



SEPTEMBER 2011 • CITY OF BOULDER

Community Guide to Boulder's  
**CLIMATE ACTION PLAN**  
2010/2011 PROGRESS REPORT

# ACKNOWLEDGMENTS

## City Council members

Susan Osborne, Mayor  
Ken Wilson, Deputy Mayor  
Suzy Ageton  
Matt Appelbaum  
KC Becker  
Macon Cowles  
Crystal Gray  
George Karakehian  
Lisa Morzel

## Environmental Advisory Board

Bill Roettker  
Brian Vickers  
Victoria Mandell  
Scot Woolley  
Stephen Morgan

## City of Boulder

Jane Brautigam, *City Manager*  
Paul Fetherston, *Deputy City Manager*

## Department of Community Planning & Sustainability

David Driskell, *Executive Director*  
Mary Ann Weideman, *Deputy Director of Operations*  
Kara Mertz, *Local Environmental Action Manager*  
Jonathan Koehn, *Regional Sustainability Coordinator*  
Chris Meschuk, *Planner II*

## Local Environmental Action Division Staff

Kelle Boumansour, *Contracts and Data Manager*  
Kelly Crandall, *Special Projects Coordinator*  
Megan Cuzzolino, *Residential Sustainability Specialist II*  
Leonie Fischer-Gibson, *Intern*  
Vanessa Frambes, *Business Sustainability Specialist II*  
Yael Gichon, *Residential Sustainability Coordinator*  
Nick Grossman, *Temporary Education and Outreach Coordinator*  
Jamie Harkins, *Business Sustainability Specialist II*  
Kristen Hartel, *Residential Sustainability Specialist I*  
Elise Hassler, *Temporary Education and Outreach Coordinator*  
Ellen Orleans, *Employee Conservation Coordinator*  
Elizabeth Vasatka, *Business Sustainability Coordinator*

## Other Key Staff

Kathleen Alexander, *City Forester*  
Tim Beal, *Boulder Housing Partners*  
Joe Castro, *Facilities and Fleets Manager*  
Chris Hagelin, *Senior Transportation Planner*  
Tim Head, *Airport Manager*  
Sarah Huntley, *Media Relations/Communication Coordinator*  
Jody Jacobson, *Communications Coordinator*  
Cris Jones, *Transportation Planner II*  
Kirk Moors, *Acting Chief Building Official*  
Marni Ratzel, *Transportation Planner II*

## Consultants

The Cadmus Group, Inc.  
Franklin Energy  
McKinstry  
Nexant, Inc.  
Populus Sustainable Design Consulting  
Roche Design  
WSP Environment & Energy

## Boulder County Commissioners' Office

Beth Beckell – *Residential Energy Efficiency and Sustainability Specialist*  
Jeremy Durham – *Assistant County Attorney*  
Jeremy Epstein – *Commercial Energy Efficiency Specialist*  
Dave Hatchimonji – *Residential Energy Efficiency and Sustainability Specialist*  
Ann Livingston – *Sustainability Coordinator*  
Susie Strife – *EnergySmart Grant Manager*  
Lea Yancey – *Commercial Energy Efficiency Specialist*

## Boulder County Public Health

Bill Hayes, *BCPH Business Sustainability Team Lead*  
Anne Koenig, *BCPH Energy Efficiency and Sustainability Specialist*  
Pam Milmoie, *BCPH Air Quality and Business Sustainability Coordinator*  
Collin Tomb, *BCPH Business Sustainability Specialist*

## Photo Credits

Brian Flint and Boulder B-Cycle, City of Boulder Open Space & Mountain Parks, EnergySmart, GO Boulder, Namasté Solar

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Section One

# **EXECUTIVE SUMMARY**

In 2007, the City of Boulder adopted and began implementing a Climate Action Plan (CAP) to reduce local greenhouse gas emissions and address the growing impact of human activity on global climate change. From the beginning, the CAP laid out an aggressive set of programs and strategies to reduce local emissions. It was re-tooled in 2009 based on lessons learned in the first two years of action, and in 2010 new policies and programs were developed in collaboration with community partners. Those new programs — namely the city’s new SmartRegs requirements for rental housing and the EnergySmart efficiency services—were fully launched in January 2011.

This 2010/2011 Progress Report provides a snapshot of how we as a community are doing in our climate action efforts. While it focuses primarily on city-initiated programs, it also speaks to overall community progress in working toward this important goal. Climate action is a shared initiative in which the city is facilitator, collaborator, supporter, regulator, leader and funder. But real progress is shaped by the individual decisions and actions that we each make every day.

Because of the time-lag in obtaining access to 2010 data, this report is more of a look back than it is a statement of how things are today, in September 2011. Nonetheless, it is a valuable measure of where progress has been made, and where more attention is needed. To the extent possible, the report identifies and quantifies progress through June 2011, and differentiates between areas we have control over, and areas we don’t—so that progress toward objectives can be seen clearly, even if other factors are limiting the near-term benefit of those actions.

## So How Are We Doing?

The 2010 data points to both good news, and not such good news. The short story is that emissions were up slightly in 2010 compared to 2009 (an increase of 2.5 percent). The primary factors behind that trend were an increase in commercial and industrial electricity use (but that also reflected a post-recession increase in economic activity, which is a good thing...); an increase in the number of vans, trucks and sport utility vehicles on Boulder’s roads; and an increase in the carbon intensity of the electricity supply (we’ll explain that later).

But these factors notwithstanding, there is also a lot of good news (in fact, some really good news) to report:

- Much of 2010 was spent revising the city’s energy efficiency programs. The complete results from the 2011 implementation of EnergySmart and SmartRegs won’t be in until the end of the year, but the reductions are expected to reflect a substantial increase in participation and greenhouse gas reductions as compared to prior years programs.

Climate action is a shared initiative in which the city is facilitator, collaborator, supporter, regulator, leader and funder. But real progress is shaped by the individual decisions and actions that we each make every day.



EnergySmart Advisor assisting business owner, Richard Polk

- Rooftop solar installations increased by 30 percent over the past year. Boulder now has 11.3 megawatts of installed solar photovoltaic capacity. While this represents only about 1 percent of Boulder’s annual electricity needs, it is a significant increase. In fact, recent data suggests that Boulder now has more rooftop solar per capita than any other city in the country.
- Solid waste generation decreased by 13 percent, reducing some of the most harmful greenhouse gas emissions. This is a direct result of the new curbside composting services and continued success of single-stream recycling. Our community partners—and everyone who makes an effort to recycle, compost and reduce their waste—have every reason to be proud of this achievement. We expect 2011 data to show continued success in this area.
  - Residential electricity and natural gas consumption remained stable in 2010, despite modest population growth, which correlates to ongoing investment in home energy efficiency. With the launch of EnergySmart services and SmartRegs in January 2011, reductions

in residential energy consumption are expected in the 2011 inventory, even as the number of housing units may continue to slowly increase.

- Hydroelectric generation increased by more than 8 percent primarily as a result of retrofits on the Betasso hydroelectric plant and increased rainfall. While the total amount of hydroelectric production remains a small part of Boulder's energy mix, the energy localization report prepared for the city in 2011 identified additional opportunities for improvements in this area.
- Boulder community members' purchases of renewable energy credits (RECs) increased by 26 percent, which is likely a combination of increased awareness and declining prices enabling customers to make larger purchases.
- In 2010, by reducing vehicle miles traveled (VMT) and purchasing alternatively fueled vehicles, the city fleet maintained its emissions at 7 percent below 1990 levels for the sixth year in a row. The city organization also awarded an energy performance contract that will upgrade 66 city-owned facilities and will result in a 17 percent or more reduction in greenhouse gas emissions as compared to the city organization's 2008 emissions. The city is in the process of planning for a new climate action target to reduce the city organization's emissions by a total of 20 percent.

Nationally, approximately 15 percent of homeowners who get energy audits go on to make upgrades to their properties. In Boulder, we are seeing an upgrade rate of approximately 55 percent.

well beyond what any one of us can do alone (such as changing fuel efficiency standards, or replacing fossil fuel systems with renewable energy systems). The Boulder community is making progress toward its climate action goal, but our local achievements underscore the magnitude of the challenge ahead. Even here in Boulder, where climate-friendly decisions, policies and programs continue to prevail, meaningful emissions reductions are difficult.

