square feet and up). Data show that these homes, on average, use considerably more energy than their smaller counterparts and depending on what the City wants to pursue in the short-term, there may be worthwhile opportunities to reduce this footprint in the construction phase. For example, electricity use increases at a greater rate than natural gas does as home size increases. For every additional 1,000 square feet of home, electricity use on average is increasing by 40 percent and natural gas

use is increasing by 29 percent, and GHG emissions for the 3,000 to 4,000 square foot homes are about twice that of the 1,000 to 1,500 square foot homes (100% greater), while their energy bills are about 75% greater.

VII. PUBLIC ENGAGEMENT AND INPUT

A. June 13th Open House

Purpose:

In an effort to provide background and context for Boulder’s climate action work to-date and gather input on current and future plans moving forward, the City of Boulder hosted a Climate Action Open House to address the following items:

- Report out on RMI’s findings on the effectiveness of existing CAP tax-funded energy efficiency programs and services
- Provide background on the new climate action framework
- Gather public input on a new long-term climate action goal tied to short-term goals & targets
- Gather public input on guiding principles and goals for CAP tax programs moving forward
- Gather public input on options for recommended 2013 Energy Action Plan (EAP) programs

Structure:

The open house was structured with five different stations to allow our community to learn from, provide input to, and converse with staff. Information and questions presented at each station, along with community input, are included below. All materials displayed at the open house can be found on the Energy Future website.

Station 1: Why We’re Here: Background on Boulder’s Climate and Energy Future Work

The initial station included a timeline of CAP progress-to-date and information on recent climate action and Energy Future work. It also included copies of the Energy Future newsletter and the process graphic titled “2012 Path to Boulder’s Energy Future,” which was presented in the March 13 Update Memo to City Council.

Station 2: What We’ve Accomplished and What We’ve Learned

The second station focused on the evaluation of CAP tax-funded programs and services to-date, as determined by RMI’s research and report, which is also available on the project website. Materials included information of current climate action plan programs and services, including those funded by the CAP tax, an “at-a-glance” sheet summarizing the RMI CAP analysis report, and an opportunity for community members to share how they have contributed to and learned from all CAP focus areas.

Notably, most participants indicated that they have taken energy efficiency steps, including participating in EnergySmart, installing solar panels, and obtaining an Eco Pass. Additionally, there was a high emphasis on local food production and local produce, although local agriculture is not addressed in the current Climate Action Plan.

Station 3: Climate Action Imperative: Why Now?

The third station addressed local and global impacts of climate change and provided background on why Boulder is taking action now. This area included a slideshow displaying climate action work occurring in Boulder as well as climate change impacts and response around the globe. In addition, information on the science behind climate change, what other communities are doing, and our community's role in addressing climate change was also available.

Station 4: Where We're Heading: Help Shape Boulder's Climate Action Commitment

The fourth station was one of two that addressed the future of climate action in Boulder. Specifically, this station focused on Boulder's climate action framework, focus areas, long- and short-term goals, and how the city will measure progress. Staff provided information and collected input on Boulder's Climate Commitment, including the framework graphic, and the terminology of "carbon" vs. "climate" neutrality, as well as the general understanding of neutrality.

Generally, participants concurred that the city should develop a living plan that engages the entire community, that is coordinated with other plans, and that allows for continuous improvement. Participants showed enthusiasm for the way in which materials and programs were presented (including the draft commitment), but also expressed concern that aggressive goals such as carbon neutrality may be overly ambitious, or may not be achievable without an extension of the current Climate Action Plan tax. They suggested the city should continue to provide programs and services for all sectors of the community, allowing individuals and businesses to prioritize their actions. Finally, they provided some feedback on the definitions and terms – carbon vs. climate – saying that carbon is a more readily understandable term, but more input about what resonates with or inspires the community would be useful in shaping the climate action commitment and related short-term targets and goals.

Station 5: Where We're Heading: The Next Generation of Climate Action

This station focused mainly on the Brendle report, which provided several strategies and options for future programs funded by a potential extension of the Climate Action Plan tax. Each of the six packages provided by Brendle at the time of the Open House were presented to participants who were encouraged to ask questions and provide input on each. General feedback was also collected regarding what other areas should be considered in potential future packages.

Community members requested: flexibility; continued support to help businesses reduce their energy use, including programs, rebates, and education; an inclusion of solar garden development; a potential trade show for energy efficiency upgrade options; and, increased renewable energy generation.

Summary

Overall, staff thought that the quality of engagement and discussion at the open house was beneficial, although numbers of participants ideally would have been higher. Moving forward, the city will continue to prioritize transparency and community engagement and input in the Energy Future process. While staff will continue existing methods that have proved effective, such as the Energy Future website and monthly newsletter, staff will also consider innovative techniques for informing and engaging all sectors of the community including meeting

individuals and businesses where they are, and online engagement, in addition to traditional meetings.

B. CAP Tax Survey

The City of Boulder, in conjunction with the Boulder-based National Research Center, conducted a survey of likely Boulder voters about their willingness to extend the current Climate Action Plan tax. The 13-minute telephone survey started on Monday, June 18, and continued for about 10 days until NRC was able to reach the 400 complete responses necessary to be able to accurately draw conclusions from the data.

The majority of the survey focused on individuals' awareness about what the CAP tax has funded and their interest in seeing the funding and resulting programs continue. There were a few questions that tested the possible interplay between this tax extension ballot item and other tax measures that were being contemplated at the time, including the city's .25 sales tax and a county sustainability tax. The city learned after the survey was out in the field that the county is no longer considering its tax.

NRC analysts are compiling and assessing the responses now and are preparing to make a formal presentation of the findings to City Council on July 24. A copy of the report is expected to be made available for council and members of the public a few days in advance of that session, likely on Friday, July 20.

VIII. NEXT STEPS

Following council's discussion and feedback on July 24, staff will:

- Return to council on Aug. 28th with a detailed municipalization work plan
- Return to council on Aug. 7th with a summary of this study session
- Further refine the concept of "carbon neutrality" as Boulder's Climate Action commitment based on input from a panel of local climate experts in September or October.
- As part of the CAP tax 2nd reading ordinance materials for the Aug. 7th council meeting, include initial 2013 programs and services that would be funded by the CAP tax, as revised to reflect council feedback July 24th.
- Move forward on CEES Part 2 as revised to reflect council input, including initiating pilot program development, extensive stakeholder outreach and pilot program implementation. Further research feasible processes, tools and regulatory considerations involved in a benchmarking and disclosure program.
- Continue to examine the three options presented on page 27 related to commercial building code and develop a proposal for council consideration in the 4th quarter of 2012.

IX. ATTACHMENTS

- A. Article XIII of the City Charter
- B. Brendle Report
- C. City Summary of the RMI Report and RMI's Revised Executive Summary
- D. Commercial Energy Efficiency Strategy Part 2 Timeline

ATTACHMENT A

Article XIII: Light and Power Utility

Sec. 178. Creation, purpose and intent.

(a) The city council, at such time as it deems appropriate, subject to the conditions herein, is authorized to establish, by ordinance, a public utility under the authority in the state constitution and the city charter to create light plants, power plants, and any other public utilities or works or ways local in use and extent for the provision of electric power. The city council shall establish a light and power utility only if it can demonstrate, with verification by a third-party independent expert, that the utility can acquire the electrical distribution system in Boulder and charge rates that do not exceed those rates charged by Xcel Energy at the time of acquisition and that such rates will produce revenues sufficient to pay for operating expenses and debt payments, plus an amount equal to twenty-five percent (25%) of the debt payments, and with reliability comparable to Xcel Energy and a plan for reduced greenhouse gas emissions and other pollutants and increased renewable energy; and

(b) The governing body of the electric utility enterprise shall be the city council. The council may, by ordinance, delegate responsibility to the electric utilities board or the city manager as appropriate.

(c) The people of Boulder seek electric power supplied in a reliable, fiscally sound, and environmentally responsible manner. Therefore, the utility will be operated according to the following guiding principles.

(1) **Reliable Energy:** Community safety, convenience, and prosperity all depend on the reliable delivery of electric power. The utility will deliver reliable electric power. The utility's foremost responsibilities will be to provide electric power that is high quality and dependable, support economic vitality, prevent service outages, and respond promptly to any service outage.

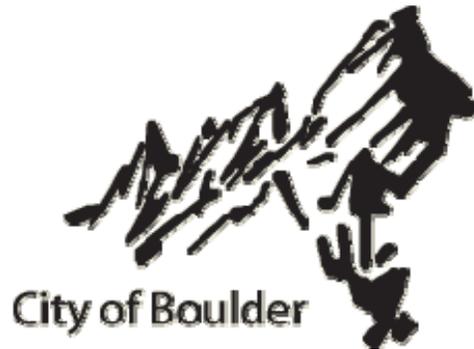
(2) **Fiscal Responsibility:** The cost of electric power is a significant portion of business and household budgets. The utility will operate in a fiscally responsible manner, always being mindful that every expenditure will be reflected in customers' rates and will affect household budgets and business profitability. The utility will, while always honoring its obligations to bondholders, strive to maintain rate parity with any investor-owned utility whose service area would include the City of Boulder.

(3) **Clean Energy:** Climate change and diminishing fossil fuel supplies, combined with the high cost of those fuels, are significant factors leading to the creation of the utility. The utility will strive to reduce reliance on fossil fuels, focus on sustainable alternatives, and seek new opportunities for producing clean energy.

(4) **Ratepayer Equity:** The utility will direct its efforts to promote ratepayer equity in all aspects of its operations. Rates charged by the utility will be designed to create a fair and equitable distribution among all users of the costs, replacement, maintenance, expansion, operations of facilities, energy, and energy conservation programs for the safe and efficient delivery of electric power to city residents and other customers. The utility will consider the effects of its programs, policies, and rates in the development of programs for low-income customers.

(5) **Environmental Stewardship:** Preserving and protecting our natural environment goes well beyond producing clean energy. The utility will be a good environmental steward by working to reduce the environmental impact of its operations, including working to reduce the demand for electricity. Energy and power that is produced in an environmentally responsible manner requires that the city balance environmental factors as an integral component of planning, design, construction, and operational decisions.

(6) Enterprise: The city will deliver electric power services by means of an enterprise, as that term is defined by Colorado law. The city further declares its intent that the city's electric utility enterprise be operated and maintained so as to exclude its activities from the application of Article X, Section 20 of the Colorado Constitution. (Added by Ord. No. 7804 (2011), § 2, adopted by electorate on November 1, 2011.)



2013 City of Boulder Energy Programs: Options and Conclusions

July 17, 2012





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Executive Summary

The City of Boulder offers a variety of programs and services related to energy, transportation, and waste to residents and businesses to reduce greenhouse gas (GHG) emissions. The largest source of GHG emissions (out of those currently accounted for in the Boulder community) is energy, and predominantly, electricity. Since 2007, energy efficiency and conservation efforts have been funded by a Climate Action Plan (CAP) tax levied on electricity use. With the tax set to expire in March 2013, the Brendle Group has been charged with analyzing the effectiveness of current programs funded by the CAP tax and identifying more expansive program packages that could move the community closer to its GHG emissions reduction goals. This analysis includes existing and potential demand-side management (DSM) programs by considering their performance, cost-effectiveness, and ability to increase Boulder's direct control while reducing reliance on external energy sources.

The consultant team's key findings emerged from evaluating program gaps, consulting with city staff and community stakeholders to identify new programs and current program enhancements, and looking at the performance of individual programs relative to their cumulative impacts. These key findings indicate that the city should extend the CAP tax beyond 2012 and focus on the following actions:

- Leverage lessons learned from previous and existing programs
- Consolidate existing commercial programs as a cornerstone of CAP spending
- Retain existing residential programs
- Include both mandatory and voluntary approaches
- Integrate renewables
- Allocate significant CAP funding to market innovation mechanisms

Furthermore, the city should integrate program management, including planning, tracking, measurement and verification, and program evolution to maximize cost efficiency, cohesion, and flexibility as programs continue to evolve and to encourage greater market innovation. This integrated management would leverage the city's approach to continuous improvement such that all programs are refined and optimized and market innovations are regularly incorporated.

The program analysis to complement these key findings began with more than 80 initial ideas that were consolidated and prioritized based on criteria relative to GHG emissions, funding, private savings, and market innovation. Ultimately, the list of programs was consolidated to 15.

The analysis process continued with a program evaluation matrix that evaluates each of the 15 core programs on a stand-alone basis. Specifically, the program matrix categorizes programs by sector, estimated impacts, cost effectiveness, and private investment. To help prioritize and optimize the programs in the matrix, five additional evaluation criteria were developed and applied to each:



ATTACHMENT B

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- Efficiency – biggest bang for the buck
- Effectiveness – magnitude and relevance
- Equity – who pays and who benefits
- Externalities – co-benefits
- Certainty – confidence in performance outcomes

On the basis of the program matrix and analysis of these programs relative to the city’s GHG reduction goals and funding constraints, the consultant team developed a number of investment packages. These packages represent the estimated cumulative effect of evaluated programs and integrate them in such a way that they maximize progress toward the city’s GHG goals while striving to be within the current estimated annual CAP funding level of \$1.8 million. Six specific investment packages were developed for consideration:

1. High GHG reductions (combination of programs that achieves the highest reduction)
2. Residential focus (combination of residential-only programs with highest efficiency and effectiveness criteria)
3. Commercial focus (combination of commercial-only programs with highest efficiency and effectiveness criteria)
4. Multiple benefits (a combination of actions with the highest combined ranking of all evaluation criteria, referenced above)
5. Solar focus (a solar photovoltaic-only package)
6. Renewable energy credit (REC) focus (a REC-only package)

While there is value to each of the six packages, none addressed all of the key findings. As a result, a seventh investment package was developed that combines existing and new programs in a way that reinforces the key findings and achieves balance with the \$1.8 million budget. This selected package includes both mandatory and voluntary programs, renewables, and triggers for innovation, while supporting continuous improvement and associated program performance. This selected package is represented in the table below:

Program	Average Annual CAP Funding	Year 10 Snapshot ¹ GHGs Avoided (mtCO ₂ e)
Commercial Energy Efficiency Program: Ordinance Development, EnergySmart Enhancements/ Campaigns, 10 for Change	\$985,000	146,780
Residential EnergySmart Enhancements and Campaigns	\$230,000	1,387
Residential SmartRegs	\$85,000	9,620
Open RFP for GHG Emission Reductions	\$285,000	50,000
Program Performance and Continuous Improvement	\$195,000	0
Total	\$1,780,000	207,787

¹ Snapshot equals the annual emissions reduced in year 10, not the cumulative reduction by year 10.



1.0 Key Findings

This report and its appendices describe in detail the background for and process of evaluating existing and new programs and developing investment packages that maximize the Boulder community's progress to GHG reduction goals within CAP tax funding constraints. The key findings are described below:

- Integrate program management (including planning, tracking, measurement and verification, and program evolution) to maximize flexibility and efficiency, and create cohesion among the suite of programs; include dedicated funding to ensure program performance and continuous improvement (e.g., staffing commensurate to required program performance) to successfully leverage lessons learned from previous and current programs.
- Create a mix of mandatory and voluntary approaches where mandatory programs take advantage of program maturity and lessons learned, and voluntary programs encourage market innovation.
- Include renewable energy generation aspects in both residential and commercial programs.
- Ensure that commercial energy efficiency programs serve as the cornerstone of spending as these programs have the strongest performance for both cost effectiveness and carbon savings.
- Continue to include residential programs as a critical component since the residential sector contributes strongly to CAP tax funding.
- Dedicate a significant portion of CAP tax funding to flexible market innovation mechanisms.

The evaluation criteria, detailed later in this report and employed in development and analysis, address many of the notable motivations for these key findings – including efficiency, cost effectiveness, program maturity, spending and impact equity, visibility, and innovation. In addition, the key findings are based on feedback from city staff as well as community stakeholders.



2.0 City Background

Since 2007, the City of Boulder has been progressively implementing a CAP to lower GHG emissions in line with the Kyoto Protocol goals by 2012. The city currently offers programs and services to reduce electricity use in commercial and residential buildings, implement energy-efficient building standards and codes, incentivize local renewable energy projects, and optimize alternative transportation options. Many of these programs have been funded by the voter-approved CAP tax, which is levied on electricity use. In 2011, the CAP tax produced \$1.8 million, which is the funding threshold used throughout this analysis². Although Boulder does not anticipate meeting the Kyoto goal in 2012, it now possesses data related to the costs and effectiveness of each individual program as they have evolved. Analyzing these data will help the city strategically improve DSM programs and draw closer to its goals.