Beyond the single-year trends which are the focus of this report, it's important to put emission trends in context. In total, Boulder's greenhouse gas emissions have remained relatively stable since CAP programs began in 2007. While small reductions were achieved in 2008 and 2009, the overall trend has been that emissions have remained steady since CAP programs began (they were only 0.65 percent higher in absolute terms in 2010 compared to 2007, and slightly lower in per capita terms). Importantly, if pre-2007 trends had continued, Boulder's 2010 emissions could have been 4.5 percent higher than they actually were. In other words, climate action efforts in Boulder have helped avoid nearly 85,000 metric tons of CO<sub>2</sub> emissions in 2010. Boulder's efforts put us in a small group of American cities that have managed to stabilize or decrease emissions.

## How Are We Doing in the Big Picture?

Taking effective action to reduce greenhouse gas emissions—in a manner that supports our economic health—is probably the greatest challenge of our generation. It requires not only action at the personal level (being wise about electricity use, or making efforts to drive less), but also requires significant system change,



EnergySmart Advisor toolkits ready for daily deployment

## So What Have We Learned? What's Next?

We have a long way to go in making meaningful progress on our emission reduction goals. More recent data indicate we are on our way to making significant progress in 2011 with the launch of EnergySmart in collaboration with Boulder County and other partners. Over 2,000 Boulder residents and businesses have participated in one or more stages of this one-stop-shop energy efficiency service in just the first half of 2011, compared to less than 200 properties that received quick installs and upgrades in all of 2010. This level of participation appears to be continuing through the second half of 2011, and it will have a lasting impact on the greenhouse gas emissions attributable to the community's building stock. In addition, the one-stop-shop service model has proven to be very effective: some studies indicate that nationally, approximately 15 percent of homeowners who get energy audits go on to make upgrades to their properties. In Boulder, we are seeing an upgrade rate of approximately 55 percent, as homeowners and businesses report that the energy advisor has helped them take the hassle out of the process.

Over the past year considerable time has also been devoted to exploring options for reducing the carbon intensity of Boulder's electricity supply. With almost 60 percent of our carbon emissions coming from electricity use in buildings, the high (and increasing) carbon intensity of our electric supply is a daunting issue. While state law requires that utilities make increasing investments in clean, renewable energy sources, it is projected

that the carbon intensity of our electricity will continue to grow through 2014. After that, it is expected to reduce due to some coal generation being replaced by natural gas and additional renewable generation coming online. But as long as the majority of Boulder's power is produced from coal, it will be difficult to achieve significant reductions in our emissions.

As we look to the end of 2011 and into 2012, there is significant work to do. In particular, there are four areas where we will be devoting considerable effort:

- **Energy efficiency in the commercial sector.** The city is already working closely with some of our largest commercial property owners to explore opportunities for increasing the energy efficiency of commercial buildings. We are building on the expertise and data gained by the EnergySmart business services team, as well as knowledge from experiences in other communities. The pilot program stage is now completed; the second half of 2011 will fully implement new business efficiency services developed in collaboration with the city's business partners. This is a more complicated area than home energy use, as businesses often use far more energy in manufacturing or computing processes than they do in heating, cooling, and lighting their buildings. The challenge is developing tailored strategies that create efficiency while supporting our businesses' productivity and vitality.
- **Energy localization.** Another area that will be a focus for the rest of 2011 and 2012 is the development of community solar gardens—made possible by the passage of state legislation in 2010. Plans are underway already for several Boulder-based projects. Other opportunities for “energy localization” were highlighted in the work done as part of the Energy Future project in the first half of 2011. These opportunities will be further explored in 2012 to identify the most promising near-term strategies.
- **Continued success of EnergySmart services.** The city and county team responsible for EnergySmart is already working with its partners to develop new strategies to continue the high level of participation in EnergySmart services and to encourage even more participants to follow through with implementation of identified efficiency improvements. The 2011 efforts have exceeded the program participation targets. The goal is to exceed expectations in 2012 as well.
- **Planning for the next generation of the Climate Action Plan.** With 2012 marking the final year before expiration of the voter-approved Climate Action Plan tax, city staff will engage the City Council and the entire Boulder community in discussions about “what's next?” beginning in late 2011. As part of this, a greenhouse gas emissions inventory focused solely on city organization operations is being completed, in accordance with recent emissions protocol guidance for local governments. The new inventory will build upon knowledge from the city vehicle fleet and building energy use and identify other areas in city operations that produce greenhouse gases. The new



inventory, expected to be complete by the end of 2011, will set the baseline for the city organization and could serve as a platform for identifying new community-wide goals and strategies beyond 2012.

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### What's Included In This Report?

- **Section 2**, the 2010 Greenhouse Gas Emissions Inventory, presents the 2010 greenhouse gas inventory for the Boulder community and offers context for year-to-year changes. **Appendix A** explains the assumptions and calculations that went into the inventory.
- **Section 3**, 2010 Results and 2011 Progress, summarizes the results of Climate Action Plan programs and services from 2010 and ongoing strategies and plans in 2011. **Appendix B** summarizes CAP program expenditures and estimates avoided emissions in 2011 and 2012 as they compare to the community's 2012 goal.



Section Two

# 2010 GREENHOUSE GAS EMISSIONS INVENTORY

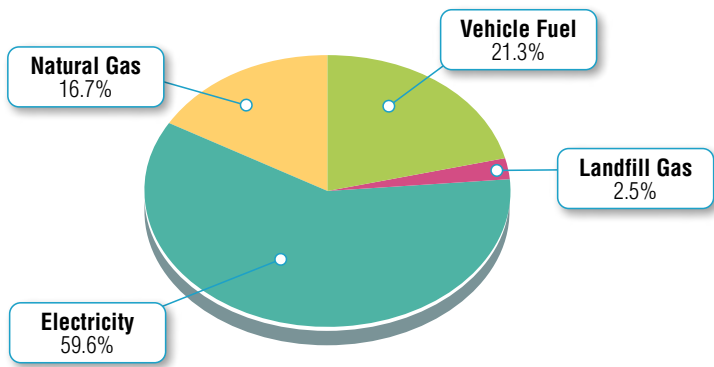


In 2010, Boulder, as a community, emitted an estimated 1,896,068 metric tons of carbon dioxide equivalent (mtCO<sub>2</sub>e), compared to 1,849,329 mtCO<sub>2</sub>e in 2009. Although this represents a one-year increase of 46,739 metric tons (2.5%), which is due to factors discussed later in this section. However, from a multi-year perspective, community emissions have only increased by 0.65 percent since 2007. Looked at another way, if “business as usual” had continued with pre-2007 trends, the community’s greenhouse gas emissions could have been 4.5 percent higher than they are today.

From a regional and national perspective, Boulder’s climate action efforts continue to make a difference. Boulder’s annual per capita emissions, 18.3 mtCO<sub>2</sub>e, remains below both the national average (24.5 mtCO<sub>2</sub>e) and that of Denver (25.3 mtCO<sub>2</sub>e), and starting in 2007 the city joined the ranks of a handful of US cities that have stabilized or decreased their emissions.

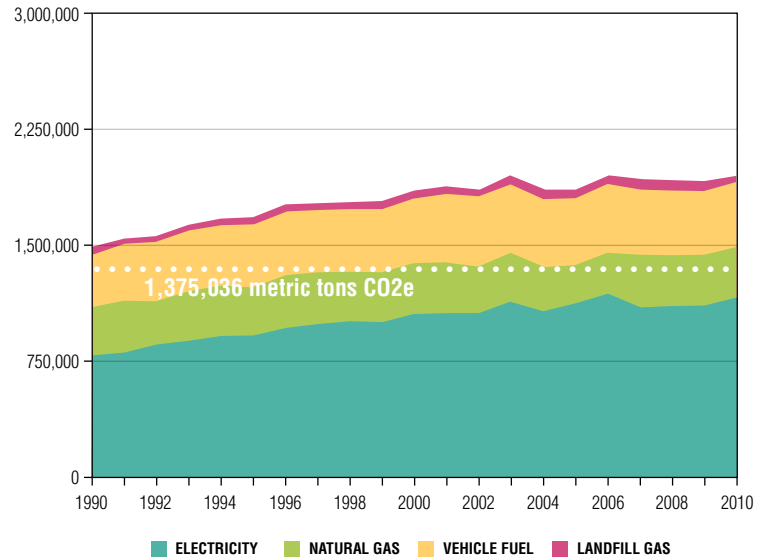
From 2009 to 2010, out of the components that make up the community’s emissions inventory:

### 2010 Inventory by Source



- Overall electricity consumption increased by approximately 2.8 percent (reflecting growth in commercial electricity use, while residential use held steady);
- Overall natural gas consumption increased by 1.9 percent due to increases in residential and transported natural gas purchases, but commercial consumption declined 1.1 percent;
- Transportation-related emissions increased by 0.6 percent; these appear to be due to changes in the proportion of vehicle classes, which suggests increased purchases of trucks, vans, and sport utility vehicles;
- Solid waste emissions decreased by 12.9 percent;
- Hydroelectric generation increased by over 8.3 percent;
- Windsource purchases declined by 1.9 percent; and
- Purchases of renewable energy credits (RECs), measured in kilowatt-hours (kWh), increased by 26.1 percent.

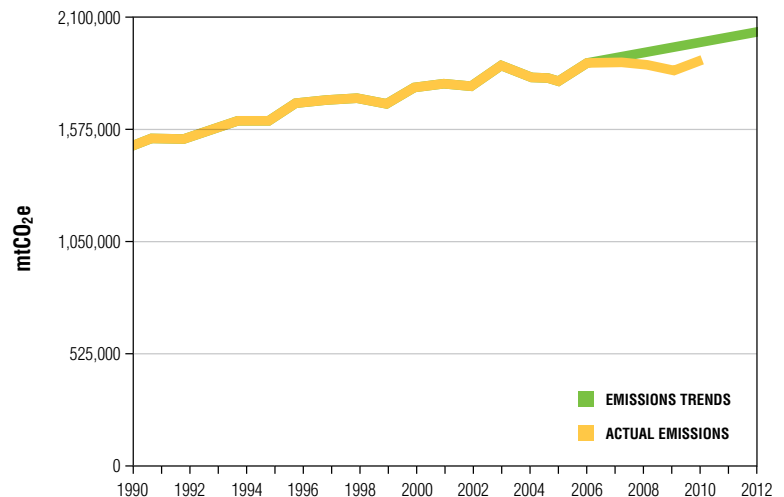
### 2010 Greenhouse Gas Inventory



### Energy Emissions in the Inventory

Because energy-related emissions, including electricity and natural gas, comprise nearly 80 percent of the inventory (76.3%), the most dramatic contribution to the overall 2010 emissions data came from increased electricity and natural gas consumption, coupled with a higher emissions intensity factor for electricity. Higher consumption may be in part due to 2010 weather pat-

### Actual vs. Forecast Emissions Using Pre-2007 Trends



terns. In 2010, Boulder experienced more “cooling degree” days and fewer “heating degree” days than in 2009, suggesting that a hotter summer led to increased electricity loads from air conditioning use. The city does not receive granular enough electricity usage data from Xcel Energy (Xcel) to conclusively determine whether this was in fact the case.

In the process of re-structuring the CAP demand-side programs to address challenges like this, it has become apparent that efficiency and conservation can only address a small portion of the

emissions-reduction puzzle. To make significant in-roads, the emissions intensity attributable to the energy supply must also decrease. Therefore, in 2010 and 2011, the CAP tax also helped fund in-depth analyses to identify ways to affect the energy supply.

The city uses the Environmental Protection Agency’s eGRID factor, which is updated every few years, to calculate its electricity-related greenhouse gas emissions. The eGRID factor analyzes all electric power generation in the US by plant or facility type

**Table 1: Total Emissions (in metric tons of CO2e)**

Year	Electricity	Natural Gas	Transportation	Solid Waste	Offsets	Total
2006	1,191,656	269,224	444,896	53,398	-72,021	1,887,152
2007	1,104,482	330,095	432,269	61,500	-44,604	1,883,742
2008	1,109,544	336,596	416,553	56,164	-47,839	1,871,017
2009	1,120,822	319,570	413,602	55,540	-60,206	1,849,329
2010	1,166,533	325,870	416,234	48,368	-60,938	1,896,068



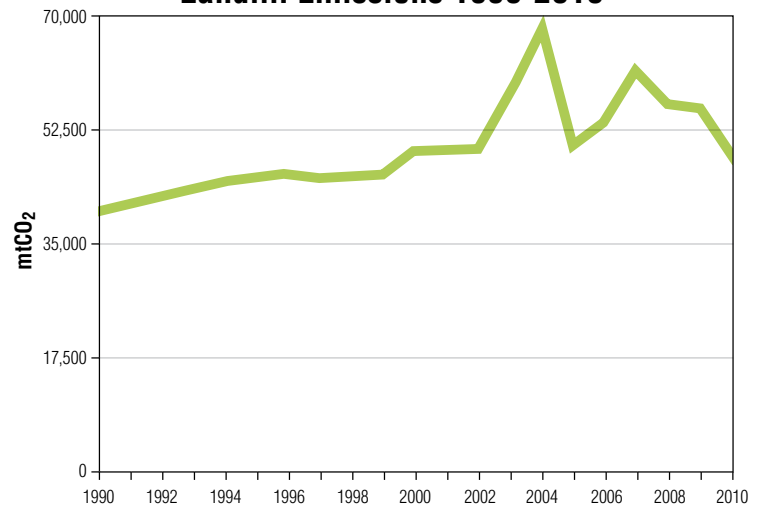
and provides regional carbon emissions figures in pounds per megawatt-hour (MWh) of electricity consumed. Boulder's inventory uses the carbon emissions factor for the Rocky Mountain region, which includes Colorado as well as parts of Wyoming, South Dakota, Nebraska and New Mexico. For 2010, this figure was 1,906.06 lbs CO<sub>2</sub>e/MWh, which represents 2007 power plant data (version 1.1), EPA's most recent data. This eGRID factor is currently the highest in the nation, indicating the high carbon intensity of the electricity consumed in this region.

Using a different emissions factor transforms the inventory, and is a measure of the impact from shifting the electricity supply from one source to another. **Appendix A** explains this and other assumptions and calculations used in the emissions inventory. **Appendix B** shows the actual and projected results from the current demand reduction efforts. It shows that if the carbon intensity of Boulder's electricity decreased by approximately 25 percent, we would achieve our Kyoto Protocol emissions reduction goal. This 25 percent reduction translates to an emissions intensity of approximately 1,440 lbs CO<sub>2</sub>e/MWh, which would be somewhere in the middle of other emissions factors around the country.

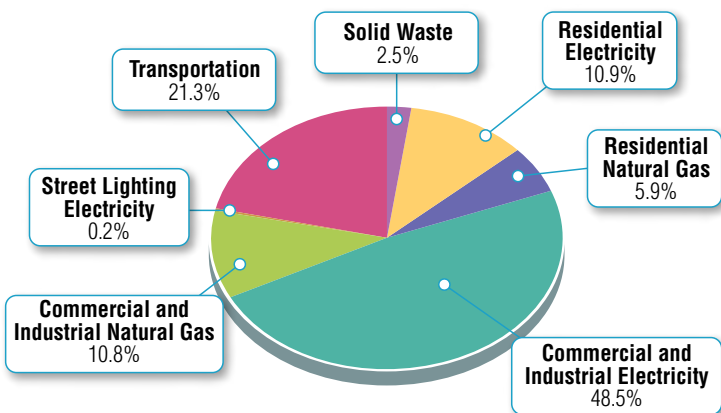
## Looking Toward a New Goal

As the 2010 inventory indicates, more work is needed to meet the community's CAP goals. In 2011 and 2012, the city will continue to engage the community in discussions about what proportion of the CAP goal can be realistically accomplished through demand reduction (efficiency and conservation) programs and services, and what proportion should be addressed through supply-side renewable and low-carbon energy strategies.