An initial step in this process is developing a multi-part Energy Action Plan (EAP) that will help achieve climate action goals while moving the Boulder community toward greater energy independence and cleaner energy sources. Reducing energy-related GHG emissions is vitally important because electricity contributes approximately 60 percent, and natural gas, 17 percent, of what the city currently counts.³ This report informs part 1 of the EAP and will serve as the foundation for parts 2 and 3 of the EAP. The consultant team's analysis explores the cost and impact of existing and new DSM programs to inform city staff's recommendation to council about whether or not to continue, expand, or shift the focus of the current CAP tax, if it is extended.

A historic review of the CAP program was completed by Rocky Mountain Institute (RMI) in parallel with the development of this report (*City of Boulder Climate Action Plan Analysis Report*, RMI 2012). RMI's work complemented this report and generated the following findings, which informed this report's analysis:

- Within the current portfolio of CAP programs, those above average in cost effectiveness include residential lighting programs, Commercial and Residential EnergySmart, and 10 for Change.
- Boulder has generated significant carbon savings at reasonable cost. Compared to other municipal programs in Connecticut and Oregon, Boulder's lighting programs are slightly less cost effective, Residential EnergySmart is considerably less cost effective, Commercial EnergySmart is similarly cost effective, and renewables are far more cost effective.
- Commercial and Residential EnergySmart are still maturing as programs and can be expected to improve over time. A sensitivity analysis of the likely future of these programs predicts improved cost effectiveness, which would make Boulder's programs significantly more cost effective than other, more mature municipal programs.

² Reducing electricity consumption will reduce CAP tax funding.

³ Based on the 2010 GHG inventory. More information is available at

http://www.bouldercolorado.gov/index.php?option=com_content&view=article&id=15356&Itemid=2150.

- Ongoing programs should continue to be comprehensive (such as the existing Commercial and Residential EnergySmart) and become increasingly coordinated across sectors (i.e., recognizing interrelationships between emissions reductions from energy efficiency, renewable energy systems, and transportation technologies).
- Boulder must push beyond the simple and easy programs and encourage residents and businesses to think longer term about their buildings, investment choices, and energy use.
- The City of Boulder needs to extend an overarching demand side program (which considers interactions with the supply mix) to hit future emissions reductions targets.

As shown in Figure 1, the consultant team’s analysis was based on an iterative process in which they evaluated gaps in existing programs, consulted with city staff and community stakeholders to collect ideas for new programs and existing program enhancements, and analyzed programs for individual performance and cumulative impacts. These efforts helped to prioritize programs and provide recommendations.

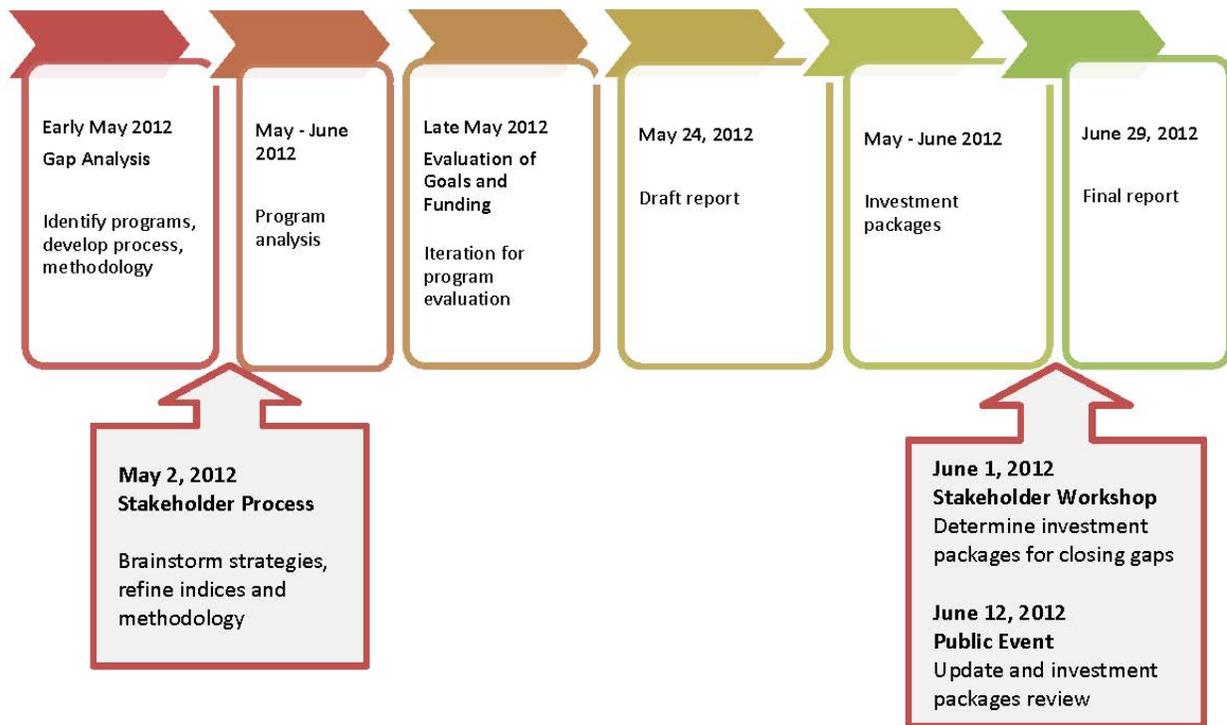


Figure 1: Analysis Process Diagram



2.1 Data Sources

This analysis relied on the following data sources:

- Materials from the Rocky Mountain Institute report, the January 2012 City Council packet, and annual reports for the CAP
- Deemed or actual kilowatt hours (kWh) and therms avoided by previous and current energy efficiency measures, programs, and policies
- Actual or approximate generation and/or capacity from local renewable energy resources, including hydroelectric plants and solar photovoltaic systems
- Program participation data and, where available, point of enrollment and audit-to-action results
- Actual or approximate program expenditures, including tax funds, grant funds, and staffing (both CAP tax and non-CAP tax funded)
- Estimates of private investment associated with programs or policies
- The city's GHG inventory management system (IMS) spreadsheets
- Data on participation by Boulder residents and businesses in utility energy efficiency rebate programs
- Localization report and results from peer review analysis
- Comparison of the effectiveness of Boulder's existing demand-side and supply-side programs to other municipal or utility programs from a consultant report
- Assessment of the cumulative impact of energy/GHG savings and expenditures for each CAP tax funded program and limited CAP-affiliated program assessed over the life of the program
- Analysis of cost-effectiveness for each program presented in levelized cost and considering varying levels of CAP tax funding and program funding

2.2 Input and Stakeholder Engagement

The consultant team worked with city staff and other key stakeholders throughout the development of this analysis, including a May 2, 2012 workshop to review the evaluation approach and solicit beginning ideas for program development. The team then met with city staff again on June 1 to review draft results. City staff also conducted a public event the evening of June 13 to solicit input and review draft investment packages.



3.0 Process

The first step in evaluating programs was to brainstorm a consolidated list of over 80 ideas (full list provided in Appendix A) through input from city staff, community stakeholders, previous reports, best practices from other organizations, and other sources. This initial list was based on exploring ideas in the following areas:

- Continuation and/or modification of current CAP-funded DSM programs
- DSM offerings not currently provided by the City of Boulder
- Potential near-term local generation options that can be offered under the current regulatory framework
- Other innovative approaches to avoid emissions, reduce energy load, or lower the carbon intensity of the fuel supply
- Other innovative approaches to reduce peak electrical load by shifting or removing demand that results in reduced GHG emissions
- Other innovative uses of tax revenue that result in reduced emissions

In addition, the consultant team conducted a gap analysis to identify programs that could continue and possibly be enhanced, and potential programs not currently offered that would improve effectiveness in reducing local GHG emissions. The analysis was organized by sectors and the existing CAP categories of Reduce Use, Build Better, and Ramp Up Renewables. It broadly included comparisons of emissions, cost effectiveness, and existing programs. Result highlights included the following:

- Reduce Use for residential and commercial/industrial represents the largest percentage of emissions compared to these sectors for Build Better and Ramp Up Renewables combined.
- Reduce Use and Ramp Up Renewables have the most existing and potential programs, while Build Better has the least.
- In terms of existing program counts, coverage for residential and a combined sector of commercial/industrial cover is similar.
- Demand response is a far less frequently addressed topic area for both sectors compared to efficiency/conservation and local generation.

Using information gathered from the gap analysis, combining like ideas and action steps into programs, and querying city staff for priority areas, the list was narrowed down to 15 programs representing the top priorities for quantitative and qualitative analysis. Some of these 15 programs were enhancements to existing programs and some are new.



A program matrix was then used to evaluate individual existing and potential programs (independent of one another) in the following focus areas:

- Estimated GHG emissions avoided, in metric tons of carbon dioxide equivalent (CO₂e)
- CAP tax funding dollars
- CAP tax funding dollars per metric ton CO₂e
- Private savings for participants from program implementation

Based on the results collected in the program matrix, a second analysis was completed to evaluate the cumulative effect of evaluated programs with respect to funding, GHG reduction goals, and the potential for overlap and double counting among programs. More detail is provided in Section 4.0.

3.1 Program Evaluation

For the quantitative and qualitative analysis of the 15 priority programs, the overall planning horizon for each program was based on 10 years to align with the possible timing of the CAP tax extension as well as future EAP phases. Detailed in Appendix B, each priority program evaluation included the applicable following components:

- A description of the program
- Categorization of each program by sector
- Key working assumptions such as penetration rates, timelines, and associated funding levels necessary to achieve maximum GHG emissions reductions
- Estimated impacts, including avoided GHG emissions, number of participants, cost-effectiveness, and related community benefits
- Methods of incentivizing private investment

Cost development, including costs associated with staffing levels, was a key step in evaluating each program. The total costs considered were intended to be comprehensive, ranging from applicable capital equipment costs to applicable programmatic costs (city staffing, training, data management, etc.). Where appropriate based on program descriptions, costs did vary over time to reflect program maturity, staff experience, and continuous improvement practices. To reinforce previous CAP review findings regarding the importance of staff resources to leverage CAP dollars, dedicated staffing costs were included in programs that were interpreted to require it (either through current funding levels that include staffing or through estimated costs of new positions). Previewing results detailed later in this report, many programs maintained current staffing levels and associated costs. For programs with new staffing requirements, the most common funding level was for either one-half or one full-time equivalent (FTE) position.



The program evaluation process also took into consideration the following as applicable:

- Appropriate regulations, including how regulatory processes could enhance the efficiency/effectiveness of the program and how regulations can be balanced and integrated with incentives and voluntary compliance
- Access to financing, if any, and what approaches can be used
- To what extent the programs can be made self-supporting versus being dependent on the tax extension remaining in place
- Effective educational means (“develop informed energy consumers”)
- Community partnerships
- Other recommended metrics based on experience and consultation with staff

Ultimately to help summarize all the quantitative and qualitative analysis information, five evaluation criteria were developed and applied to each program to aid in prioritizing, determining the appropriate design and implementation, and predicting the uncertainty or resiliency of the overall mix of programs. These evaluation criteria, listed below, are described in more detail in Appendix C:

- Efficiency: Getting the most output for the amount of input
- Effectiveness: How well the program addresses the size and nature of the problem
- Equity: Where funding for a program comes from versus where it is spent, and the extent to which any disadvantaged groups or sectors are impacted
- Externalities: The extent to which a program supports co-benefits that are not directly quantified in the program analysis
- Certainty: The level of confidence that the program will perform as evaluated

Appendix C summarizes the criteria in terms of definition, methodology, and results for how the criteria can be most effectively used in continued discussions and next iterations of program analysis to optimize the mix of programs under any future CAP tax.

3.2 Program Matrix

The following program matrix summarizes the evaluation of all programs. It is important to reiterate that the results shown in this matrix, as well as Appendix B, have been evaluated only on a stand-alone basis. Programs are organized in the matrix by the sector they address (Commercial, Industrial, Residential) and further grouped into three categories based on their primary purpose:

- Reduce Use: The CAP focus area that looks at energy efficiency and conservation in existing buildings



ATTACHMENT B

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- Ramp Up Renewables: From the CAP focus area on renewable energy technologies
- City Organization: Programs and projects where the city can lead the community by example

As a note, the column associated with average annual cap funding presents the *predicted* annual average over 10 years and is not intended as a reflection of current CAP funding, although current CAP funding was used to inform these predictions.

ATTACHMENT B

Table: Individual Program Evaluation Matrix

#	SECTOR	PROGRAM NAME	AVG. ANNUAL CAP FUNDING (\$)	CAP \$ per mtCO2e	TOTAL \$ per mtCO2e	PRIVATE PAYBACK (years)	EFFICIENCY	YEAR 10 ESTIMATED GHGs AVOIDED (mtCO2e)	% of TOTAL GHG EMISSIONS GOAL	EFFECTIVENESS	EQUITY	EXTERNALITIES	CERTAINTY
REDUCE USE													
1	Commercial	Commercial Energy Efficiency	\$290,000	\$3	\$71	7	Medium-High	116,023	3.8%	High	Medium	Medium	Medium-Low
2.1	Residential	Behavior Change Platform (Opower)	\$274,700	\$70	\$70	0	High	3,759	0.4%	Medium-Low	High	Medium	Medium-High
2.2	Residential	Behavior Change Platform (In-House)	\$35,000	\$12	\$12	0	High	2,872	0.3%	Medium-Low	Medium-High	Medium	Medium-High
2.3	Commercial	10 for Change Enhancement	\$50,000	\$6	\$601	5	Medium-Low	11,250	0.1%	Medium-Low	High	Medium	Medium-High
3.1	Commercial	EnergySmart Enhancements and Campaigns (Commercial)	\$1,083,100	\$20	\$87	4	High	46,114	2.3%	High	Medium-High	Medium	Medium-High
3.2	Residential	EnergySmart Enhancements and Campaigns (Residential)	\$1,913,600	\$83	\$217	9	Medium-Low	20,680	3.5%	High	Medium-High	Medium	Medium-High
4	Industrial	EnergySmart Industrial	\$109,900	\$85	\$152	3	Medium-High	1,053	0.1%	Low	Medium-High	Medium	Medium
4.1	Industrial	Industrial Process Renewables/Generation (CHP)	\$125,000	\$20	\$202	57	Low	10,493	0.1%	Medium-Low	High	Medium-Low	Medium-Low
RAMP-UP RENEWABLES													
4.2	Industrial	Industrial Process Renewables/Generation (AD)	\$18,800	\$36	\$460	27	Low	544	0.004%	Low	High	Medium-Low	Medium
5	Commercial	Solar Thermal	\$97,400	\$112	\$561	35	Low	488	0.04%	Low	High	Medium	Medium-High
6	N/A	Hydroelectric power (secure all RECs, expand capacity)	\$1,287,600	\$96	\$96		Medium	18,187	1.2%	Medium-High	Medium	Low	High
8	Residential & Commercial	Solar photovoltaic (increase deployment, gardens, roof-top)	\$20,800	\$75	\$235	24	Low	186	0.01%	Low	High	Medium	Medium-High
OTHER													
9	Residential & Commercial	Open RFP for greenhouse gas emissions reductions	\$84,400	\$4	\$36	4	High	14,913	0.8%	Medium-High	High	Medium	Low
11	N/A	City Lead by Example (Street lighting upgrades/retrofits, roof-top solar, new construction, etc.)	\$1,155,500	\$220	\$220	15	Low	3,249	0.4%	Medium	Medium	Medium-Low	High
13	Commercial	District-scale approach to efficiency, renewables, construction, community aggregated energy efficiency (ESCO?), micro-grid	\$419,500	\$101	\$149	5	Medium	2,831	0.1%	Low	High	Medium-High	Low



3.3 Goals and Funding Evaluation

The consultant team next used the program matrix to take stock of a number of key questions described below.

Funding

Is there a gap between available CAP revenue and required CAP funding?

To fund all of the programs currently analyzed in the program matrix would require the city to invest about \$7 million annually. This assumes no outside grant sources, but it does include an assumption that significant contribution by the private sector would be provided in addition to the CAP funding required. Given that 2011 CAP revenue was \$1,838,000, there is a significant gap in CAP funding to support program implementation. Therefore, the recommended investment packages discussed later in this report assume a fiscally constrained budget of approximately \$1.8 million/year.

GHG Emissions Reduction

Is there a gap between estimated GHG emissions avoided and community GHG goals/targets?

The programs listed in the program matrix are estimated to reduce GHG emissions nearly 253,000 metric tons (mt) of CO₂e annually by Year 10. (For context, this reduction level would achieve just below 50 percent of the city’s current total reduction goal based on the Kyoto Protocol, or about 520,000 mtCO₂e.)