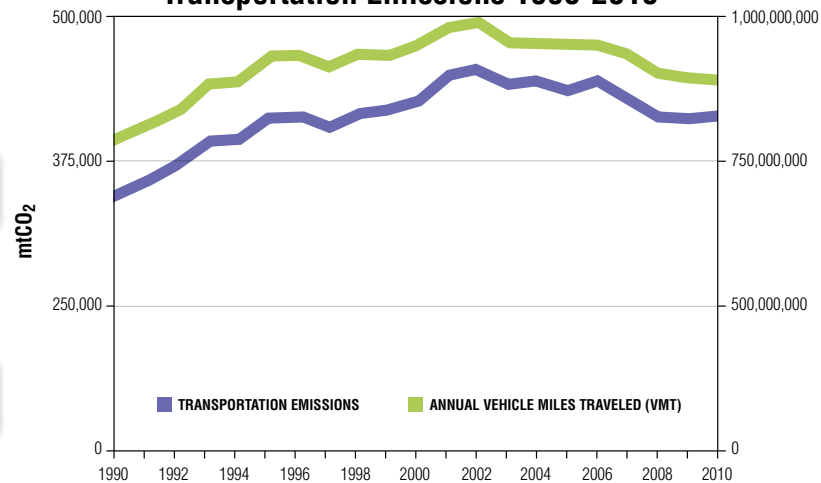
### Landfill Emissions 1990-2010



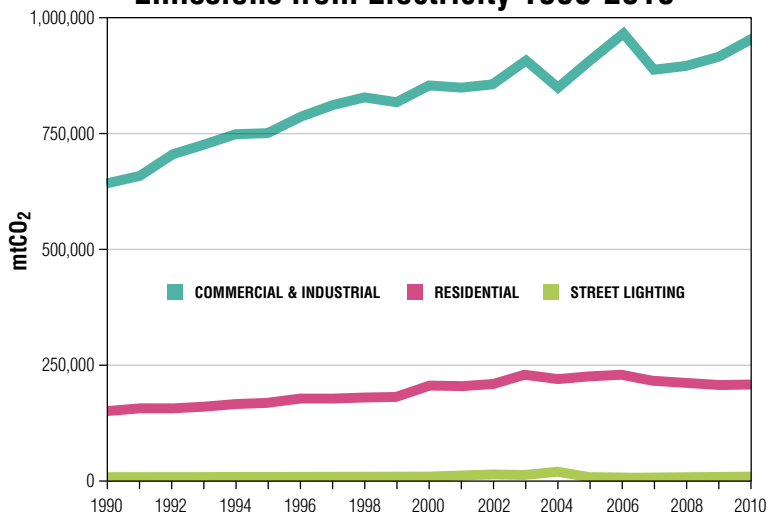
### Emissions by Sector



### Transportation Emissions 1990-2010

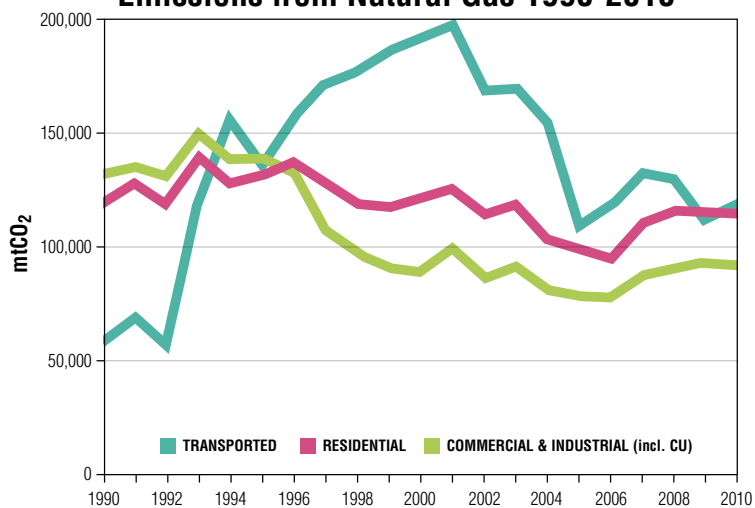


### Emissions from Electricity 1990-2010



In addition, during 2012, the community will discuss what Boulder’s post-2012 goals and objectives should be, including an investigation of the inventory metrics, the city’s CAP strategy areas, and ways to procure more local renewable energy. To aid in this process, **Appendix B** estimates the amount of emissions that can be avoided through CAP programs in 2011 and 2012, based on actual results from 2010 and 2011 compared with prospective funding. This appendix is being used by the city to refine and focus its CAP work plan for the remainder of the current CAP tax term.

### Emissions from Natural Gas 1990-2010





Section Three

# 2010 RESULTS & 2011 PROGRESS



Boulder's Climate Action Plan (CAP) defines six key strategy areas to address greenhouse gas emissions. Together, they provide the structure for the climate action programs and services. This section summarizes the 2010 results of these six strategy areas and outlines the programs and services underway for 2011. While City of Boulder programs are the primary focus of the strategy area discussion, this section also describes some programs administered by or in partnership with Boulder County, Xcel, local nonprofits, and other organizations.

Within the city organization, many departments and work groups are involved in implementing the wide range of climate action initiatives, including the Local Environmental Action Division (LEAD), the Regional Sustainability Coordinator, and other workgroups in Community Planning and Sustainability (CP&S); the Planning and Development Services workgroup (jointly supported by Public Works and CP&S); numerous workgroups within Public Works (including GO Boulder in Transportation, to Facilities Management and Fleet Services, and the Water Conservation Program in Utilities); and the Urban Forestry section within the Parks and Recreation Department. The city also advances climate action objectives through engagement of the City Attorney's Office at the Public Utilities Commission and a wide variety of other policy and program activities.



# STRATEGY AREA 1 REDUCE USE

## APPROACH

- Retrofit existing buildings and replace appliances to improve energy efficiency.
- Promote energy-conserving behavior.

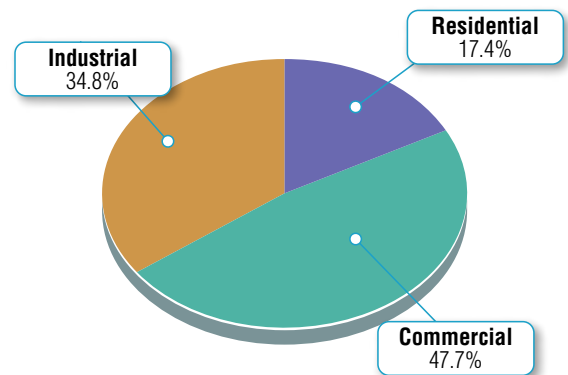
Most of Boulder's greenhouse gas emissions, 76.3 percent, come from energy use, including electricity and natural gas, in buildings. In fact, 59.6 percent of the community's emissions are solely due to electricity use. The Reduce Use strategy offers Boulder residents and businesses programs and services to reduce energy waste from buildings.

In 2010, the new CAP strategy to create a one-stop-shop approach to energy-efficiency services was in its final design stages but had not yet been implemented. The city and community partners made estimates of what would be possible from a new program strategy; but services had not yet been brought to market. During 2010, although residents and businesses could still participate in the former CAP efficiency programs and could sign up for Xcel's energy audit services, there was no energy advisor service in place and the rebates were smaller than the city now provides. In 2010, low-income residents could receive federal weatherization services, as they can now, through Longs Peak Energy Conservation (LPEC) of Boulder County and other avenues.



By the beginning of 2011 the new CAP strategy had produced EnergySmart's audit, advisor, and upgrade service administered by Populus Sustainable Design Consulting and funded by the city's CAP tax, the Department of Energy's American Recovery and Reinvestment Act (ARRA) and some Boulder County tax dollars. EnergySmart is implemented by the city in partnership with Boulder County, the City of Longmont and Xcel Energy. By January 2011, these services had been piloted for the residents in Boulder and were ready for a full-scale launch. In a report to council on January 18, 2011, the city projected emissions reductions and participation levels for these programs, all of which have been surpassed. Also, in late 2010 the City Council adopted a set of ordinances as part of the SmartRegs project to establish mandatory energy efficiency standards for existing rental housing. Properties must comply with the requirements by 2019, and are certified through the city's licensing program for rental housing. The ordinances went into effect in January 2011.

## Electricity Consumption by Sector in 2010



As can be seen by the statistics below, the new CAP strategy including the SmartRegs requirements is increasing the impact of the city's Reduce Use strategy substantially. However, even in an aggressive scenario (see **Appendix B**), continued participation in these conservation programs can only be expected to make a 10 to 15 percent advancement toward the whole of Boulder's Kyoto Protocol goal.

## 2010 PROGRAMS AT-A-GLANCE

- The city worked with LPEC to "sweep" two multi-family complexes in October 2010. Volunteers reached out to 310 units with a contact rate of 31 percent, giving renters 1,078 CFLs, as well as very low-flow showerheads, clothes drying racks, and other energy-saving tools. These simple measures led to an estimated annual savings of 56,800 kWh or 40 mtCO<sub>2</sub>e.
- From January 2010 through May 2011, LPEC weatherized 114 low-income residential units in Boulder, with support from

the Department of Energy and the Governor's Energy Office (GEO). GEO estimates annual energy savings of 636 kWh and 155 therms per unit, for a total savings of 72,500 kWh and 17,670 therms — about 50 mtCO<sub>2</sub>e.