Program Overlap

Has program overlap and the potential for double-counting contributions to GHG reductions been minimized?

Overlap, or double-counting, means that the GHG emissions assumed for some programs also may be calculated in others -for example, a business in the 10 for Change program might also participate in EnergySmart. The analysis indicated two potential areas of overlap among the programs evaluated. In the area of behavior change, two points of overlap were identified: 1) the use of Opower mailing and web-based resources; and 2) an in-house custom web-based platform with flexible and enhanced functionality. In developing the programs, the objective was to identify one or the other for implementation, as opposed to both tools, unless they are deployed in a phased manner. It is recommended that one of these tools be removed from the final implementation package, which will affect total program costs as well as GHG reductions.

The second area of overlap was identified in the area of commercial energy use reduction. Specifically, five overlaps were identified:



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- Commercial Energy Efficiency Program: Ordinance Development
- Commercial Energy Efficiency Program: 10 for Change
- Commercial Energy Efficiency Program: Energy Smart Enhancement and Campaigns
- Energy Smart Industrial
- District-scale approaches

These overlaps were considered and addressed in subsequent analysis.



4.0 Investment Packages

On the basis of the program matrix and goals and funding analysis, a number of investment packages were developed to extend this report’s analysis beyond individual programs to cumulative outcomes and impacts of combining key programs. The outcomes and impacts of investment packages account for the benefits of combined packages within the boundaries of the CAP funding level – \$1.8 million. The six specific investment packages are summarized below and include estimated staffing needed to support the package. Again, it is anticipated that over time and with continuous improvement and measurement and verification, staffing levels can be adjusted along with other program efficiency refinements. The investment packages are described more fully in Appendix D.

1. **High GHG reductions** (combination of programs that achieves the highest emissions reductions of the packages developed in this section)
2. **Residential focus** (combination of residential only programs with highest efficiency and effectiveness evaluation criteria)
3. **Commercial focus** (combination of commercial only programs with highest efficiency and effectiveness evaluation criteria)
4. **Multiple benefits** (a combination of actions with the highest combined ranking of all evaluation criteria)
5. **Solar focus** (note that this solar photovoltaic only package assumed that all of the \$1.8 million of CAP funding would be used for this program only)
6. **Renewable energy credit (REC) focus** (note that this REC only package assumed that all of the \$1.8 million of CAP funding would be used for this program only)

Throughout the development period of this analysis SmartRegs was assumed to be a required element of any final package. As such, SmartRegs is not detailed in the program descriptions explored previously in this report. The development of the residential focus investment package (item number two above) prompted additional analysis, detailed as follows:

- **CAP Category:** Reduce Use
- **Mandatory vs. Voluntary:** Mandatory
- **Existing or New Program:** Existing
- **Description:** The SmartRegs ordinances update the City of Boulder Housing Code and Rental Licensing Code, and provide new baseline energy efficiency requirements for existing rental housing



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- **Quantification Methodology:** Assumed continued program performance similar to calendar year 2011 with revised program costs based on a more streamlined level of service
- **Certainty (see evaluation criterion definition):** High
- **Total Costs Include:** CAP funding and estimated private cost of compliance
- **CAP Only Portion of Total Costs Include:** 0.5 FTE for minimal level of support, consulting on policy troubleshooting and changes, licensing fees for tracking process, and trainings
- **Key Assumptions**
 - **Level of Penetration/Participation Rate Assumption:** Continued performance at 2011 level
 - **GHG Reduction Assumptions:** Continued performance at 2011 level
 - **Staffing Level: 0.5 FTE included in CAP only portion costs**



5.0 Conclusion

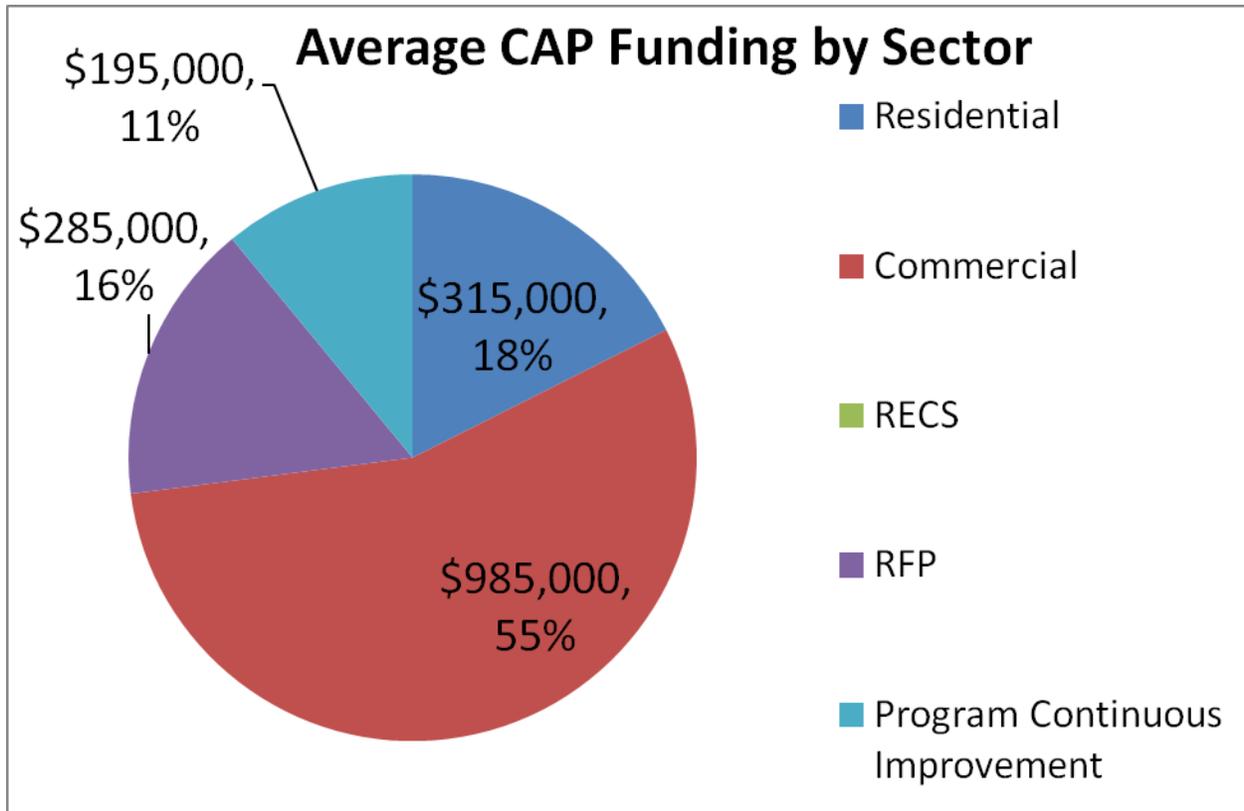
The investment package presented in this section addresses the lessons gathered from the analyses and reinforces the key findings outlined in Section 1.0., which include integrated management for continuous improvement, a mix of mandatory and voluntary approaches, renewables for both commercial and residential sectors, and market innovation triggers. It also achieves balance with the \$1.8 million budget that is based on 2011 funding levels while incorporating the key findings identified in Section 1.0.

A key differentiator in this selected package compared to the packages captured in the previous section is the inclusion of the Open Request for Proposal (RFP) program. This selected package is a key part of a future EAP. In addition, these CAP tax funded programs need to be paired with private sector investment and efforts to change the supply of energy to make meaningful reductions in emissions.

Program	Average Annual CAP Funding	Year 5 Snapshot GHGs Avoided (mtCO ₂ e)	Year 10 Snapshot GHGs Avoided (mtCO ₂ e)
Commercial Energy Efficiency Program: Ordinance Development, EnergySmart Enhancements/ Campaigns, 10 for Change	\$985,000	37,704	146,780
Residential EnergySmart Enhancements and Campaigns	\$230,000	744	1,387
Residential SmartRegs	\$85,000	4,810	9,620
Open RFP for GHG Emission Reductions	\$285,000	25,000	50,000
Program Performance and Continuous Improvement	\$195,000	0	0
Total	\$1,780,000	68,258	207,787

On average, the collective costs of this selected package are globally estimated to represent at least six full-time equivalent positions. It is important to note for this estimate that staffing cost development varied in resolution based on the format of cost information available for a given program. As detailed in Appendix B, some program staffing costs are based on specific staffing levels. Other programs have staffing costs derived from a total cost per unit of program participation. (As an example, consider the total costs of a program reported by available data to be \$100 for each participant (e.g., individual, business). Staffing cost is only one component of the total cost make-up for this program. Other components of the total costs could include funding for rebates to the participants, the cost of materials to market the program and/or any other cost aside required for the program’s success).

For this selected package, the following pie chart depicts the average CAP funding for by sector:



In this selected package, the existing programs that continue are outlined below:

- **Commercial EnergySmart:** Receiving average annual CAP funding of about \$570,000, this program will be funded to a level that allows for just over 3,000 business participants in 10 years.
- **10 for Change:** Receiving an average annual CAP funding of about \$55,000 for 4 years into the 10-year planning period, this program will function at current levels. It is assumed that after Year 4, the program will ultimately be absorbed into the early voluntary element of the Commercial Energy Efficiency Ordinance Development.
- **Residential Energy Smart:** Receiving average annual CAP tax funding of about \$230,000, this program will be funded to a level that allows for just over 2,300 rental and owner-occupied participants over 10 years. This level of participation represents a volume that is about 75 percent lower than current levels, which was necessary to stay within the \$1.8 million package.
- **Residential SmartRegs:** Receiving average annual CAP funding of about \$85,000, this program will be retained at the lowest level of service. Services at this lowest level would include general support in answering landlord/inspector questions, limited troubleshooting, and very limited data entry.

The new programs introduced in this package are described below:

- **Commercial Energy Efficiency Ordinance Development:** Receiving average annual CAP funding of near \$360,000, this program’s funding will ramp up annually according to the planned three phases



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of implementation. For this selected package, this program builds on the program matrix and information detailed in Appendix B and adds \$165,000 of CAP funding per city staff.

- **Open RFP for GHG Emissions Reductions:** This program will require RFP responses to achieve conditions of performance equivalent to the performance of current programs and will include \$285,000 in CAP tax funding. Specifically, with CAP tax funding, climate reduction measures must achieve or exceed a required performance that matches the required performance of city programs to achieve current goals – or about \$5 per ton of GHG reduction over a 10-year lifetime. As outlined in the program details in Appendix B, this option offers the flexibility to shift funding to higher performing programs if responses do not achieve required condition of performance. The consultant team identified \$285,000 as the minimum level that will both promote meaningful market innovation and include staff time for program development and implementation.

In addition, reflecting the key finding regarding continuous improvement and ensuring program high performance, the city will incorporate a program component of planning, data management, and verification to carry on exploration of more cost effective options in the future. That is, as the city looks to extend the CAP, in whatever form it ultimately takes, this analysis will help to inform not only what programs should receive funding but also how to most efficiently manage these programs. Lessons learned from CAP performance to date, as well as best practices from local government and utility DSM programs, suggest that future CAP funding should be allocated in a way that promotes integrated program management. Each program will have a program manager as in the past, but a new integrated program management function would manage the interrelationship between programs under the CAP umbrella. As programs mature and evolve, adjustments in funding and program design can be made to individual programs that help to ensure an optimal performance of the overall mix. An integrated approach also provides consistent metrics and methodologies to measure and verify individual program performance, as well as a way to streamline shared activities between programs. From CAP performance to date, the consultant team knows that setting conditions for continuous improvement is very important to both new and mature programs. The integrated program management function would provide a platform for better planning and management, improved flexibility to support continuous improvement in program design, and greater efficiencies between programs.



Appendix A – Programs Brainstorm

More than 80 ideas from city staff, community stakeholders, and the team’s knowledge of best practices were originally considered as part of this analysis. This list was consolidated and prioritized into the list of 15 prioritized programs described in detail in this Appendix B and introduced in the report.

- Open RFP for reductions
- Deep energy retrofits
- Net zero new construction
- Challenge programs (e.g. everyone change out porch light)
- Leverage Elevations Loan Program
- Commercial Lighting campaign
- Commercial HVAC program
- Separate focus on industrial customers
- Solar thermal
- Behavior change
- Point of sale
- Passive solar
- Commercial Energy Rating: Market Transformation
- Significantly expand EnergySmart – owner occupied housing as stand-alone (leverage building momentum)
- Continue EnergySmart – SmartRegs (note: recent NREL analysis) as stand-alone (high interest) <http://www.nrel.gov/docs/fy12osti/54724.pdf>
- EnergySmart model - value: ongoing relationship (personal energy advisor), can be extended to more of a clearinghouse for additional topics demand, solar installations, etc. and extended to water
- Marketing – big component to drive demand; focus key, needed; non-traditional marketing (referrals, organizations outreach, personal, coupon code) vs. traditional marketing (e.g., bus ads); social media
- EnergySmart – interaction, engagement with contractors (now: open, future: standardization) could result in greater savings
- Extend SmartRegs residential model in reasonable way to commercial side
- Opower concept/behavior modification (1% reduction)
- On-site UASBs (type of anaerobic digestion) for breweries and food processing plants that have high strength wastewater. This would provide on-site natural gas replacement for industrial/domestic hot water and potentially for boiler fuel. The CO2 emissions on-site would be a wash, but there would be reduction at the municipal wastewater treatment plant.
- Adding high strength waste to the wastewater treatment plant anaerobic digester (East Bay Municipal Utility District is doing this successfully in Oakland, CA). Currently have two CHP units,



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but only have enough digester gas to power one. Without much infrastructure cost, they could produce an additional 1.5 million kWh per year.

- Expand food waste collection and digest it at the existing composting facility. Could be done with a dry digestion system. Assumption is that the existing compost operation's permit could be amended to accommodate this.
- Load shift using thermal storage
- Demand response measure similar to RDSI in which HVAC control takes place in office buildings in late afternoon. Therefore, there is energy savings available when the building shuts down at the end of the work day as opposed to load shifting if control takes place in the middle of the day and HVAC system comes back on later in the day.
- Analysis and implementation of program to fully deploy roof-top solar. This includes evaluation of existing, short term targets for installed watts, and analysis of existing sites. A secondary step is to work with local installers, and financial institutions to create a new incentive structure for full deployment.
- Small/medium business lighting retrofits
- Revolving Loan fund for new and innovative incentives (e.g., systems control training on the commercial/industrial sector, decommissioning, etc.)
- Regional passive and solar thermal
- Street lighting retrofit
- Behind the meter programs such as reactive power inverters for existing solar installations, micro-grid pilot project
- Net zero energy downtown district
- Business lighting retrofit trade-out (T8, T12)
- EnergySmart Lighting Campaign – Discussion about the role of T12s or not with federal mandates, but makes sense to create discrete campaigns. One for lighting is a good idea. Other technologies as well as sustainable purchasing practices and embedded carbon. Broaden education base.
- EnergySmart Heating and Cooling Campaign –new and efficient (optimized) equipment
- Incentivizing Solar Loans – adding incentives and advising for businesses nearing 15% energy efficiency target so they will be eligible for solar loans (revolving loan fund from Better Buildings' funds)
- EnergySmart for All Businesses – continue the assessment and/or quick with the goal of every business receiving something from the program
- EnergySmart Sector specific incentives, targeted offerings, networking, recognition and certification (10 for Change, PACE and EnergySmart combined) How do we be more effective and efficient with one program with many offerings?
- Commercial Energy Conservation Ordinance (CECO) – potential requirements could include benchmarking and disclosure; audits and implementation of key measures; periodic retrocommissioning; lighting upgrades; submetering.