- In 2010, 110 businesses participated in the city's 10 for Change program, through which they voluntarily pledged to reduce their company's energy use by 10 percent. Sixty of those businesses reduced their electricity usage by 2,130,780 kWh and their natural gas usage by 127,900 therms, leading to a reduction of 2,510 mtCO<sub>2</sub>e.
- The Small Building Tune-Up, which led to the development of commercial EnergySmart services, provided energy efficiency services to 15 buildings of less than 50,000 sq ft in late 2010. Overall, the pilot contributed to estimated annual savings of 119,700 kWh and 21,790 therms, or about 220 mtCO<sub>2</sub>e avoided. In 2011, ARRA funds will pay for this program to be expanded to 75 buildings throughout Boulder County. City CAP funds will extend the reach of this service to approximately 200 additional buildings.
- Boulder County's ClimateSmart Loan Program provided 22 energy efficiency loans comprising over \$1.4 million to Boulder businesses, nonprofits, and multi-family houses in 2010. Overall, businesses received funding for 100 energy efficiency measures, most prominently for heating, ventilation, and air conditioning (HVAC) upgrades, lighting upgrades, and roof insulation. Residents throughout Boulder County also received more than \$9.7 million in two rounds of funding for measures ranging from air sealing to whole-house fans.
- It appears that Boulder residents and businesses avoided approximately 13,000 mtCO<sub>2</sub>e by participating in Xcel's DSM programs in 2010. Data on these programs was received in mid-September 2011; analyses are underway to precisely quantify the Boulder community's participation in Xcel's DSM offerings.



## 2011 NEW CLIMATE ACTION PLAN STRATEGY PROGRESS AND PLANS

### EnergySmart

Building on the City of Boulder's new CAP strategy and its design for the new residential and commercial one-stop-shop services (formerly known as "Two Techs and a Truck"), the city coordinated with Boulder County to apply for a federal ARRA grant. In May 2010, the consortium received a \$25 million award that included \$12 million to scale up the city's programs to be countywide and \$13 million for the Denver metropolitan area to develop similar services. The purpose of this grant is to blanket the community with basic efficiency upgrades and encourage deeper retrofits where possible.

### EnergySmart Impact by end of June 2011

EnergySmart Path	In Process	Estimated mtCO <sub>2</sub> e Avoided
Residential Units	400	280
SmartRegs Units	1,480	480
Commercial Properties	> 500	1,200
<b>TOTAL</b>	<b>2,380</b>	<b>1,960</b>

In January 2011, the new EnergySmart suite of building efficiency services launched throughout Boulder County. EnergySmart services provide efficiency solutions for residential homes whether rental or owner-occupied, commercial businesses, and property owners in Boulder, resulting in permanent improvements to Boulder's building stock.

- **Residential Services.** EnergySmart offers an energy assessment with customized recommendations for energy efficiency measures. The EnergySmart energy advisor quickly installs low-cost measures — such as compact fluorescent light bulbs (CFLs), water-saving showerheads, faucet attachments, and water heater pipe insulation — and assists the property owner to pursue rebates, financing, and contractor selection. From December 2010 through June 2011, nearly 400 Boulder residents enrolled in the residential EnergySmart program, with over 60 percent of the homeowners undertaking at least one upgrade beyond the "quick installs" that were made at the time of the audit. This has resulted in estimated annual savings of 153,790 kWh and 32,970 therms, with 280 mtCO<sub>2</sub>e avoided. Based on increased participation in recent months, by the end of 2012 as much as





6,000 mtCO<sub>2</sub>eT could be avoided through owner-occupied EnergySmart services (see **Appendix B**). Boulder residents have also received over \$438,000 in rebates and micro-loans for efficiency improvements.

- **SmartRegs Services.** In addition to the owner-occupied residential properties described above, residential rental property owners can participate in the EnergySmart services if they choose. This helps them take the first step to comply with the city's [SmartRegs efficiency requirements](#). Each property owner is assigned a licensed SmartRegs inspector and an EnergySmart advisor, who completes quick installs and assists the property owner to make cost-effective investments aimed toward SmartRegs compliance.
- **Commercial Services.** Commercial services are offered throughout Boulder County in three tiers to help diverse businesses and property owners make appropriate upgrades. The "Discover" tier provides businesses and commercial property owners with low and no-cost energy-saving equipment and education. The "Optimize" tier brings in contractors to tune-up existing building equipment and install new components, such as programmable thermostats. The "Upgrade" tier offers energy advising services and helps businesses and property owners replace old or inefficient equipment with new, efficient equipment using time-limited rebates and tax incentives. From December 2010 through June 2011, 379 Boulder businesses and commercial property owners completed the "Discover" tier (with 259 receiving quick installs), 24 completed the "Optimize" tier, and 116 completed the "Upgrade" tier. This has resulted in an estimated 1,616,390 kWh and 14,150 therms of annual energy savings, with 1,214 mtCO<sub>2</sub>e avoided. Boulder businesses and property owners have also received over \$82,000 in rebates for lighting, mechanical equipment, and other upgrades.

The EnergySmart services are subject to continuous improvement, and the city is working to roll out the small building tune-up service to at least one-third of Boulder buildings in 2011 and 2012. More detailed information will be available in quarterly updates and in the 2011 progress report.

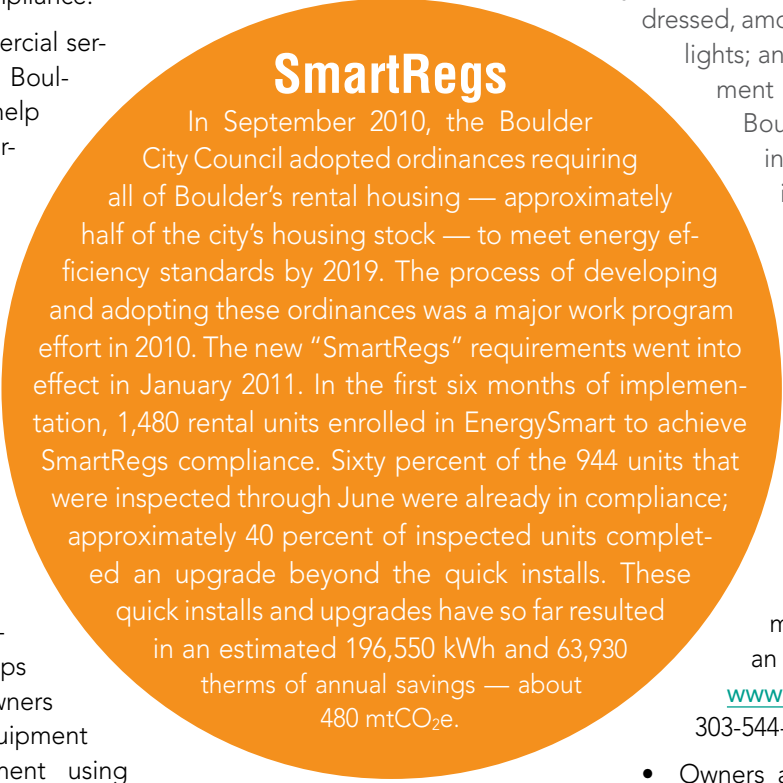
### Commercial Property Owners

The city continues to work to improve commercial energy efficiency services. In May 2011, city staff facilitated a work session

with large commercial property owners to determine how best to increase their access to energy efficiency improvements. Results from that session are helping the city develop a suite of business and commercial energy efficiency services specifically tailored for tenant-occupied space under general management.

### Xcel Demand-Side Management Programs

The city regularly participates in dockets at the Colorado Public Utilities Commission (PUC) to influence the development of Xcel's demand-side programs, which affect residents, businesses, and city operations. In 2010, these dockets included Xcel's SmartGridCity pricing pilot; a smart meter data privacy docket; traffic signal tariff dockets that addressed, among other issues, the use of LED lights; and Xcel's demand side management (DSM) strategic issues docket. Boulder continues to participate in these dockets in 2011 and will intervene in other dockets that address Xcel's energy efficiency and demand response programs.



**SmartRegs**  
In September 2010, the Boulder City Council adopted ordinances requiring all of Boulder's rental housing — approximately half of the city's housing stock — to meet energy efficiency standards by 2019. The process of developing and adopting these ordinances was a major work program effort in 2010. The new "SmartRegs" requirements went into effect in January 2011. In the first six months of implementation, 1,480 rental units enrolled in EnergySmart to achieve SmartRegs compliance. Sixty percent of the 944 units that were inspected through June were already in compliance; approximately 40 percent of inspected units completed an upgrade beyond the quick installs. These quick installs and upgrades have so far resulted in an estimated 196,550 kWh and 63,930 therms of annual savings — about 480 mtCO<sub>2</sub>e.

## RESOURCES

### For Residents

- Receive an **EnergySmart Assessment** for your home, with personal assistance on measures and rebates from an Energy Advisor. Sign up at [www.EnergySmartYES.com](http://www.EnergySmartYES.com) or call 303-544-1000.
- Owners and managers of rental housing can receive energy assessments and assistance to comply with **SmartRegs**. To sign up, visit [www.EnergySmartYES.com](http://www.EnergySmartYES.com) or call 303-544-1000.
- **Low-income residents** have access to weatherization assistance through several channels. Visit [www.rechargecolorado.com](http://www.rechargecolorado.com) or [www.bouldercounty.org/hhs/energyconservation](http://www.bouldercounty.org/hhs/energyconservation) for more information.
- **Energy Efficiency Rebates.** Even if homeowners are not participating in EnergySmart, they also have access to diverse rebates for purchasing energy efficient products through the City of Boulder, Xcel, and the Governor's Energy Office. The Governor's Energy Office offers an "Energy Action Planner" that helps you choose an energy-efficiency plan, provides tips, and connects you to rebates. For more information, visit [www.bouldercolorado.gov/LEAD](http://www.bouldercolorado.gov/LEAD), [www.xcelenergy.com](http://www.xcelenergy.com) and [www.rechargecolorado.com](http://www.rechargecolorado.com).

### For Businesses

- Receive an **EnergySmart Assessment** for your business, with assistance tailored to your needs. To sign up, visit [www.EnergySmartYES.com/business](http://www.EnergySmartYES.com/business) or call 877-505-6722.
- The **10 for Change program** gives Boulder businesses tools to meet a pledge of at least 10 percent energy reduction. This program is funded through the CAP tax, and 10 for Change helps businesses build a baseline and choose sustainability actions. For more information, visit [www.10forChange.net](http://www.10forChange.net).
- **Partners for a Clean Environment (PACE)** provides local businesses with free technical assistance to improve their zero waste management and water conservation. It also links businesses to the proper EnergySmart tier of services. For more information, visit [www.pacepartners.com](http://www.pacepartners.com).
- **Energy Efficiency Rebates.** Businesses have access to diverse rebates for purchasing energy-efficient products through the City of Boulder, Xcel, and the Governor's Energy Office. For businesses that participate in EnergySmart services, the rebates will be managed by an Energy Advisor. For more information, visit [www.bouldercolorado.gov/LEAD](http://www.bouldercolorado.gov/LEAD), [www.xcelenergy.com](http://www.xcelenergy.com) and [www.rechargecolorado.com](http://www.rechargecolorado.com).



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### APPROACH

- Maximize opportunities for energy efficiency in new buildings. Energy efficiency is most effective when it is designed into buildings from the beginning rather than as the result of retrofits. Boulder's Green Building and Green Points program, implemented in 2008, was updated in 2009. Boulder's Planning and Development Services Center has a goal of carbon neutrality for all new construction by 2030.

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### 2010 PROGRAMS AT-A-GLANCE

- Residential construction included 81 single-family dwellings and 12 multifamily buildings — adding more than 450 new residential units — and around 170 remodels or additions, all of which had to comply with the Green Building and Green Points code. As compared to conventional construction, these energy-efficient projects will avoid an estimated 1,100 mtCO<sub>2</sub>e annually.
- Non-residential construction included 19 buildings, ranging from parking garages to banks. By meeting Boulder's requirement for 30 percent more energy efficiency than the base code, these construction projects are avoiding an estimated 3,900 mtCO<sub>2</sub>e each year compared to conventional construction.

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### 2011 NEW CLIMATE ACTION PLAN STRATEGY PROGRESS AND PLANS

#### Boulder Housing Partners

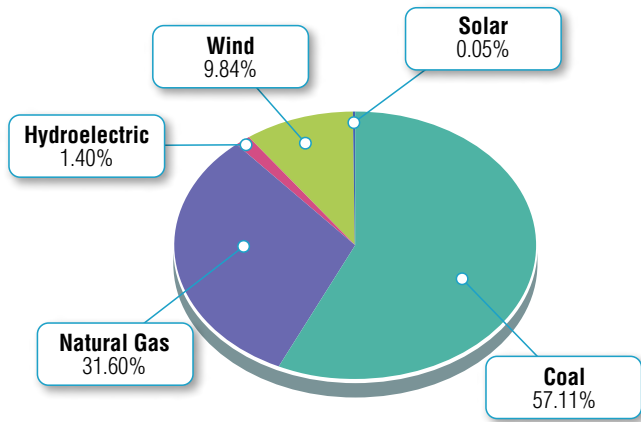
In 2009, the [Boulder Housing Partners'](#) (BHP) Board of Commissioners adopted a motion that BHP seek to become the first net-zero housing authority in the US. BHP is pursuing this goal as it builds new energy efficient housing and renovates older units. In August 2011, BHP opened Red Oak Park, an affordable community with 59 units. These green-built units include highly efficient walls, windows, and climate controls, as well as ENERGY STAR appliances. Red Oak Park also includes 130 kW of on-site solar PV.

#### Commercial Energy Conservation Ordinance

Not all prospective buyers or tenants consider a building's energy consumption when they select a business site to lease or purchase. The city is considering how best to provide commercial property owners, managers, brokers, and tenants with information they can use to choose energy-efficient worksites and to invest in energy-efficiency measures. Toward this end, the city is



## Boulder's Electricity Resource Mix



collaborating with public, private, and institutional partners to provide tailored energy efficiency education services to commercial building stakeholders.

### RESOURCES

#### For Residential and Commercial Developers:

- Information on the **Green Building and Green Points Program** is available at [www.bouldergreenpoints.com](http://www.bouldergreenpoints.com).
- Information on permits issued in Boulder can be found at [www.boulderplandevlop.net](http://www.boulderplandevlop.net).

*New solar PV array at Boulder Community Hospital, part of Boulder's 11.3 MW of site-based solar generation*



### APPROACH

- Promote use of renewable energy sources for individual buildings and sites.
- Increase renewable sources in our regional energy supply.

While the first two strategy areas focus on changes to energy demand, Ramp Up Renewables looks at the energy supply. Just over 57 percent of Boulder's electricity is currently sourced from coal and another 32 percent comes from natural gas. Reducing carbon emissions requires shifting this generation portfolio from fossil fuels toward lower carbon fuels and renewable resources and increasing the rooftop solar and on-site wind and geothermal heating to diversify the sources of our power.

Boulder is doing its part locally by generating power from solar panels, wind turbines, and hydroelectric plants. With more than 300 sunny days annually, Boulder's best option for renewable energy may be sunlight. Residents, businesses, and the city have all contributed to the installation of more than 11.3 MW of solar photovoltaics (PV) throughout Boulder. As pointed out at the beginning of this report, that represents the highest per-capita installed solar capacity of any city in the US.

However, most of the renewable energy reflected in the CAP inventory comes in the form of renewable energy credits (RECs), which represent the "green attributes" of electricity (see **Appendix A** for more information). While these RECs contribute to a large carbon reduction in the city's inventory, they represent a one-time buy-down of the problem rather than a lasting means to reduce our emissions.

### 2010 PROGRAMS AT-A-GLANCE

- Approximately 2,360 kW of solar PV were permitted in 2010, with an estimated annual generation of 3.44 million kWh and avoided emissions of 2,420 mtCO<sub>2</sub>e. This represents a 30 percent increase over 2009, in which 1,810 kW of PV were permitted.
- A considerable amount of this PV resulted from the efforts of Boulder Housing Partners, which installed 325 kW of solar PV on six affordable developments in 2010.
- The Solar Grants Committee, composed of community members and city and county staff, awarded just over \$64,000 from city sales tax grant funds in 2010. This funding contributed to the installation of approximately 82 kW of solar PV on local nonprofits and affordable housing.
- The solar rebate program offers a sales and use tax rebate of approximately 15 percent on qualifying solar PV and solar

thermal installations. In 2010, 44 rebates totaling \$5,650 were issued for 235 kW of solar PV and 130 kBTU of solar thermal.