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- Energy Coaches for CECO Requirements
- Managing building energy use around peak demand reduction and bill analysis advising
- Green Lease requirement or incentives (lease renewal or new) under the Economic Vitality Flex Rebate menu
- Energy “Smartest” -- Net Zero Electric businesses
- Net Zero for New Construction
- Net Zero Districts – for redevelopment areas (e.g., Fort ZED)
- Promoting Solar Gardens, apartment carports, PPAs, Commercial Solar Map
- Office Building Automation Systems and Controls
- Incentivizes Energy Services Companies (ESCOs) Aggregation Districts
- Heat Islands
- Greater Deployment of PV
- Street lighting upgrades/retrofits
- Energy management systems
- Lighting
- Demand response
- Zero energy districts
- Combined heat and power
- Geothermal
- City Council packet January 31, 2012 (starting on p.22-23) – long list of recommendations for improving existing programs
- REC purchases
- EnergySmart higher penetration, continued significant funding beyond ARRA,
- 10 for Change higher penetration
- Weatherization and insulation higher penetration for better cost-effectiveness
- EnergySmart focus on longer-term measures, deep-energy retrofit incentives, packages of improvements for better payback, load-reduction for cost savings
- Collaborative efficiency and renewable projects
- Energy efficiency in the commercial sector
- Energy localization
- Continued success of EnergySmart services
- Planning for the next generation of the Climate Action Plan
- Future plans for hydroelectric with contracts expire?
- Expanded microhydro
- Green button participation or other consumer behavior programs
- Increase education programs for behavior change
- Building automation systems for all commercial buildings
- Smart Building Renovation



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- Demand Dispatch
- Hydroelectric Power
- Solar Thermal
- Plug-In Electric Vehicles
- Waste-to-energy/heat
- District Heat Island Program
- Biomethane
- Combined Heat and Power (including Biomass)
- Direct Use Geothermal
- Combined Heat and Power
- Wind and Hydroelectric Capacity Balancing
- 10 for Change for tenants
- Portfolio-wide property manager engagement
- Property management: three options before Council (voluntary, mandatory, combined with regulation of prescriptive measures (SmartRegs))
- Go out to bid for greenhouse gas reductions
 - Dovetail on existing programs & set some parameters for the proposals
- Develop a comprehensive plan around the built environment
 - Consider how to get deeper retrofits – look at building as a system
- Regulatory program for commercial buildings
- Net zero standards for new construction
- Reach all utility customers so everyone does one thing (e.g., change out porch lights)
 - Allows for holistic engagement
- Leverage Elevations Loan Program (Energy loan through EnergySmart) to encourage upgrades, utilizing revolving funds
- Commercial lighting campaign/change out; develop dynamic goals around lighting upgrades
- Commercial heating, cooling, and ventilation program
- Provide more resources to encourage energy conservation and energy upgrades
- Help residents & businesses understand and manage their bills
- Continue Energy Advisor role to help assist residents & business through the upgrade process
 - Incorporate this model into other programs, programs, and campaigns
- Break out industrial customers from commercial customers
 - Use lessons learned and case studies from what's already being done by industrial customers
- Solar thermal
- Low-income weatherization (county funding is getting cut for this)
- City pays residents/businesses to go off the grid
- Shift and broaden 10 for Change to an industry specific business networking program



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- Add Advisors to EnergySmart commercial service to help business to comply with potential commercial energy conservation ordinance
- Encourage peak reduction – help save money
- Address multifamily units – codes? Direct installs?
- Develop & offer sector specific commercial programs
- Behavior change programs & competitions
- Point of sale incentives
- Separate residential owner occupied EnergySmart, SmartRegs EnergySmart, and multifamily unit EnergySmart
- Passive solar



Appendix B – 15 Core Programs

The program numbers referenced in this appendix match the evaluation matrix presented in Section 3 of the report. It is important to note that the details given in this appendix represent the standalone evaluation of these programs.

Program 1 Summary: Commercial Energy Efficiency Program - Ordinance Development

- **CAP Category:** Reduce Use.
- **Mandatory vs. Voluntary:** Begins as voluntary; concludes as mandatory.
- **Existing or New Program:** New.
- **Description:** This program entails developing a Commercial Energy Conservation Ordinance for the city over three phases. Such an ordinance would require commercial property owners to meet energy conservation targets based on voluntary benchmarking of energy consumption to similar business types and sectors, mandatory benchmarking, or some combination of benchmarking and prescriptive building retrofits.
- **Quantification Methodology:** Estimated penetration in commercial sector through three phases as structured by city staff.
- **Certainty (see evaluation criterion definition):** Medium-low.
- **Total Costs Include:** Program (increasing over time from roughly 0.25 to 5 full-time equivalents (FTEs) modeled off residential SmartRegs) + Private (modeled off \$595/ton for Commercial Energy Smart – Jan 2012 Council Packet).
- **CAP Only Portion of Total Costs Include:** Program costs (i.e., FTEs).
- **Key Assumptions**
 - **Level of Penetration/Participation Rate Assumption:** Phase 1 - Years 1 and 2: 50 businesses per year; Phase 2 - Years 3 to 5: 2,500 businesses per year; then Phase 3 – Years 5 to 10: 1,500 businesses per year to get to 7,500 total – or reaching all businesses per Nexant study based on electric meters count.
 - **GHG Reduction Assumptions:** Varies by 3 phases. Level of GHG reduction – Phase 1: 3%; Phase 2: 1%; Phase 3: 10% (percentages not cumulative). Adds to lower level of certainty.
 - **Staffing Level/Costs:** 1 FTE (\$100,000) in years 1 to 4. Ramps to 3 to 5 FTEs in years 6 to 10.
 - **Other:** \$0.10/kWh average unit cost with 3% annual increase; \$0.61/therm average unit cost with no annual increase.



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Program 1 Analysis Details: Commercial Energy Efficiency Program - Ordinance Development

Year	1	2	3	4	5	6	7	8	9	10
Participants	50	50	2,500	2,500	2,500	1,500	1,500	1,500	1,500	1,500
Cumulative Participants (resets for each phase)	50	100	2,500	5,000	7,500	1,500	3,000	4,500	6,000	7,500
GHG Reduction	3%	3%	1%	1%	1%	10%	10%	10%	10%	10%
Free ridership	90%	90%	90%	90%	90%	20%	20%	20%	20%	20%
Savings depreciation or attrition rate										
New Gross Avoided MTCO _{2e}	232	232	3,867	3,867	3,867	23,205	23,205	23,205	23,205	23,205
Cumulative Gross Avoided MTCO _{2e}	232	464	3,867	7,735	11,602	11,602	46,409	69,614	92,818	116,023
Net Avoided MTCO _{2e}	23	46	387	773	1,160	9,282	37,127	55,691	74,255	92,818
Net % of Total Sector Emissions	0.00%	0.00%	0.03%	0.07%	0.10%	0.80%	3.20%	4.80%	6.40%	8.00%
CAP \$	\$100,000	\$100,000	\$100,000	\$100,000	\$300,000	\$400,000	\$400,000	\$400,000	\$500,000	\$500,000
Other \$	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Private \$	\$137,993	\$137,993	\$2,299,881	\$2,299,881	\$2,299,881	\$13,799,283	\$13,799,283	\$13,799,283	\$13,799,283	\$13,799,283
Total \$	\$237,993	\$237,993	\$2,399,881	\$2,399,881	\$2,599,881	\$14,199,283	\$14,199,283	\$14,199,283	\$14,299,283	\$14,299,283
Private Savings \$	\$17,203	\$17,727	\$304,446	\$313,721	\$323,278	\$1,998,762	\$2,059,655	\$2,122,403	\$2,122,403	\$2,122,403
Cumulative Private Savings \$	\$17,203	\$34,929	\$339,375	\$653,095	\$976,374	\$2,975,135	\$5,034,790	\$7,157,193	\$9,279,595	\$11,401,998
Private Sector Simple Payback	8	8	8	7	7	7	7	7	7	7

*Note that savings and avoided emissions assumed to continue to year 20.



Programs 2.1 and 2.2 Summaries: Behavior Change Platform - Residential

- **CAP Category:** Reduce Use.
- **Mandatory vs. Voluntary:** Voluntary.
- **Existing or New Program:** New.
- **Description:** This program would entail expanding behavior change-based approaches to energy efficiency and conservation in residential applications. Such approaches may include providing more access to data to better understand their energy consumption patterns, expanding education and engagement campaigns and initiatives, such as energy challenges between neighborhoods, to incent energy conservation.
- **Quantification Methodology:** 2.1: Opower approach model with mailings (residential); 2.2: Website only, no mailing approach (residential)
- **Certainty (see evaluation criterion definition):** Medium-high.
- **Total Costs Include:** 2.1: 2012-2013 Biennial Xcel DSM Plan; 2.2: Longmont pilot.
- **CAP Only Portion of Total Costs Include:** 100% program costs (no private investment).
- **Key Assumptions**
 - **Level of Penetration/Participation Rate Assumption:** Participation rate: 2% in Year 1 then smooth ramping up (ranging from 8 to 25% annually) to 90% of residential customers by Year 6. Assumption adds to lower level of certainty.
 - **GHG Reductions Assumptions:** Electricity savings, and thus GHG reduction, assumes 2% reduction for each participant; 0.6% for natural gas; then pro-rated based on actual Boulder residential utility use and lower effectiveness for 2.2.
 - **Staffing Level:** Estimated \$50,000 in Year 1 (set-up year) and then ramping down to \$10,000 by Year 6 and following.
 - **Other:** Delivers on the vision of getting utility information to consumer. Utility bill access key (also adds to lower level of certainty). \$0.10/kWh average unit cost with 3% annual increase; \$0.61/therm average unit cost with no annual increase.
- **Key Points/Highlights:** Xcel has pilot in progress.



Programs 2.1 and 2.2 Analysis Details: Behavior Change Platform – Residential

2.1

Year	1	2	3	4	5	6	7	8	9	10
Total Residential Customers	39,000	39,000	39,000	39,000	39,000	39,000	39,000	39,000	39,000	39,000
Participation Rate	2%	10%	25%	50%	75%	90%	90%	90%	90%	90%
Participants	780	3,900	9,750	19,500	29,250	35,100	35,100	35,100	35,100	35,100
Free ridership	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
kWh savings	98,722	493,610	1,234,025	2,468,049	3,702,074	4,442,489	4,442,489	4,442,489	4,442,489	4,442,489
Dth savings	263	1,314	3,284	6,568	9,852	11,823	11,823	11,823	11,823	11,823
Gross Avoided MTCO _{2e}	84	418	1,044	2,088	3,132	3,759	3,759	3,759	3,759	3,759
Net Avoided MTCO _{2e}	79	397	992	1,984	2,976	3,571	3,571	3,571	3,571	3,571
Net % of Total Sector Emissions	0.02%	0.12%	0.30%	0.60%	0.90%	1.08%	1.08%	1.08%	1.08%	1.08%
CAP \$	\$9,000	\$45,000	\$112,000	\$224,000	\$337,000	\$404,000	\$404,000	\$404,000	\$404,000	\$404,000
Other \$	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Private \$	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total \$	\$9,000	\$45,000	\$112,000	\$224,000	\$337,000	\$404,000	\$404,000	\$404,000	\$404,000	\$404,000
Private Savings \$	\$12,856.96	\$65,999.14	\$169,414.25	\$347,930.39	\$535,964.34	\$660,554.04	\$678,480.88	\$696,953.87	\$696,953.87	\$696,953.87

*Note that savings and avoided emissions assumed to continue to year 20.



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2.2

Year	1	2	3	4	5	6	7	8	9	10
Total Residential Customers	39,000	39,000	39,000	39,000	39,000	39,000	39,000	39,000	39,000	39,000
Participation Rate	2%	10%	25%	50%	75%	90%	90%	90%	90%	90%
Participants	780	3,900	9,750	19,500	29,250	35,100	35,100	35,100	35,100	35,100
Free ridership	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
kWh savings	74,041	370,207	925,519	1,851,037	2,776,556	3,331,867	3,331,867	3,331,867	3,331,867	3,331,867
Dth savings	219	1,095	2,737	5,474	8,210	9,852	9,852	9,852	9,852	9,852
Gross Avoided MTCO _{2e}	64	319	798	1,595	2,393	2,872	2,872	2,872	2,872	2,872
Net Avoided MTCO _{2e}	61	303	758	1,516	2,273	2,728	2,728	2,728	2,728	2,728
Net % of Total Sector Emissions	0.02%	0.09%	0.23%	0.46%	0.69%	0.82%	0.82%	0.82%	0.82%	0.82%
CAP \$	\$160,000	\$50,000	\$40,000	\$30,000	\$20,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000
Other \$	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Private \$	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total \$	\$160,000	\$50,000	\$40,000	\$30,000	\$20,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000
Private Savings \$	\$9,776.28	\$50,167.13	\$128,730.13	\$264,286.66	\$406,981.56	\$501,425.50	\$514,870.63	\$528,725.37	\$528,725.37	\$528,725.37

*Note that savings and avoided emissions assumed to continue to year 20.



Program 2.3 Summary: Commercial Energy Efficiency Program - 10 for Change Enhancement

- **CAP Category:** Reduce Use.
- **Mandatory vs. Voluntary:** Voluntary.
- **Existing or New Program:** Existing.
- **Description:** 10 for Change has engaged Boulder businesses in a friendly challenge to save money by integrating sustainability practices into their facilities and operations. Efforts to save energy and water, reduce waste, and use alternative transportation all contribute to Boulder’s community sustainability goals. This re-visioning would expand this voluntary program and include tenants and leased spaces.
- **Quantification Methodology:** Increased penetration of existing program.
- **Certainty (see evaluation criterion definition):** Medium-high.
- **Total Costs Include:** Existing 10 for Change program - \$50,000 annually.
- **CAP Only Portion of Total Costs Include:** Limited program costs (overhead, marketing, consultant costs, etc.); primarily private investment.
- **Key Assumptions**
 - **Level of penetration/participation rate assumption:** Modeled a penetration rate of 10% (based on Nexant report electric meter counts) by Year 5.
 - **GHG Reduction Assumptions:** 15 metric tons per business per year (which is more aggressive rate than median results to date).
 - **Staffing Level:** Reflected existing 10 for Change program.
 - **Other:** \$0.10/kWh average unit cost with 3% annual increase; \$0.61/therm average unit cost with no annual increase.
- **Key Points/Highlights:** GHG reductions by business may degrade over time.



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Program 2.3 Analysis Details: Commercial EE Program - 10 for Change Enhancement

Year	1	2	3	4	5	6	7	8	9	10
Participants	50	50	2,500	2,500	2,500	1,500	1,500	1,500	1,500	1,500
Cumulative Participants (resets for each phase)	50	100	2,500	5,000	7,500	1,500	3,000	4,500	6,000	7,500
GHG Reduction	3%	3%	1%	1%	1%	10%	10%	10%	10%	10%
Free ridership	90%	90%	90%	90%	90%	20%	20%	20%	20%	20%
Savings depreciation or attrition rate										
New Gross Avoided MTCO _{2e}	232	232	3,867	3,867	3,867	23,205	23,205	23,205	23,205	23,205
Cumulative Gross Avoided MTCO _{2e}	232	464	3,867	7,735	11,602	11,602	46,409	69,614	92,818	116,023
Net Avoided MTCO _{2e}	23	46	387	773	1,160	9,282	37,127	55,691	74,255	92,818
Net % of Total Sector Emissions	0.00%	0.00%	0.03%	0.07%	0.10%	0.80%	3.20%	4.80%	6.40%	8.00%
CAP \$	\$100,000	\$100,000	\$100,000	\$100,000	\$300,000	\$400,000	\$400,000	\$400,000	\$500,000	\$500,000
Other \$	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Private \$	\$137,993	\$137,993	\$2,299,881	\$2,299,881	\$2,299,881	\$13,799,283	\$13,799,283	\$13,799,283	\$13,799,283	\$13,799,283
Total \$	\$237,993	\$237,993	\$2,399,881	\$2,399,881	\$2,599,881	\$14,199,283	\$14,199,283	\$14,199,283	\$14,299,283	\$14,299,283
Private Savings \$	\$17,203	\$17,727	\$304,446	\$313,721	\$323,278	\$1,998,762	\$2,059,655	\$2,122,403	\$2,122,403	\$2,122,403
Cumulative Private Savings \$	\$17,203	\$34,929	\$339,375	\$653,095	\$976,374	\$2,975,135	\$5,034,790	\$7,157,193	\$9,279,595	\$11,401,998
Private Sector Simple Payback	8	8	8	7	7	7	7	7	7	7

*Note that savings and avoided emissions assumed to continue to year 20.



Programs 3.1 and 3.2 Summaries: EnergySmart Enhancements and Campaigns (Commercial and Residential)

- **CAP Category:** Reduce Use.
- **Mandatory vs. Voluntary:** Voluntary.
- **Existing or New Program:** Existing.
- **Description:** This program would focus on enhancing the EnergySmart program in both the residential and commercial sectors. These enhancements range widely and include support for other topics beyond energy efficiency and conservation, such as renewable energy, expanded contractor engagement to further build a trade ally network, continued support of weatherization efforts, expanding retrofits to be more extensive and other related efforts. Campaigns within the current EnergySmart program could be used to expand the program to target particular business sectors, particular technologies, or other similar focused efforts. Such campaigns could include targeted marketing of sectors or technologies and a streamlined approach for implementing a particular retrofit across a larger customer group, similar to components of the current EnergySmart program.
- **Quantification Methodology:** Build on existing program by increasing participation, converting on capital upgrades, and increasing GHG reduction per participant.
- **Certainty (see evaluation criterion definition):** Medium-high.
- **Total Costs Include:** Program + Private (both modeled equivalent Energy Smart programs – Jan 2012 Council Packet); estimated 30% program/70% private over entire 10 year program life.
- **CAP Only Portion of Total Costs Include:** Program only.
- **Key Assumptions**
 - **Level of penetration/participation rate assumption:**
 - Commercial - Proposed actions increase participation by 2 to 5% (cumulative) over current level. In other words, begin with 550 base participants (city’s 2012 goal per Jan 2012 Council Packet) in Year 1 then add 116 per year for program lifetime.
 - Residential - Per city’s 2012 goals Council packet, base is 850/yr owner-occupied base, ramping up; 3,200/yr rental, ramping down not to exceed total number of units.
 - **GHG Reduction Assumptions:**
 - Commercial - 14% beginning in Year 2 (cumulative from broaden scope, engaging industry and new technologies).
 - Residential - Current level of 1.7% per owner occupied, 0.5% per rental (per Jan 2012 Council Packet).
 - **Staffing Level:** Per existing program
 - **Other:**
 - Commercial itemized costs



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- \$558 non-rebate cost per business for 550 annual participants
- \$1,322 rebate cost per 257 annual upgrades completed
- \$6,576 private investment per 257 annual upgrades completed
- Residential itemized costs
 - \$243 non-rebate cost per unit for 4,050 annual participants
 - \$358 rebate cost per 1,875 annual upgrades completed
 - \$89 Xcel rebate cost per 1,875 annual upgrades completed
 - \$1,266 private investment per 1,875 annual upgrades completed
- \$0.10/kWh average unit cost with 3% annual increase; \$0.61/therm average unit cost with no annual increase.
- **Key Points/Highlights:** Cost per ton checks against range from Rocky Mountain Institute report. Commercial area includes allowance for equipment-specific campaigns – e.g., evaporative cooling.



Programs 3.1 and 3.2 Analysis Details: EnergySmart Enhancements and Campaigns – Commercial and Residential

3.1 Commercial EnergySmart

Year	1	2	3	4	5	6	7	8	9	10
Cumulative businesses served	960	1510	2126	2742	3358	3974	4590	5206	5822	6438
Base Participants	550	550	550	550	550	550	550	550	550	550
Total Participants	550	616	616	616	616	616	616	616	616	616
Base Upgrade Conversion Rate	50%	60%	70%	80%	90%	100%	100%	100%	100%	100%
Upgrades achieved	275	413	474	536	598	616	616	616	616	616
Cumulative Upgrades achieved	257	532	945	1419	1955	2552	3168	3784	4400	5016
GHG Reduction per Business	11.06	11.06	11.06	11.06	11.06	11.06	11.06	11.06	11	11
Gross Avoided MTCO _{2e}	3,041	5,203	5,979	6,756	7,532	7,765	7,765	7,765	7,765	7,765
Cumulative Avoided MTCO _{2e}	3,041	7,939	13,124	18,568	24,243	29,584	34,390	38,716	42,610	46,114
Net Avoided MTCO _{2e}	3,041	7,939	13,124	18,568	24,243	29,584	34,390	38,716	42,610	46,114
Net % of Total Sector Emissions	0.26%	0.68%	1.13%	1.60%	2.09%	2.55%	2.96%	3.34%	3.67%	3.97%
CAP \$	\$687,034	\$914,232	\$999,382	\$1,084,532	\$1,169,682	\$1,195,227	\$1,195,227	\$1,195,227	\$1,195,227	\$1,195,227
Other \$										
Private \$	\$1,808,451	\$2,714,123	\$3,119,217	\$3,524,310	\$3,929,403	\$4,050,931	\$4,050,931	\$4,050,931	\$4,050,931	\$4,050,931
Total \$	\$2,495,485	\$3,628,356	\$4,118,599	\$4,608,842	\$5,099,085	\$5,246,158	\$5,246,158	\$5,246,158	\$5,246,158	\$5,246,158
Private Savings \$	\$336,461	\$905,234	\$1,542,029	\$2,248,020	\$3,024,565	\$3,803,324	\$4,555,973	\$5,285,333	\$5,816,838	\$6,295,193
New Private Savings	\$336,461	\$593,193	\$702,499	\$817,913	\$939,709	\$998,286	\$1,028,699	\$1,060,038	\$1,060,038	\$1,060,038
SPB	5.4	4.6	4.4	4.3	4.2	4.1	3.9	3.8	3.8	3.8

*Note that savings and avoided emissions assumed to continue to year 20.



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3.2 Residential EnergySmart

Year	1	2	3	4	5	6	7	8	9	10
Cumulative owner-occupied served	678	1,528	2,528	3,678	4,978	6,428	8,028	9,778	11,678	13,728
Cumulative rentals served	2,081	5,281	8,181	10,781	13,081	15,081	16,781	18,181	19,281	20,081
Cumulative total units served	2,759	6,809	10,709	14,459	18,059	21,509	24,809	27,959	30,959	33,809
Owner-occupied participating	850	1,000	1,150	1,300	1,450	1,600	1,750	1,900	2,050	2,200
Rental participating	3,200	2,900	2,600	2,300	2,000	1,700	1,400	1,100	800	500
Owner-occupied upgrade rate	70%	75%	80%	85%	90%	95%	100%	100%	100%	100%
Rental upgrade rate	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%
Owner-occupied upgrades	595	750	920	1,105	1,305	1,520	1,750	1,900	2,050	2,200
Rental upgrades	1,280	1,305	1,300	1,265	1,200	1,105	980	825	640	425
Cumulative owner-occupied upgrades	595	1,345	2,265	3,370	4,675	6,195	7,945	9,845	11,895	14,095
Cumulative rental upgrades	1,280	2,585	3,885	5,150	6,350	7,455	8,435	9,260	9,900	10,325
Cumulative upgrades	1,875	3,930	6,150	8,520	11,025	13,650	16,380	19,105	21,795	24,420
GHG Reduction Owner-occupied	1013	1277	1566	1881	2222	2588	2979	3235	3490	3745
GHG Reduction Rental	685	698	696	677	642	591	524	441	342	227
Gross Avoided MTCO _{2e}	1,698	1,975	2,262	2,558	2,864	3,179	3,504	3,676	3,832	3,973
Cumulative Gross Avoided MTCO _{2e}	1,698	3,503	5,415	7,431	9,552	11,775	14,102	16,368	18,563	20,680
Net Avoided MTCO _{2e}	1,698	3,503	5,415	7,431	9,552	11,775	14,102	16,368	18,563	20,680
Net % of Total Sector Emissions	0.51%	1.06%	1.64%	2.24%	2.89%	3.56%	4.26%	4.94%	5.61%	6.25%
CAP \$	\$1,824,209	\$1,868,225	\$1,905,531	\$1,936,128	\$1,960,014	\$1,977,192	\$1,987,659	\$1,948,923	\$1,896,767	\$1,831,191
Other \$										
Private \$	\$2,373,554	\$2,601,415	\$2,810,288	\$3,000,172	\$3,171,068	\$3,322,976	\$3,455,895	\$3,449,565	\$3,405,259	\$3,322,976
Total \$	\$4,197,763	\$4,469,640	\$4,715,819	\$4,936,300	\$5,131,083	\$5,300,167	\$5,443,554	\$5,398,488	\$5,302,026	\$5,154,167
Private Savings \$	\$196,865	\$428,975	\$698,055	\$1,005,830	\$1,354,025	\$1,744,365	\$2,178,575	\$2,637,575	\$3,119,805	\$3,623,705
New Private Savings	\$196,865	\$232,110	\$269,080	\$307,775	\$348,195	\$390,340	\$434,210	\$459,000	\$482,230	\$503,900
SPB	12	11	10	10	9	9	8	8	7	7

*Note that savings and avoided emissions assumed to continue to year 20.



Program 4 Summary: EnergySmart Industrial

- **CAP Category:** Reduce Use.
- **Mandatory vs. Voluntary:** Voluntary.
- **Existing or New Program:** Existing.
- **Description:** The EnergySmart rebates are available to commercial and institutional properties within Boulder County (including non-profits, manufacturing facilities and multifamily housing) installing eligible retrofit measures. Under this program EnergySmart would be expanded to industrial facilities.
- **Quantification Methodology:** Applied similar performance metrics (payback, CAP fraction of total funding, etc.) as existing EnergySmart commercial program to industrial sector.
- **Certainty (see evaluation criterion definition):** Medium
- **Total Costs Include:** A per-customer rebate cap of \$15,000
- **CAP Only Portion of Total Costs Include:** 37% of total costs per EnergySmart commercial program model
- **Key Assumptions**
 - **Level of Penetration/Participation Rate Assumption:** 25% penetration rate of roughly 290 industrial facilities (per Point 380 report).
 - **GHG Reduction Assumptions:** 100% of the modeled energy savings.
 - **Staffing Level:** Included in CAP only portion costs
 - **Other:** Payback of 2.5 years. Cost savings derive 75% from electricity reduction and 25% from natural gas reduction. Point 380 indicates that Boulder's industrial sector consists of approx. 75 large office, 133 warehouses, and 75 manufacturing facilities.
- **Key Points/Highlights:** Cost per ton equals EnergySmart commercial program.



Program 4 Analysis Details: EnergySmart Industrial

Year	1	2	3	4	5	6	7	8	9	10
Implementation Rate	2.5%	5.0%	7.5%	10.0%	12.5%	15.0%	17.5%	20.0%	22.5%	25.0%
Members	7	15	22	29	37	44	51	59	66	73
Gross Avoided MTCO _{2e}	162	307	438	556	662	758	843	921	990	1,053
Net Avoided MTCO _{2e}	162	307	438	556	662	758	843	921	990	1,053
Net % of Total Sector Emissions	0.01%	0.03%	0.04%	0.05%	0.06%	0.07%	0.07%	0.08%	0.09%	0.09%
CAP \$	\$109,875	\$109,875	\$109,875	\$109,875	\$109,875	\$109,875	\$109,875	\$109,875	\$109,875	\$109,875
Other \$	\$40,015	\$40,015	\$40,015	\$40,015	\$40,015	\$40,015	\$40,015	\$40,015	\$40,015	\$40,015
Private \$	\$45,147	\$45,147	\$45,147	\$45,147	\$45,147	\$45,147	\$45,147	\$45,147	\$45,147	\$45,147
Total \$	\$195,037	\$195,037	\$195,037	\$195,037	\$195,037	\$195,037	\$195,037	\$195,037	\$195,037	\$195,037
Private Savings \$	\$ 18,059	\$ 36,117	\$ 54,176	\$ 72,235	\$ 90,293	\$ 108,352	\$ 126,411	\$ 144,469	\$ 162,528	\$ 180,587
New Savings \$	\$ 18,059	\$ 18,059	\$ 18,059	\$ 18,059	\$ 18,059	\$ 18,059	\$ 18,059	\$ 18,059	\$ 18,059	\$ 18,059
SPB	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5

*Note that savings and avoided emissions assumed to continue to year 20.



Program 4.1 Summary: Industrial Process Renewables/Generation – Combined Heat and Power

- **CAP Category:** Ramp-up Renewables.
- **Mandatory vs. Voluntary:** Voluntary.
- **Existing or New Program:** New.
- **Description:** A variety of industrial processes can be deployed to capture and/or generate energy. In combined heat and power (CHP), a heat engine or power station is used to simultaneously generate both electricity and useful heat.
- **Quantification Methodology:** Modeled new combined heat and power installations at individual industrial locations.
- **Certainty (see evaluation criterion definition):** Medium-low.
- **Total Costs Include:** \$1250/kW for equipment + operating costs (e.g., fuel, O&M) – utility cost offset
- **CAP Only Portion of Total Costs Include:** CAP funding is 10% of total capital costs.
- **Key Assumptions**
 - **Level of Penetration/Participation Rate Assumption:** Ten individual locations.
 - **GHG Reduction Assumption:** Total utilities energy savings less the CO2 created by from genset operation.
 - **Staffing Level:** Included in CAP only portion costs
 - **Other:** System size of 1 MW per location. Electrical efficiency of 40%. Derated ‘capturable’ waste heat quantity by 25% of annual usability and 20% thermal losses. Assumed full load. \$0.10/kWh average unit cost with 3% annual increase; \$0.61/th average unit cost with no annual increase.
- **Key Points/Highlights:** Cost per ton of emission reduction is inversely proportional to annual run hours.



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Program 4.1 Analysis Details: Industrial Process Renewables/Generation – Combined Heat and Power

Year	1	2	3	4	5	6	7	8	9	10
Implementation Rate	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Units	1	2	3	4	5	6	7	8	9	10
Gross Avoided MTCO _{2e}	1,908	2,862	3,816	4,770	5,724	6,678	7,632	8,585	9,539	10,493
Net Avoided MTCO _{2e}	191	286	382	477	572	668	763	859	954	1,049
Net % of Total Sector Emissions	0.02%	0.02%	0.03%	0.04%	0.05%	0.06%	0.07%	0.07%	0.08%	0.09%
CAP \$	\$125,000	\$125,000	\$125,000	\$125,000	\$125,000	\$125,000	\$125,000	\$125,000	\$125,000	\$125,000
Other \$	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Private \$	\$1,125,000	\$1,125,000	\$1,125,000	\$1,125,000	\$1,125,000	\$1,125,000	\$1,125,000	\$1,125,000	\$1,125,000	\$1,125,000
Total \$	\$1,250,000	\$1,250,000	\$1,250,000	\$1,250,000	\$1,250,000	\$1,250,000	\$1,250,000	\$1,250,000	\$1,250,000	\$1,250,000
Private Savings \$	\$ 19,659	\$ 39,318	\$ 58,977	\$ 78,637	\$ 98,296	\$ 117,955	\$ 137,614	\$ 157,273	\$ 176,932	\$ 196,591
New Savings	\$ 19,659	\$ 19,659	\$ 19,659	\$ 19,659	\$ 19,659	\$ 19,659	\$ 19,659	\$ 19,659	\$ 19,659	\$ 19,659
SPB	57	57	57	57	57	57	57	57	57	57



Program 4.2 Summary: Industrial Process Renewables/Generation - Anaerobic Digestion

- **CAP Category:** Ramp-up Renewables.
- **Mandatory vs. Voluntary:** Voluntary.
- **Existing or New Program:** New.
- **Description:** A variety of industrial processes can be deployed to capture and/or generate energy. In anaerobic digestion, micro-organisms break down biodegradable material without oxygen to release energy.
- **Quantification Methodology:** Modeled brewery waste-to-energy (hot water generation) projects based on industry waste stream and volatile solids destruction standards.
- **Certainty (see evaluation criterion definition):** Medium.
- **Total Costs Include:** \$/kW for equipment + operating costs (e.g., fuel, O&M) – utility cost offset
- **CAP Only Portion of Total Costs Include:** CAP funding is 10% of total capital costs.
- **Key Assumptions**
 - **Level of Penetration/Participation Rate Assumption:** Large projects in 2 (total) breweries.
 - **GHG Reduction Assumption:** 100% offset of the equivalent natural gas use
 - **Staffing Level:** Included in CAP only portion costs
 - **Other:** One-half barrel of waste generated to 2 barrels of beer. 80% conversion of volatile to biogas. \$0.10/kWh average unit cost with 3% annual increase; \$0.61/th average unit cost with no annual increase.
- **Key Points/Highlights:** Current waste stream used as livestock feed. Digesting this waste stream will reduce livestock feed revenue value.