- In 2010, the city received 23,675,973 kWh of RECs from electricity generation at seven local hydroelectric plants, an increase of 8 percent over 2009 production. This represents an emissions reduction of 16,690 mtCO<sub>2</sub>e.
- In 2010, 34,407,422 kWh of RECs were purchased in Boulder through Windsource, Xcel's green pricing program. Although this represents a decrease of 2 percent from 2009, these purchases translate into an emissions reduction of 24,255 mtCO<sub>2</sub>e in 2010.
- In 2010, Boulder residents and businesses purchased 28,998,789 kWh of RECs — an emissions reduction of 19,990 mtCO<sub>2</sub>e — from local REC providers, not including Windsource, 26 percent more than were purchased in 2009.
- The city has some ability to influence the community's energy supply by becoming involved at the Colorado Public Utilities Commission (PUC). In 2010, Boulder participated in dockets related to the Clean Air, Clean Jobs Act and the implementation of new requirements for investor-owned utilities due to changes in the state Renewable Energy Standard.
- The city is also very involved in state legislative efforts. In 2010, city staff worked to build a coalition for the successful "Solar Gardens" legislation that allows residents and businesses to invest in solar PV even if their own property is not available for a site-based PV array.

## 2011 NEW CLIMATE ACTION PLAN STRATEGY PROGRESS AND PLANS

### Hydroelectric Power

The city operates seven [hydroelectric plants](#) from which Xcel has contracted to purchase electricity to help it meet requirements under Colorado's Renewable Energy Standard. However, based on a legal settlement, the City and Xcel split ownership of the RECs equally and Xcel retires Boulder's share through the WREGIS REC-tracking system. As these contracts expire over the next few years, Boulder may seek new options for its hydroelectric resources.

### Community Solar Gardens

In 2010, the State of Colorado passed [HB 10-1342](#), allowing the state's residents and businesses the opportunity to develop and participate in community solar gardens by purchasing subscriptions to a portion of the output of a "garden" of solar panels. While solar gardens have been implemented throughout the US, including in Colorado, these new gardens will be Colorado's first in Xcel's service territory. Several groups are currently working on plans to develop solar gardens in Boulder.

### Influencing the Supply Side

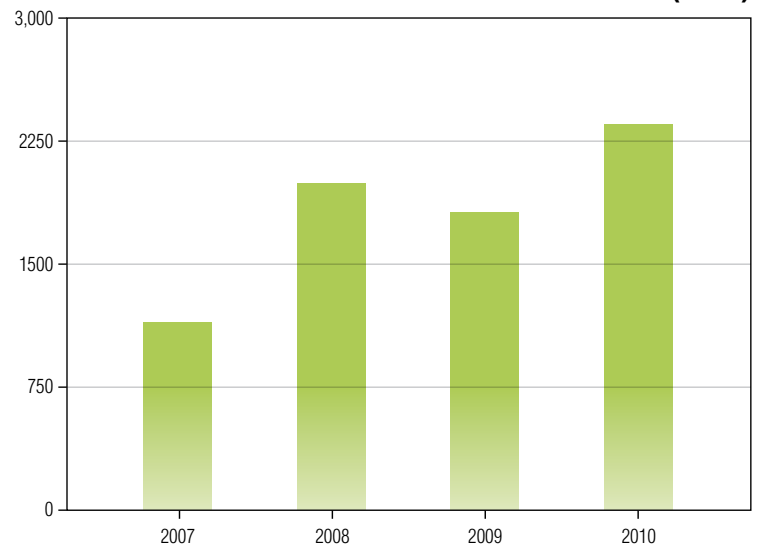
Boulder continues to monitor or participate in PUC dockets related to community solar gardens, Xcel's compliance with the state

Renewable Energy Standard, as well as Xcel's resource planning dockets. The decisions that are made at the PUC are based on a statewide picture of the resources needed.

### Energy Localization

In 2011, the city contracted for studies on Boulder's baseline energy consumption and the potential for localizing its clean energy supply. The [baseline report](#) assesses Boulder's current and historical energy resource mix, consumption patterns, and access to green energy programs — information that will help inform further climate action planning. The [localization report](#) further highlights opportunities for developing local power resources from within the Denver-Boulder metropolitan region and innovative ways to make Boulder's energy supply cleaner.

## Solar PV Permitted in Boulder 2007-2010 (MW)



## RESOURCES

### Adding Renewable Resources

- Ordinance 2487 (2006) established **solar rebate and grant funds** out of a portion of city sales taxes. For more information, visit [www.bouldercolorado.gov/LEAD](http://www.bouldercolorado.gov/LEAD).
- Colorado residents and businesses can qualify for **performance-based incentives** and RECs under Xcel's Solar\*Rewards program when they install solar PV. For more information, visit [www.xcelenergy.com](http://www.xcelenergy.com).

### Purchasing RECs and Offsets

- **Windsource** is Xcel's voluntary green pricing program, through which residents and businesses can purchase blocks of renewable energy up to 100 percent of their electricity bills. For more information on Windsource, visit [www.xcelenergy.com](http://www.xcelenergy.com).
- To learn more about **REC and carbon offset programs**, visit the Governor's Energy Office's Colorado Carbon Fund at [www.coloradocarbonfund.org](http://www.coloradocarbonfund.org).



## STRATEGY AREA 4 TRAVEL WISE

### APPROACH

- Increase the percentage of trips made by transit, bike, and walking.
- Encourage the use of low-emission vehicles.

Boulder residents, workers, and students are committed to sustainable transportation options: they navigate the city by bike, bus, foot and alternative fuel vehicle. Since 1990, Boulder has seen a 15 percent decline in single-occupant car trips — with a 75 percent increase in bicycle travel and a 300 percent increase in bus travel. In 2009, Boulder workers commuted by bicycle at a rate 20 times the nation's average,

People with Eco Passes are five to nine times more likely to use the bus than those without.

making use of the city's ever-expanding network of multi-use paths and bicycle facilities, which now includes more than 150 miles of roads with bikeways and 76 underpasses (including two that opened in 2010). The city helps fund alternative transportation options ranging from local bus service to bicycle sharing.

Transportation accounts for approximately 21 percent of greenhouse gas emissions in Boulder, creating substantial opportunities for emissions reductions. Boulder's transportation emissions are calculated based on annual vehicle miles traveled (VMT) within the Boulder Valley, categorized by the class of vehicle and type of fuel. Because the Denver Regional Council of Governments (DRCOG) did not model Boulder-specific VMT data for 2010, the inventory continues to use the 2009 figure of 2.46 million VMT daily. The city expects to receive updated VMT figures from DRCOG later in 2011.

Despite the fact that the underlying VMT data is unchanged for 2010, transportation-related emissions increased by just under one percent compared to 2009, likely due to a small increase in the number of trucks, vans and sports utility vehicles proportionate to other vehicle classes.

### 2010 PROGRAMS AT-A-GLANCE

- In 2010, nearly 80,700 gallons of biodiesel were purchased in Boulder, an increase of 28,800 gallons — or 55 percent — over 2009. Ethanol purchases also increased by 2 percent from 2009 to 2010.
- Experience shows that people with Eco Passes are five to nine times more likely to use the bus than those without. In 2010, 67,580 Eco Passes were available to Boulder employees, neighbors, and university students, compared to 68,270 in 2009. Specifically, 6,430 households in 38 neighborhoods were eligible for Neighborhood Eco Passes, 29,460 employees working for more than 1,300 employers were eligible for Business Eco Passes, and approximately 32,000 university students had access. GO Boulder has calculated that each Eco Pass holder is responsible for 1.19 mtCO<sub>2</sub>e fewer emissions each year than a Boulder resident non-Eco Pass holder. Given that not everyone who is eligible for an Eco Pass actually picks one up and uses it and some Boulder residents have access to more than one pass, staff estimates that the various Eco Pass programs result in an approximate 33,000 mtCO<sub>2</sub>e reduction. Better data in this area may become available if the smartcard technology now being piloted by the Regional Transit District (RTD) proves to be successful in more accurately tracking Eco Pass utilization.
- Transit ridership declined by 3 percent in 2010, with an average of 30,400 riders daily on Boulder routes. The Community Transit Network — including the HOP, SKIP, JUMP, BOLT, DASH, BOUND, and STAMPEDE — served more than 16,500 riders daily.





The new Boulder B-Cycle station at the Main Public Library is one of 12 new stations in central Boulder.

- In collaboration with Community Cycles, GO Boulder sponsored Bike to Work Day in June 2010. More than 5,000 people biked a total of 37,500 miles — saving more than 75,000 car miles that might otherwise have been driven that day and reducing the greenhouse gases emitted that day by over 30 mtCO<sub>2</sub>e.
- October is National Walk to School Month, and in 2010, Heatherwood Elementary School won first place and \$5,000 in the national Clorox Green Works Walk to School Challenge — 138 families walked approximately 5,270 miles.