Program 4.2 Analysis Details: Industrial Process Renewables/Generation - Anaerobic Digestion

Year	1	2	3	4	5	6	7	8	9	10
Implementation Rate	50.0%	100.0%								
Units	1	2	0	0	0	0	0	0	0	0
Gross Avoided MTCO ₂ e	272	544	544	544	544	544	544	544	544	544
Net Avoided MTCO ₂ e	27	54	54	54	54	54	54	54	54	54
Net % of Total Sector Emissions	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
CAP \$	\$93,794	\$93,794	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Other \$	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Private \$	\$844,150	\$844,150	\$62,530	\$62,530	\$62,530	\$62,530	\$62,530	\$62,530	\$62,530	\$62,530
Total \$	\$937,945	\$937,945	\$62,530	\$62,530	\$62,530	\$62,530	\$62,530	\$62,530	\$62,530	\$62,530
Private Savings \$	\$31,265	\$62,530	\$62,530	\$62,530	\$62,530	\$62,530	\$62,530	\$62,530	\$62,530	\$62,530
SPB	27									



Program 5 Summary: Solar Thermal

- **CAP Category:** Ramp-up Renewables.
- **Mandatory vs. Voluntary:** Voluntary.
- **Existing or New Program:** New.
- **Description:** Solar thermal is a technology for harnessing solar energy for generating thermal energy (heat). At an individual home or business scale, solar thermal can be used to heat water or for domestic hot water needs or radiant heating. At a larger scale, solar thermal electric energy generation concentrates the light from the sun to create heat, and that heat is used to run a heat engine, which turns a generator to make electricity. This program would support the increased deployment of solar thermal technologies at both an individual building and district scale in Boulder.
- **Quantification Methodology:** Installations on 19% of electric-only water heaters in commercial office space by year 10.
- **Quantification Certainty (see evaluation criterion definition):** Medium-high.
- **Total Costs Include:** Equipment (based on market bids) + Program (pro-rated off solar grant program, per CAP Expenditures for 2011).
- **CAP Only Portion of Total Costs Include:** 20% of total costs, modeling conservative DSM rebate program
- **Key Assumptions**
 - **Level of Penetration/Participation Rate Assumption:** Models equivalent annual adoption rate as solar PV program (Year 1 = 10%, 1% annual increase for 19% total by Year 10). Reflects about 30% of total electric water heating load.
 - **GHG Reduction Assumption:** 100% offset of the equivalent electricity generation.
 - **Staffing:** Minimal to manage incentive.
 - **Other:** Electric water heater loads of 1.1 kbtu/square foot based on federal Energy Information Administration data for small and large offices. \$0.10/kWh average unit cost with 3% annual increase; \$0.61/therm average unit cost with no annual increase.
- **Key Points/Highlights:** Extending program to natural gas water heaters will result in lower greenhouse gas reduction compared to electric water heaters.



Program 5 Analysis Details: Solar Thermal

Year	1	2	3	4	5	6	7	8	9	10
Year over year % adoption	10%	11%	12%	13%	14%	15%	16%	17%	18%	19%
Production (ttl load x percent) - therms	12,444	13,688	18,288	16,177	17,421	18,666	19,910	21,154	22,399	23,643
Production - equivalent kWh (29.3 kWh/th)	364,603	401,064	535,844	473,984	510,445	546,905	583,365	619,826	656,286	692,747
Annual GHG Reduction	257	283	378	334	360	386	411	437	463	488
New Gross Avoided MTCO _{2e}	257	283	378	334	360	386	411	437	463	488
Gross Avoided MTCO _{2e}	257	283	378	334	360	386	411	437	463	488
Net Avoided MTCO _{2e}	257	283	378	334	360	386	411	437	463	488
Net % of Total Sector Emissions	0.02%	0.02%	0.03%	0.03%	0.03%	0.03%	0.04%	0.04%	0.04%	0.04%
Step 3 - CAP \$	\$67,370	\$73,778	\$97,330	\$86,520	\$92,891	\$99,263	\$105,634	\$112,005	\$118,376	\$121,053
Step 2 - Private \$	\$269,480	\$295,111	\$389,319	\$346,081	\$371,566	\$397,050	\$422,535	\$448,020	\$473,505	\$484,213
Step 1 - Total \$ (equip + pgm)	\$336,850	\$368,889	\$486,649	\$432,601	\$464,457	\$496,313	\$528,169	\$560,025	\$591,882	\$605,267
Private Savings \$	\$7,591	\$8,350	\$11,156	\$9,868	\$10,627	\$11,386	\$12,145	\$12,904	\$13,663	\$14,422

*Note that savings and avoided emissions assumed to continue to year 20.



Program 6 Summary: Hydroelectric Power

- **CAP Category:** Ramp-up Renewables.
- **Mandatory vs. Voluntary:** Voluntary.
- **Existing or New Program:** Mix.
- **Description:** Since 1985, the City of Boulder has run a hydroelectric program to turn water power into electricity, generate revenue, and provide sustainable, non-polluting electricity. This energy exists in water because of large changes in elevation between the city's diversion points from streams and the delivery points for treated water in the city. This program entails expanding Boulder's capacity to generate hydroelectric power. It also entails ensuring that all renewable energy credits (RECs) are captured from the city's hydroelectric generation facilities—currently, the city splits RECs with Xcel Energy, which retires 50% of hydroelectric RECs on behalf of the city.
- **Quantification Methodology:** Restructuring contracts to retain RECs for remaining 60% of existing capacity and expanded capacity.
- **Certainty (see evaluation criterion definition):** High.
- **Total Costs Include:** Calculations for capacity were based on previous City of Boulder projects. Calculations for RECs were based on \$0.02/kWh and wholesale electricity price of \$0.04/kWh.
- **CAP Only Portion of Total Costs Include:** 100% of total costs.
- **Key Assumptions**
 - **Level of Penetration/Participation Rate Assumption:** n/a
 - **GHG Reduction Assumption:** 100% of new generation capacity and also energy use associated with REC purchased for remaining 60% of existing capacity.
 - **Staffing:** Included in CAP only portion costs
 - **Other:** 43,000 MWH of existing generation. Expanded capacity of 4,500 MWH. CAP funds are cost of RECS and capacity construction minus revenue from expanded capacity.



Program 6 Analysis Details: Hydroelectric Power

Year	1	2	3	4	5	6	7	8	9	10
Balance of existing generation kWh					25,800,000	25,800,000	25,800,000	25,800,000	25,800,000	25,800,000
Boulder Canyon kWh		3,000,000	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000
Carter Lake Pipeline					1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000
Gross Avoided mtCO _{2e}	0	2,115	2,115	2,115	21,360	21,360	21,360	21,360	21,360	21,360
Net Avoided mtCO _{2e}	0	2,115	2,115	2,115	21,360	21,360	21,360	21,360	21,360	21,360
Net % of Total Sector Emissions	0.00%	0.14%	0.14%	0.14%	1.43%	1.43%	1.43%	1.43%	1.43%	1.43%
Additional generation revenue	\$0	\$60,000	\$60,000	\$60,000	\$90,000	\$90,000	\$90,000	\$90,000	\$90,000	\$90,000
Balance of existing RECs cost	\$0	\$0	\$0	\$0	\$516,000	\$516,000	\$516,000	\$516,000	\$516,000	\$516,000
Boulder Canyon cost	\$5,000,000									
Carter Lake cost		\$5,500,000								
Total CAP \$	\$5,000,000	\$5,440,000	-\$60,000	-\$60,000	\$426,000	\$426,000	\$426,000	\$426,000	\$426,000	\$426,000
Other \$										
Private \$										
Total \$	\$5,000,000	\$5,440,000	-\$60,000	-\$60,000	\$426,000	\$426,000	\$426,000	\$426,000	\$426,000	\$426,000
Private Savings \$										



Program 7 Summary: Solar Photovoltaic

- **CAP Category:** Ramp-up Renewables.
- **Mandatory vs. Voluntary:** Voluntary.
- **Existing or New Program:** New.
- **Description:** Increasing the deployment of solar PV systems in Boulder could include both roof-top systems as well as solar "gardens" that could be constructed on city land or in neighborhood/district applications. Such solar gardens can include a mechanism by which residents and businesses can purchase "shares" to help offset their own electricity use.
- **Quantification Methodology:** Increase number of participants by 19% by year 10.
- **Quantification Certainty (see evaluation criterion definition):** High.
- **Total Costs Include:** Costs include equipment and program considerations. The equipment cost is based on an assumption of \$5 for each watt of installed solar PV. Program costs are pro-rated off solar grant program, per CAP Expenditures for 2011.
- **CAP Only Portion of Total Costs Include:** CAP funding is modeled to cover 20% of equipment purchase costs which is a similar level of funding to conservative DSM rebate programs. The CAP funding is also assumed to cover 100% of the city's program costs.
- **Key Assumptions**
 - **Level of Penetration/Participation Rate Assumption:** Year 1 = 10% increase in participants over 2011 Solar Rebate participants; 1% cumulative annual increase in participants for a 19% increase over 2011 by Year 10.
 - **GHG Reduction Assumption:** 100% offset of the equivalent electricity generation
 - **Staffing:** Included in CAP only portion costs
 - **Other:**
 - \$0.10/kWh average unit cost with 3% annual increase
 - electricity production of 1,459 kWh/kW/yr based on Solar Grant and Rebate assumption
 - Base load is modeled off 2011 solar rebate results with 27 participants and a 4.6 kW average system size.
- **Key Points/Highlights:** Increase solar PV installations by an average of 18 kW per year or 181 kW over a 10 year period.



Program 7 Analysis Details: Solar Photovoltaic

Year	1	2	3	4	5	6	7	8	9	10
Year over Year % Increase	10%	11%	12%	13%	14%	15%	16%	17%	18%	19%
New Participants	2.7	3	3	4	4	4	4	5	5	5
Cumulative New Participants	3	6	9	12	16	20	25	29	34	39
New kW	12	14	15	16	17	19	20	21	22	24
New kWh	18,221	20,044	21,866	23,688	25,510	27,332	29,154	30,976	32,799	34,621
Cumulative kWh	18,221	38,265	60,131	83,819	109,329	136,661	165,815	196,792	229,590	264,211
Participant Net PV Cost	\$49,970	\$53,593	\$56,996	\$60,186	\$63,169	\$65,953	\$68,543	\$70,946	\$73,167	\$75,212
Gross Avoided mtCO _{2e}	13	27	42	59	77	96	117	139	162	186
Net Avoided mtCO _{2e}	13	27	42	59	77	96	117	139	162	186
Net % of Total Sector Emissions	0.001%	0.002%	0.003%	0.004%	0.005%	0.006%	0.008%	0.009%	0.011%	0.012%
CAP \$	\$14,321	\$15,753	\$17,186	\$18,618	\$20,050	\$21,482	\$22,914	\$24,346	\$25,778	\$27,210
Other \$ (sales tax rebate)	\$279	\$306	\$334	\$362	\$390	\$418	\$446	\$474	\$501	\$529
Private \$	\$34,700	\$37,208	\$39,563	\$41,768	\$43,828	\$45,749	\$47,534	\$49,188	\$50,715	\$52,119
Total \$	\$49,300	\$53,268	\$57,083	\$60,748	\$64,268	\$67,649	\$70,894	\$74,008	\$76,995	\$79,859
Apply PV REC Payment	0	0	0	0	0	0	0	0	0	0
Solar PV REC Payment	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total Private Savings \$	\$1,421	\$3,076	\$4,980	\$7,154	\$9,615	\$12,385	\$15,485	\$18,938	\$22,094	\$25,426

*Note that savings and avoided emissions assumed to continue to year 20.



Program 8 Summary: Open RFP for GHG Emissions Reductions

- **CAP Category:** Innovative Ideas.
- **Mandatory vs. Voluntary:** Voluntary.
- **Existing or New Program:** New.
- **Description:** Using this approach the city would maintain an open, continuous request for proposals process whereby any entity or organization may submit ideas to the city for ways to reduce GHG emissions. Such submissions may also include opportunities for outside investment/funding for reduction measures. RFP responses must achieve conditions of performance that are equivalent to the performance of current programs. Specifically, climate reduction measures must achieve a required performance of \$5 per ton or less over a 10-year lifetime.
- **Evaluation Methodology:** RFP projects achieve 0.1% of total Boulder emissions.
- **Certainty (see evaluation criterion definition):** Low.
- **Total Costs Include:** Private (constant \$500/mtCO₂e) + CAP.
- **CAP Only Portion of Total Costs Include:** CAP funding assumes \$70/mtCO₂e and increasing annually by 5%.
- **Key Assumptions**
 - **Level of Penetration/Participation Rate Assumption:** n/a
 - **GHG Reduction Assumption:** Annual percent reduction of 0.1% is commensurate with other existing programs.
 - **Staffing:** Minimal 10% of an FTE assumed to administer RFP.
 - **Other:** \$0.10/kWh average unit cost with 3% annual increase; \$0.61/th average unit cost with no annual increase
- **Key Points/Highlights:** Program offers flexibility to shift funding to better performing programs if responses do not achieve required condition of performance. Maximum funding threshold set to minimize impact of program uncertainty. Minimum funding threshold set to prompt meaningful market innovation and attract participation.



Program 8 Analysis Details: Open RFP for GHG Emissions Reductions

Year	1	2	3	4	5	6	7	8	9	10
% of Total COB Emissions	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
New Avoided mtCO2e	1,491	1,491	1,491	1,491	1,491	1,491	1,491	1,491	1,491	1,491
Cumulative Avoided mtCO2e	1,491	2,983	4,474	5,965	7,456	8,948	10,439	11,930	13,421	14,913
CAP \$/mtCO2e	\$45	\$47	\$50	\$52	\$55	\$57	\$60	\$63	\$66	\$70
Private \$/mtCO2e	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500
Avoided Electricity, kWh	1,057,738	2,115,475	3,173,213	4,230,951	5,288,688	6,346,426	7,404,164	8,461,901	9,519,639	10,577,377
Avoided Natural Gas, therms	140,527	281,054	421,581	562,107	702,634	843,161	983,688	1,124,215	1,264,742	1,405,269
Gross Avoided mtCO2e	1,491	2,983	4,474	5,965	7,456	8,948	10,439	11,930	13,421	14,913
Net Avoided mtCO2e	1,491	2,983	4,474	5,965	7,456	8,948	10,439	11,930	13,421	14,913
Net % of Total Sector Emissions	0.10%	0.20%	0.30%	0.40%	0.50%	0.60%	0.70%	0.80%	0.90%	1.00%
CAP \$	\$67,107	\$70,463	\$73,986	\$77,685	\$81,569	\$85,648	\$89,930	\$94,427	\$99,148	\$104,105
Other \$										
Private \$	\$745,636	\$745,636	\$745,636	\$745,636	\$745,636	\$745,636	\$745,636	\$745,636	\$745,636	\$745,636
Total \$	\$812,743	\$816,098	\$819,621	\$823,320	\$827,205	\$831,283	\$835,566	\$840,062	\$844,783	\$849,741
Private Savings \$	\$206,303	\$419,954	\$641,288	\$870,653	\$1,108,415	\$1,354,951	\$1,610,654	\$1,875,934	\$2,110,426	\$2,344,918
Private Payback	3.6	1.8	1.2	0.9	0.7	0.6	0.5	0.4	0.4	0.3

*Note that savings and avoided emissions assumed to continue to year 20.



Program 9 Summary: City Lead by Example

- **CAP Category:** City Organization.
- **Mandatory vs. Voluntary:** Voluntary.
- **Existing or New Program:** Existing (expansion).
- **Description:** Municipalities have significant opportunities to lead communities by example with respect to energy management in their own operations. Beyond the efficient use of energy in existing buildings, this program may include upgrading street lights to more efficient ballasts and lighting, integrating energy efficiency into the design of new municipal buildings, and deploying more renewable energy on municipal buildings such as rooftop PV systems.
- **Quantification Methodology:** City organization implements LED street lighting, new high performance buildings and solar PV.
- **Certainty (see evaluation criterion definition):** Medium.
- **Total Costs Include:** By project based market costs.
- **CAP Only Portion of Total Costs Include:** CAP costs are 100% of related, incremental upgrades.
- **Key Assumptions**
 - **Level of Penetration/Participation Rate Assumption:** n/a
 - **GHG Reduction Assumption:** 100% offset of the equivalent energy reduction and generation.
 - **Staffing:** Included in CAP only portion costs
 - **Other:** 3,400 street lights. 50,000 square feet of planned new building with energy use intensity target of 30 kbtu/square foot. 2 MW of additional solar PV. \$0.10/kWh average unit cost with 3% annual increase; \$0.61/th average unit cost with no annual increase.
- **Key Points/Highlights:** Xcel currently owns street lights, although the city is involved at the state utility commission in an ongoing docket on metering street lights that may provide additional flexibility. Performance of city office buildings in 2008 was 130 kbtu/square foot.



Program 9 Analysis Details: City Lead by Example

Year	1	2	3	4	5	6	7	8	9	10
New Street Light Implementation	20%	20%	20%	20%	20%					
Cumulative % Implementation	20%	40%	60%	80%	100%	100%	100%	100%	100%	100%
Cumulative Avoided kWh	231,264	462,528	693,792	925,056	1,156,320	1,156,320	1,156,320	1,156,320	1,156,320	1,156,320
New High-perf Building sqft	0	0	25,000				25,000			
Avoided Electricity, kWh	0	0	261,880	261,880	261,880	261,880	523,761	523,761	523,761	523,761
Avoided Natural Gas, therms	0	0	8,565	8,565	8,565	8,565	17,129	17,129	17,129	17,129
Solar PV kW Installed	200	200	200	200	200	200	200	200	200	200
Cumulative Avoided kWh	280,000	560,000	840,000	1,120,000	1,400,000	1,680,000	1,960,000	2,240,000	2,520,000	2,800,000
Net PV Cost	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000
Gross Avoided mtCO _{2e}	360	721	1,311	1,672	2,032	2,229	2,657	2,854	3,052	3,249
Net Avoided mtCO _{2e}	360	721	1,311	1,672	2,032	2,229	2,657	2,854	3,052	3,249
Net % of Total Sector Emissions	0.05%	0.10%	0.18%	0.23%	0.28%	0.31%	0.37%	0.39%	0.42%	0.45%
CAP \$	\$1,236,000	\$1,236,000	\$1,423,500	\$1,236,000	\$1,236,000	\$1,000,000	\$1,187,500	\$1,000,000	\$1,000,000	\$1,000,000
Total \$	\$1,236,000	\$1,236,000	\$1,423,500	\$1,236,000	\$1,236,000	\$1,000,000	\$1,187,500	\$1,000,000	\$1,000,000	\$1,000,000
Solar PV REC Payment	\$39,200	\$78,400	\$117,600	\$156,800	\$196,000	\$235,200	\$274,400	\$313,600	\$352,800	\$392,000
Total City Savings \$	\$71,563	\$143,127	\$241,605	\$313,829	\$386,073	\$436,251	\$516,131	\$567,097	\$616,573	\$666,049
New City Savings	\$71,563	\$71,563	\$98,478	\$72,224	\$72,244	\$50,178	\$79,880	\$50,966	\$49,476	\$49,476
SPB	17	17	14	17	17	20	15	20	20	20

*Note that savings and avoided emissions assumed to continue to year 20.



Program 10 Summary: District-scale Approaches

- **CAP Category:** Build Better.
- **Mandatory vs. Voluntary:** Voluntary.
- **Existing or New Program:** New.
- **Description:** District-scale energy approaches focus energy efficiency and conservation and/or energy supply efforts at a neighborhood, district, or other geographic subset of a community. District approaches may include energy efficiency initiatives tailored to a district's existing building stock, local production of energy through renewable energy or other locally distributed energy generation sources, energy efficiency and/or renewable energy standards for new construction, and/or the ability for a district to respond to peak electricity prices by shedding load.
- **Quantification Methodology:** Demand control, energy efficiency and renewable energy benefits form a defined energy district.
- **Certainty (see evaluation criterion definition):** Low.
- **Total Costs Include:** Program costs are modeled off 10 for Change program costs. Equipment costs also included in total costs.
- **CAP Only Portion of Total Costs Include:** 50% of non-PV equipment, 20% of PV systems and 100% of program costs.
- **Key Assumptions**
 - **Level of Penetration/Participation Rate Assumption:** Implementation rate 60% of district total square footage by year 10.
 - **GHG Reduction Assumption:** 100% offset of the energy reduction and generation
 - **Staffing:** Assumes \$60,000 or approximately 0.5 FTE to manage program based on 10 for Change overhead. \$0.10/kWh average unit cost with 3% annual increase; \$0.61/th average unit cost with no annual increase.
- **Key Points/Highlights:** District has 1 million square feet of commercial building space. Commercial sectors and percentages modeled of Point 380 report. Implementation defined as 10% annual energy savings, 330 monthly peak kW reduction by year 10 and 600 kW of solar PV. CAP costs are 50% of efficiency and demand reduction system costs plus 20% of PV costs.



ATTACHMENT B

2013 City of Boulder Energy Programs: Options and Conclusions
July 16, 2012

Program 10 Analysis Details: District-scale Approaches

Year	1	2	3	4	5	6	7	8	9	10
% Implementation	5%	7%	10%	14%	19%	25%	32%	40%	49%	59%
New Sqft	50,000	20,000	30,000	40,000	50,000	60,000	70,000	80,000	90,000	100,000
Cumulative Avoided Electricity, kWh	71,425	99,995	142,850	199,990	271,415	357,125	457,120	571,400	699,965	842,815
Avoided Natural Gas, therms	26,238	36,733	52,475	73,465	99,703	131,188	167,920	209,900	257,128	309,603
Controllable Air Conditioning kW	85	119	170	238	323	425	544	680	833	1,003
Air Conditioning kW Reduced	28	39	56	79	107	140	180	224	275	331
Avoided kWh	281	393	561	785	1,066	1,403	1,795	2,244	2,749	3,310
Solar PV % Installed	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
New Solar PV kW Installed	60	60	60	60	60	60	60	60	60	60
Solar PV kW Installed	60	120	180	240	300	360	420	480	540	600
Solar PV kWh	84,000	168,000	252,000	336,000	420,000	504,000	588,000	672,000	756,000	840,000
Net PV Cost	\$240,000	\$240,000	\$240,000	\$240,000	\$240,000	\$240,000	\$240,000	\$240,000	\$240,000	\$240,000
Gross Avoided mtCO _{2e}	249	384	557	768	1,017	1,304	1,629	1,992	2,393	2,831
Net % of Total Comm/Ind Emissions	0.02%	0.03%	0.05%	0.07%	0.09%	0.11%	0.14%	0.17%	0.21%	0.24%
CAP \$	\$145,000	\$190,000	\$255,000	\$320,000	\$385,000	\$450,000	\$515,000	\$580,000	\$645,000	\$710,000
Other \$										
Private \$	\$193,000	\$178,000	\$183,000	\$188,000	\$193,000	\$198,000	\$203,000	\$208,000	\$213,000	\$218,000
Total \$	\$338,000	\$368,000	\$438,000	\$508,000	\$578,000	\$648,000	\$718,000	\$788,000	\$858,000	\$928,000
Solar PV REC Payment	\$11,760	\$23,520	\$35,280	\$47,040	\$58,800	\$70,560	\$82,320	\$94,080	\$105,840	\$117,600
Private Savings \$	\$36,924	\$60,838	\$89,384	\$122,675	\$160,835	\$203,992	\$252,284	\$305,855	\$362,798	\$424,419
SPB	5									

*Note that savings and avoided emissions assumed to continue to year 20.



Appendix C – Evaluation Criteria Descriptions

Please note that for each chart labeled “Results and Conclusions,” “Count” means the number of programs at each level and “Program List” identifies specific programs according to their numbers in the program matrix and in Appendix B.

Evaluation Criterion 1: Efficiency

Definition

Getting the most output for the amount of input, where outputs include both carbon reductions and cost savings and inputs incorporate CAP spending as well as private sector spending (where applicable, private investments were included in total cost development).

Evaluation Methodology

Quantitative Metrics (and associated data fields):

- Total \$/ton: Total \$; metric tons of CO₂e avoided tons
- Private Sector Simple Payback: Private sector \$; cost savings

Qualitative Metrics: None

Approach for Determining Scale (High-Medium-Low)

Scale	Total Dollars Per Ton	Payback (Years)
High = 1	1-100	>5
Med = 2	100-200	5-10
Low = 3	200+	<10

Results and Conclusions

Efficiency Level	Count	Program List
High	4	2.1, 2.2, 3.1, 9
Medium-High	2	1, 4
Medium	2	6, 13
Medium-Low	2	2.3, 3.2
Low	5	4.1, 4.2, 5, 8, 11

Based on the distribution of the 15 program across the scale of high to low, the **Efficiency** criterion can and should be the leading factor, along with Effectiveness, for prioritizing programs. By removing the worst-performing and least effective programs and adjusting assumptions/design parameters to increase efficiency and effectiveness for the remaining programs, revised scenario(s) can be analyzed



with the objective of minimizing (ideally closing) the identified gaps between available funding (e.g., \$1.8 million for CAP) and funding needed to maximize a given program, as well as GHG reduction targets and projected GHG reductions.

Evaluation Criterion 2: Effectiveness

Definition

Beyond efficiency, how well does the output address the size/nature of the problem? This criterion demonstrates the magnitude and relevance of the program.

Evaluation Methodology

Quantitative Metrics:

- GHG emissions reduction (cumulative metric tons of CO₂e)
- Estimated GHG reductions as a proportion of total GHG emissions from a particular sector (%)

Qualitative Metrics:

- Program maturity

Approach for Determining Scale (High-Medium-Low)

Scale	Tons	Percent of Total GHG Emissions goal	Maturity ⁴
High = 1	>150,000	>1	Established
Medium = 2	50,000-150,000	0.2-1	Emerging
Low = 3	<50,000	<0.2%	New

Results and Conclusions

Effectiveness Level	Count	Program List
High	3	1, 3.1, 3.2
Medium-High	2	6, 9
Medium	1	11
Medium-Low	4	2.1, 2.2, 2.3, 4.1
Low	5	4, 4.2, 5, 8, 13

Based on the distribution of the 15 program across the scale of high to low, the **Effectiveness** criterion can and should be a leading factor, along with Efficiency, for prioritizing programs.

⁴ Established - most elements of program in place; Emerging - significant expansion of existing elements; New - no elements of program in place.



Evaluation Criterion 3: Equity

Definition

Equity takes into consideration two factors. First, where does the money for a program come from and where is it spent? In other words, is there strong overlap between who pays for the program and who benefits from the program? The second factor considers whether there are disadvantaged subgroups unfairly impacted by the program – low-income residents, small businesses, non-profits, etc.

Evaluation Methodology

Quantitative Metrics:

- Percent overlap between the funding source for the program and where it is spent
- Data fields: Sources of funding and spending

Qualitative Metrics:

- Degree that disadvantaged sub-groups are negatively impacted

Approach for Determining Scale (High-Medium-Low)

Scale	Who Pays vs. Where Spent	Disadvantaged Subgroups
High = 1	>50% overlap	No effect
Medium = 2	25-50%	Moderate
Low = 3	<25%	Significant (adjustment needed in design)

Results and Conclusions

Equity Level	Count	Program List
High	8	2.1, 2.3, 4.1, 4.2, 5, 8, 9, 13
Medium-High	4	2.2, 3.1, 3.2, 4
Medium	3	1, 6, 11
Medium-Low	0	
Low	0	

Based on the distribution of the 15 program across the scale of high to low, rather than use the **Equity** criterion to prioritize programs (as is the recommendation with the Efficiency and Effectiveness evaluation criteria), the best use of the Equity criterion is as a tool for program design/refinement during implementation. Programs analyzed generally scored well on the equity criterion.



Evaluation Criterion 4: Externalities

Definition

Externalities are co-benefits that are not directly quantified in the program analysis.

Evaluation Methodology

Quantitative Metrics: None

Qualitative Metrics:

- Water or other sustainability benefits
- Jobs and/or support of Boulder tech and service companies
- Marketing and branding Boulder through high visibility or innovative projects
- Education and engagement potential

Approach for Determining Scale (High-Medium-Low)

Scale	Water and Other Sustainability	Jobs	Brand Visibility/Innovation	Education and Engagement Level
High = 1	>1 link	Target industries (e.g., solar installer)	Grows ⁵	High
Med = 2	1 link	General effect (e.g., electrical trade)	Aligns ⁶	Med
Low = 3	No effect	No effect	No effect	Low

Results and Conclusions

Externalities Level	Count	Program List
High	0	
Medium-High	1	13
Medium	10	1, 2.1, 2.2, 2.3, 3.1, 3.2, 4, 5, 8, 9
Medium-Low	3	4.1, 4.2, 11
Low	1	6

Based on the distribution of the 15 program across the scale of high to low, rather than use the **Externalities** criterion to prioritize programs (as is the case with the Efficiency and Effectiveness evaluation criteria), the best use of the criterion is as a tool for identifying and communicating the beyond-carbon benefits of the CAP program. It also could be used during program design to determine

⁵ This is the “wow factor.”

⁶ This means more of what already exists in programs.



the costs and benefits for adding features to address other sustainability aspects, water conservation and efficiency being the most common opportunities. The majority of the programs as analyzed scored medium on the Externalities criterion. This means that despite being designed as energy programs, additional benefits will accrue for water efficiency, job growth, positive visibility for Boulder as a place of innovation, or growing the sustainability education and engagement level of Boulder as a community.

Evaluation Criterion 5: Certainty

Definition

Certainty refers to how confident the team is that the program would perform as evaluated.

Evaluation Methodology

- Quantitative Metrics: None
- Qualitative Metrics: Certainty

Approach for Determining Scale (High-Medium-Low)

Scale	Level of Assumptions	Sensitivity ⁷	Maturity ⁸
High = 1	Few	Stable	Established
Medium = 2	Moderate	Moderate	Emerging
Low = 3	Many	Large swings	New

Results and Conclusions

Certainty Level	Count	Program List
High	2	6, 11
Medium-High	7	2.1, 2.2, 2.3, 3.1, 3.2, 5, 8
Medium	2	4, 4.2
Medium-Low	2	1, 4.1
Low	2	9, 13

Based on the distribution of the 15 program across the scale of high to low, rather than use the **Certainty** criterion to prioritize programs (as is the case with the Efficiency and Effectiveness evaluation criteria), the best use of the criterion is as a tool for interpreting the quantitative estimates for the programs in the proposed CAP program. Based on available data, some of the programs’ quantitative results are more reliable than others. The strongest areas of concern would be the few programs with

⁷ High: assumption has a large impact on GHG emissions and total costs; and so forth for medium and low.

⁸ Established: most elements of program in place.

Emerging: significant expansion of existing elements would be required.

New: no elements of program in place.



ATTACHMENT B

2013 City of Boulder Energy Programs: Options and Conclusions
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relatively low certainty but high efficiency and effectiveness because this represents vulnerabilities in the plan's ability to deliver projected results.

Appendix D – Investment Package – \$1.8 million funding level

A number of investment packages were developed to extend the analysis beyond individual programs to cumulative outcomes and impacts from combining key programs. This appendix details the six specific investment packages.

Investment Package 1: High Greenhouse Gas Reductions

Description: This package represents a combination of actions to result in high GHG emissions reductions within the \$1.8 million CAP tax funding limit. The biggest “bang for the buck” programs involve the commercial sector and hydroelectric RECs.

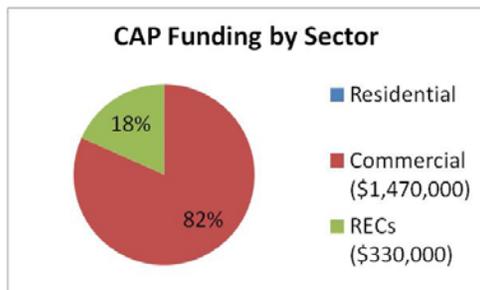
Associated Emissions Reduction:

Snapshot of Year 1: 3,300 mtCO₂e

Snapshot of Year 5: 51,000 mtCO₂e

Snapshot of Year 10: 177,000 mtCO₂e

Quantification Certainty: Medium-high



Specific programs to be funded in the package (using annual, average CAP funding):

- Commercial Energy Efficiency Ordinance (\$270,000)
- Commercial EnergySmart (\$1,200,000)
- Hydroelectric RECs (\$330,000)

Pros:

- High level of greenhouse gas reduction
- Energy cost savings for participants
- Participant cost savings
- Captures more existing, local, renewable hydroelectric generation

Cons:

- Does not include a residential component
- May be difficult to negotiate purchasing additional hydroelectric RECs



ATTACHMENT B

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- Involves a large investment in RECs rather than long-term investments in energy efficiency measures

Investment Package 2: Residential Focus

Description: This package represents a combination of actions focused on residential programs and services, including a behavior change platform developed by city staff and enhancements and campaigns related to the existing EnergySmart Residential.

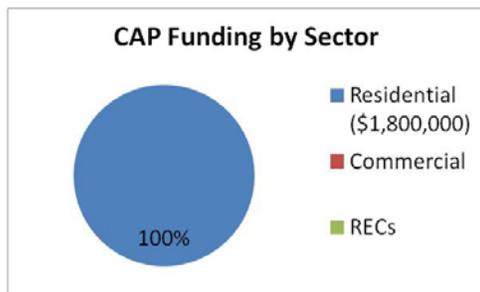
Associated Emissions Reduction:

Snapshot of Year 1: 1,600 mtCO₂e

Snapshot of Year 5: 11,200 mtCO₂e

Snapshot of Year 10: 22,000 mtCO₂e

Quantification Certainty: Medium-high



Specific programs to be funded in the package (using annual, average CAP funding):

- Behavior change platform (\$40,000)
- Residential EnergySmart (\$1,760,000)

Pros:

- Participant cost savings with good simple payback periods
- Achieves greenhouse gas reductions beyond CAP period
- Residential accounts are the primary source of CAP funding and would receive the bulk of services under this package

Cons:

- Does not achieve maximum greenhouse gas reduction for funding level
- Does not include a commercial component
- Does not maintain existing residential SmartRegs program

Investment Package 3: Commercial Focus

Description: This package represents a combination of actions related to developing a Commercial Energy Efficiency Ordinance achieved in three phases, expanding the existing 10 for Change program, and enhancing the existing Commercial EnergySmart program.

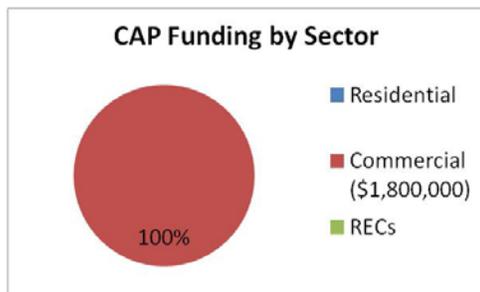
Associated Emissions Reduction:

Snapshot of Year 1: 5,500 mtCO₂e

Snapshot of Year 5: 48,000 mtCO₂e

Snapshot of Year 10: 173,000 mtCO₂e

Quantification Certainty: Medium



Specific programs to be funded in the package (using average annual CAP funding):

- Commercial Energy Efficiency Ordinance (\$540,000)
- Commercial EnergySmart (\$1,200,000)
- 10 for Change (\$60,000)

Pros:

- Participant cost savings
- Achieves greenhouse gas reductions beyond CAP period
- Funding is focused on sector with largest emissions
- Largely builds on and consolidates existing programs toward a more unified delivery of services to commercial sector

Cons:

- Does not achieve maximum greenhouse gas reduction for funding level
- Does not include a residential component
- Does not including funding to maintain mandatory SmartRegs compliance program

Investment Package 4: Multiple Benefits

Description: This package represents a combination of actions with the highest combined ranking of all evaluation criteria considered: efficiency, effectiveness, equity, externalities and certainty. The programs are enhancements and campaigns related to the existing Commercial EnergySmart program and a residential behavior change platform developed by city staff.

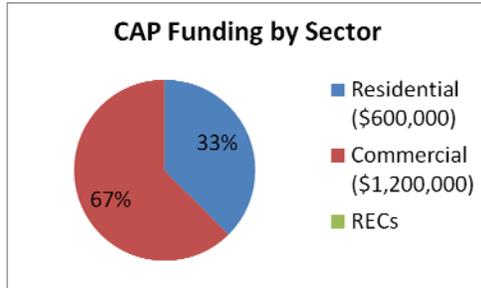
Associated Emissions Reduction:

Snapshot of Year 1: 3,400 mtCO₂e

Snapshot of Year 5: 29,000 mtCO₂e

Snapshot of Year 10: 54,000 mtCO₂e

Quantification Certainty: Medium



Specific programs to be funded in the package (using average annual CAP funding):

- Commercial EnergySmart (\$1,200,000)
- Behavior Change Platform (Opower) (\$275,000)
- Residential EnergySmart (\$325,000)

Pros:

- Participant cost savings
- Includes both commercial and residential sector components

Cons:

- Does not achieve maximum greenhouse gas reduction for funding level
- Focuses considerable funding on behavior change, which has uncertain persistence

Investment Package 5: Solar Focus

Description: This package models the impact if all of the available funding was used to invest in local solar PV installations.

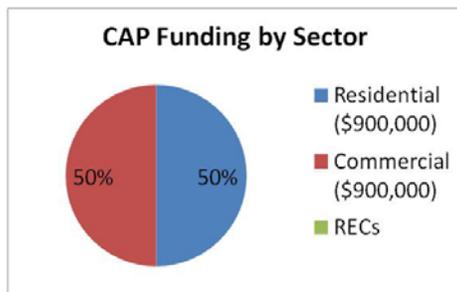
Associated Emissions Reduction:

Snapshot of Year 1: 590 mtCO₂e

Snapshot of Year 5: 3,100 mtCO₂e

Snapshot of Year 10: 6,400 mtCO₂e

Quantification Certainty: Medium-high



Specific programs to be funded in the package (using annual, average CAP funding):

- Solar photovoltaics (\$1,800,000)

Pros:

- Greenhouse gas reductions beyond CAP period
- Participant cost savings
- Visibility

Cons:

- Does not achieve maximum greenhouse gas reduction for funding level
- Relatively high cost per reduction due to large incentive required
- Payback periods on private savings exceed efficiency options
- If participants also take advantage of Xcel's Solar*Rewards program, all RECs will be purchased by Xcel

Investment Package 6: Renewable Energy Credits Focus

Description: This package models the impact if all of the available funding was used to purchase renewable energy credits (RECs).

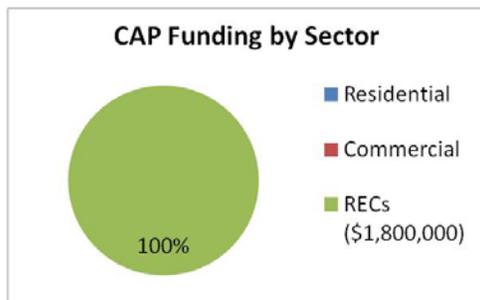
Associated Emissions Reduction:

Snapshot of Year 1: 59,000 mtCO₂e

Snapshot of Year 5: 77,000 mtCO₂e

Snapshot of Year 10: 127,000 mtCO₂e

Quantification Certainty: High



Specific programs to be funded in the package (using annual, average CAP funding):

- RECs (\$1,800,000)

Pros:

- Ease
- Public familiarity
- Can include residential and commercial components

Cons:

- Does not achieve maximum greenhouse gas reduction for funding level
- No participant cost savings for residents or businesses
- RECs need to be purchased each year. There is no “cumulative” savings effect that is seen in on-site energy efficiency, solar investments, etc.

Executive Summary of the RMI Report

Rocky Mountain Institute

7/16/2012

Introduction: In 2006, the Boulder community adopted a Climate Action Plan (CAP) to reduce greenhouse gas (GHG) emissions to 7% below 1990 levels by 2012. To support that objective, Boulder voters agreed that same year to tax their own electricity use to fund programs that offer commercial and residential energy efficiency services, renewable energy opportunities, improved building codes and standards, and efficient transportation options. Since then, this CAP tax has raised between \$600,000 and \$1.8 million a year and now primarily funds expanded energy efficiency services. The tax is due to expire at the end of March 2013. The Boulder community has not reduced the emissions required to meet its goal, and the city is evaluating how to offer more robust and cost-effective services to address the continuing threat of climate change.

City Council began considering the possibility of seeking a continuation of the CAP tax in the spring of 2012. As part of this assessment, the city looked back at existing programs and their effectiveness and looked ahead by evaluating potential future programs. Rocky Mountain Institute (RMI) performed the first part of this analysis – an examination of CAP tax-funded programs to date.

Value of considering cumulative savings: The community has had concerns about the ability to meet its aggressive goal for the past couple of years. This is partly because the energy supply in this region is one of the most carbon-intensive in the country, but it is also because energy efficiency programs take a long time to mature and produce major savings. Programs such as Commercial EnergySmart can have an immediate impact by helping to make several hundred businesses more energy efficient each year. In subsequent years, however, these programs' benefits improve because they build on the previous year's efficiency gains. The ideal goal is to create programs that provide efficiency gains and total energy savings that grow each year.

Methodology: RMI's primary task was to determine if CAP tax dollars were spent efficiently, or in ways that are cost effective over time. To assess this, RMI examined the total savings each program will produce over its lifetime¹. For example, one program, Neighborhood Energy Sweeps (now incorporated in Residential EnergySmart), replaced incandescent light bulbs with energy-efficient compact fluorescent light bulbs (CFLs) in households across Boulder. Each efficient light bulb provides energy savings for as many as six to 10 years. For this reason, RMI forecasted the results of this improvement out over a longer period of time than the year the bulb was actually changed. In general, the longer the program lasts, the better.

¹ RMI determined the useful life of each program using either an average of the expected life of the installed equipment (from light bulbs to solar panels) or industry standard estimates (primarily for programs involving energy audits).

Findings and Conclusions:

- RMI compared the impact of CAP tax-funded programs to the gap between the Boulder community's emissions and the Kyoto Protocol goal emissions level, which is calculated annually. By 2011, city CAP-funded programs met 3.3% of the 2007 gap to the Kyoto protocol goal. The total emissions reductions from 2007 to 2011 are equivalent to saving 23 million gallons of gasoline or taking 41,000 cars off the road for one year. As impressive as that is, it's only 30% of the total energy reductions that will be created over the life of these same CAP programs. And the yearly (as well as total) carbon reductions will grow if these and similarly cost effective programs are extended. If Boulder fully funds the three most effective programs, emissions reductions from these ongoing programs could eliminate the 2007 gap by the year 2028.
- Boulder has attained impressive energy savings with the money spent. RMI found that Boulder's energy efficiency programs, individually, cost between \$4 and \$280 per metric ton of carbon dioxide reduced. On average, \$30 of CAP tax funding were spent per metric ton of carbon dioxide reduced through energy efficiency programs. In other words, to offset the yearly emissions of an average American home, or 11.5 metric tons, the City of Boulder spent \$345. City programs rate slightly more cost-effective than offsetting a home through Windsource, which would cost \$359.
- Compared to municipal emissions reductions programs in Connecticut and Oregon – the only comparable programs found – Boulder's results are two to three times better (more cost effective). Some of Boulder's CAP programs rank exceptionally high in cost effectiveness due to the city receiving external funding that reduced the need to use CAP tax dollars. Even after removing the benefit of these non-city tax funds, Boulder's programs compare favorably to Connecticut and Oregon. Boulder's renewables programs are, in fact, far more cost effective than those in the two comparison states. Commercial EnergySmart is similarly cost effective. A few other programs, like Boulder's lighting initiatives and Residential EnergySmart, have been considerably less cost effective, primarily because both Residential and Commercial EnergySmart are relatively new programs and can be expected to improve for years to come if funding continues and the programs are given the opportunity to mature.
- RMI performed a sensitivity analysis to assess the impact of extending core programs (Residential and Commercial EnergySmart and SmartRegs). This analysis forecasted larger savings based on expected learning curves, which predict the improvement of efficiency programs due to program maturation, improved program data, better staff knowledge, and the application of new technology. RMI also extrapolated improvements due to economies of scale (primarily cost advantages), which correspond to larger funding for the programs. Even without external funding sources (which EnergySmart has used in recent years), these key programs would produce large cumulative emissions reductions cost-effectively. Expanding and extending these programs another six years would more than triple the expected cumulative GHG savings created by programs thus far.

The RMI report, which includes all calculations and the detailed methodology used for the cost-effectiveness assessment, is available on the [City of Boulder's Energy Future website](#).

YOUR

CAP TAX DOLLARS AT WORK

HAVE THEY BEEN USED EFFECTIVELY?

In 2006, Boulder voters were the first in the country to tax their own energy use in order to raise money for programs that help reduce greenhouse gas emissions. Since it was passed, this Climate Action Plan (CAP) tax has provided between \$600,000 and \$1.8 million a year to fund energy efficiency and conservation programs for homes and businesses. Voters may be asked in November 2012 if they'd like to renew the tax, which expires in March 2013.

To gauge the effectiveness of the CAP tax, the City of Boulder hired Rocky Mountain Institute (RMI) to conduct an independent analysis of CAP programs. The full report is available at BoulderEnergyFuture.com. This handout provides an at-a-glance look at this report and its conclusions.



In short, RMI found that the city has used your CAP tax dollars to invest in programs that are reducing emissions at a reasonable cost.

The consultants urge continued support and funding for these programs and encourage the community to make even more substantial efficiency improvements to address the climate change challenge.

KEY FINDINGS

- ▶ Boulder has attained impressive energy savings and emission reductions, and is well positioned to achieve future emissions reduction targets.
- ▶ While the city will not reach its Kyoto Protocol carbon emissions reduction goal this year, something the city has known and informed the community about previously, Boulder has generated significant carbon savings at a reasonable cost.
- ▶ Lighting replacement programs, especially in the residential sector, offered the most cost effective savings.
- ▶ Renewables programs in Boulder, such as the Solar Grant Program, have been far more cost effective than city-run programs in other states.

- ▶ EnergySmart programs are showing impressive results in helping people put energy efficiency recommendations into action. While they have had significant, and anticipated, start-up costs, these programs are expected to gain in cost effectiveness, providing greater emissions reductions per dollar invested.

ARE THERE WAYS THE CITY COULD DO EVEN BETTER?

Yes. The report contained several recommendations:

Boulder must push beyond the simple and easy programs and begin additionally encouraging residents and businesses to think long term about their buildings, investment choices and energy use.

The interaction between where our energy comes from (specifically, increasing renewable sources) and how we use it is important and should continue to be a focus if the community wants to hit future emissions-reduction targets.

The city can and should improve its methods of tracking data and assessing the performance of its programs. These improvements include investing in a comprehensive program database,



City staff are holding a community climate workshop on June 13 and will make an additional presentation to City Council at a study session on July 24.

determining yearly and lifecycle emission reductions, clearly defining which programs are funded by CAP tax dollars and which benefit from other sources of revenue, and developing a better system of citywide carbon accounting.

WHAT'S NEXT?

The city is working with interested community members and a consulting firm called the Brendle Group to identify a set of programs and strategies that would be most effective in terms of reducing emissions and using available resources wisely as climate action in Boulder continues.

A possible ballot item may ask voters to renew the Climate Action Plan tax, as it is currently structured, on Election Day, Nov. 6, 2012.

WHAT WENT INTO THIS ANALYSIS?

RMI studied 19 residential, commercial and renewable energy programs (such as lighting retrofits, EnergySmart, and 10 for Change) that have been wholly or partially funded with the CAP tax. The consultants determined the amount of emissions each program can be expected to save throughout the lifecycle of any installed equipment or upgrades, and

conducted a cost/benefit analysis based on the tax dollars that were used to create and support the program.

While the city has conducted a yearly accounting of the money it has spent, this is the first analysis that takes into account the cumulative value of energy efficiency efforts. The idea is that an efficiency improvement, such as changing an incandescent bulb to a CFL, saves energy and money for more than just the first year. After calculating the CAP tax-funded programs' costs and savings over time, RMI compared the city's programs to similar efforts in other municipalities.

WHO IS RMI?

Rocky Mountain Institute was co-founded by leading environmentalist Amory Lovins in 1982. The Colorado-based, independent non-profit is committed to collaborating with businesses, government and communities to drive the efficient and restorative use of resources using profitable and innovative approaches. RMI works in the four energy-using sectors of the economy: buildings, industry, transportation, and electricity, and leverages whole-system thinking to reveal interconnections and systemic solutions, which are often simpler, cheaper and able to solve multiple

problems with single investments. RMI adheres to a set of guiding principles, including one called the "end-use/least-cost" approach; "What are we trying to do, and what's the best and cheapest way to do it?"



Recommendations: In its report to council, RMI detailed a series of preliminary recommendations, the first of which is an extension of the CAP tax in order to continue delivering cost-effective carbon reductions to Boulder. RMI recommends that future programs push beyond simple and easy energy savings to encourage residents and businesses to think longer term about their buildings, investment choices, and energy use. Programs should aim for larger energy reductions in commercial buildings through [deep energy retrofits](#) (which cost-effectively save greater than 50 percent of pre-retrofit energy) and passive solar houses that depend primarily on the sun for heating. The city should also examine the interaction between Boulder's supply (how green the sources of the community's energy are) and future demand (how the community uses energy) to reach future emissions reductions targets. Opportunities exist to make a shift towards renewable sources, like wind, solar and hydro, far easier and cheaper by first implementing energy efficiency reductions.

The city can also improve its methods of tracking data and determining the performance of emissions reductions programs. These improvements include developing a comprehensive program database, determining yearly and lifecycle emissions reductions, clearly defining which programs are funded by CAP tax dollars and which benefit from other sources of revenue, and developing a better system of city-wide carbon accounting (specifically, a comprehensive determination of all sources of Boulder's carbon emissions).

Conclusion: The RMI report shows that the Boulder community has effectively and efficiently used its CAP tax dollars to reduce GHG emissions, but that existing and future CAP programs must be enhanced to reach the community's goals. It is imperative that emission reduction programs continue to be funded so that expected energy savings can be realized, and so that each program can reach its desired level of functionality. In addition, new deeper-reaching programs must be created to successfully mitigate the effects of climate change. Boulder has done well, but more can and should be done.

Commercial Energy Efficiency Strategy- Part 2

Part 2 DRAFT Process & Timeline- Next Steps