## 2011 NEW CLIMATE ACTION PLAN STRATEGY PROGRESS AND PLANS

### Eco Pass Programs for Residents and Businesses

The RTD Eco Pass programs provide cost-effective bus passes for Boulder workers, neighbors, and students. Businesses and neighborhoods spent nearly \$2.3 million of their own money on two Eco Pass programs. The Neighborhood Eco Pass (NECO) program assists Boulder neighborhoods to purchase Eco Passes — new neighborhoods joining the program receive a 50 percent subsidy the first year and an ongoing subsidy of 25 to 30 percent depending on per-household costs. GO Boulder's Business Eco Pass (BECO) support program gives employers a 50 percent rebate in the first year of offering Eco Passes to employees and a 25 percent rebate in the second year to encourage new businesses to participate. Boulder East Transportation Management Organization, which now coordinates BECO outreach and mar-

keting for the city, added more than 2,000 eligible employees in the first half of 2011 by working with new businesses. The CAP tax paid for NECO subsidies to 40 neighborhoods in 2011 to ensure that all the new neighborhoods from 2010 remained with the program for 2011. In addition, the city is investigating using a significant part of the CAP funds to pay for low-income residents and K-12 students to have access to free bus passes.

### B-Cycle Bicycle Sharing

In May 2011, [Boulder B-Cycle](#) launched 12 bike-sharing stations around Boulder. The program allows users to check out bicycles for short trips and is supported by \$250,000 in ARRA funding. B-Cycle's bright red bikes traveled over 10,000 miles within the first month of operation, an average of 119 trips daily. Over 1,860 memberships were sold in the first month, mostly for one-day use. Additional bicycle stations will be opened throughout 2011.

### Bike Corral Pilot Program

Based on a 2010 survey that showed that the demand for bicycle parking in downtown areas of Boulder exceeded supply by more than 30 percent, GO Boulder partnered with other organizations to increase bicycle parking with a Bike Corral Pilot Program. Beginning in September 2010 and continuing in 2011, two on-street parking spaces on downtown Pearl Street were replaced with bike corrals. Each corral accommodates eight bicycles. The city is gathering data on use, maintenance, traffic safety, and public opinion during the year-long pilot.

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## RESOURCES

### To Drive Less:

- GO Boulder's Transportation Demand Management (TDM) program offers customized Commute Trip Reduction programs for any Boulder business seeking to reduce vehicle trips by their employees. Visit [www.goboulder.net](http://www.goboulder.net) for more information.
- RideArrangers is a ridematching program that helps employers, employees, residents, and parents form car-pools, vanpools, and school pools. To sign up, visit: [www3.drcog.org/RideArrangers](http://www3.drcog.org/RideArrangers).

### To Walk, Bus, and Bike More:

- GO Boulder and Boulder East work with businesses and neighborhoods to initiate and maintain Eco Pass programs: [www.goboulder.net](http://www.goboulder.net).
- Donate your time and receive a bicycle through Community Cycles' Earn-a-Bike program: [www.communitycycles.org](http://www.communitycycles.org).
- Learn about bus routes and schedules through RTD at: [www.rtd-denver.com](http://www.rtd-denver.com).
- Join the Employee Transportation Coordinator (ETC) Network through GO Boulder for resources on employee commuting programs: [www.goboulder.net](http://www.goboulder.net).
- Get turn-by-turn directions on Boulder's streets and multi-use path system at [www.gobikeboulder.net](http://www.gobikeboulder.net).



## STRATEGY AREA 5 WASTE NOT

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### APPROACH

- Reduce and move toward eliminating the amount of waste going to landfills.

Landfilled solid waste composes about 2.5 percent of Boulder's greenhouse gas emissions. Decomposing landfill waste emits methane, a greenhouse gas over 20 times as potent as carbon dioxide — meaning that diverting solid waste from landfills can go a long way toward reducing overall greenhouse gas emissions. In 2006, Boulder adopted both a [Master Plan for Waste Reduction](#) and a [long-term goal](#) of becoming a zero-waste community through conservation, recycling, and careful sourcing of materials and products. Since 1989, waste reduction efforts have been funded by a trash tax on hauling companies providing residential and commercial trash collection services in Boulder. This tax now raises approximately \$1.8 million annually.

From 2009 to 2010, solid waste emissions dropped from 55,540 to 48,370 mtCO<sub>2</sub>e, a decrease of 13 percent. This is largely due to an 11,000-ton reduction in solid waste sent to landfills in 2010. Recycling and composting are also growing in proportion to landfilled waste, due in part to the widespread availability of single-stream recycling and curbside composting, which were phased in starting in 2009. Yet annual reports from haulers identified that businesses and multi-family housing continue to lag behind single-family housing in the percentage of waste diverted to recycling and composting. With the 2011 review and update of the Master Plan for Waste Reduction — now called the Zero Waste Master Plan, new goals and strategies are being considered to help Boulder address these gaps.

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### 2010 PROGRAMS AT-A-GLANCE

- In 2010, 75,450 tons of solid waste generated in Boulder was sent to landfills. This represents a decrease of 11,190 tons — 13 percent — since 2009, and a 21.4 percent decrease since 2007, when a downward trend began.
- Additionally, 34 percent of waste generated in Boulder was recycled (47,630 tons) and 12 percent was composted (16,530 tons) — leaving 54 percent to be landfilled.
- Excluding construction and demolition waste, which accounted for approximately 40 percent of the community-wide recycling in 2010 (19,510 out of 47,630 tons), 57 percent of waste from single-family homes was recycled or composted. However, only about 30 percent of commercial waste, and 19.5 percent of waste from multi-family housing, was recycled or composted.

- Approximately 5,200 tons of construction and demolition (C&D) waste were landfilled in 2010, a reduction from 6,850 in 2009. Overall, 22,450 tons of C&D waste were recycled in 2010, a diversion rate of 81 percent; of this, 19,510 tons came from University of Colorado construction projects. Excluding the university, 2,930 tons of C&D waste were recycled in 2010 compared to 980 in 2009.

## 2011 NEW CLIMATE ACTION PLAN STRATEGY PROGRESS AND PLANS

### Zero Waste Master Plan

The city's role in creating a zero-waste community focuses on providing services and incentives for waste collection; developing facilities for waste processing; adopting regulations that reduce landfill waste and remove barriers to reuse, recycling, and composting; and providing community education. The Zero Waste Master Plan will outline the community's waste reduction goals and objectives, and create a framework for making strategic decisions about waste reduction policies, programs and funding. The five-year update to the Zero Waste Master Plan is underway in 2011. More information is at: [www.bouldercolorado.gov/LEAD/wastereduction](http://www.bouldercolorado.gov/LEAD/wastereduction).

### Centralizing Waste Reduction

To co-locate many of the community's recycling and reuse facilities, in August 2010, the City Council approved the purchase of property at 6400 Arapahoe Ave. for the creation of a one-stop waste reduction site that will house organizations including Resource (operated by the Center for Resource Conservation), the Center for Hard to Recycle Materials (CHaRM) (operated by Eco-Cycle), and the Eco-Cycle offices. Additionally, assisted by city funding, Boulder County's new Hazardous Materials Management Facility (HMMF) is now open for hazardous waste drop-off from residents and businesses. These new facilities help create a unified waste reduction area that will provide community recycling, composting, and disposal services.

### Waste Reduction Technical Assistance for Businesses

The city offers free zero-waste technical assistance, including waste audits, educational services, and signs to Boulder businesses through the Partners for a Clean Environment (PACE) program. In 2010, PACE conducted 121 site visits and 17 zero-waste audits in the city. This type of waste audit entails a survey of a business' waste containers prior to collection and records the amount and type of waste produced over a two-week period. PACE zero waste and commercial EnergySmart advisors each refer their clients to the other program to promote more comprehensive services to businesses. PACE also recognizes businesses that divert at least 70 percent of their waste

From 2009 to 2010, solid waste emissions dropped from 55,540 to 48,370 mtCO<sub>2</sub>e, a decrease of 13 percent.





from the landfill by composting and recycling with the Zero Waste Area of Excellence.

### Construction & Demolition Waste

The Green Building and Green Points Program is a city regulation that requires new residential construction projects to recycle at least 50 percent of construction waste and residential full-demolition projects to recycle and/or reuse 65 percent of their waste. According to annual haulers' reports, the Boulder community generally recycles 1,000 to 2,000 tons of C&D waste each year. University of Colorado construction projects added more than 11,000 tons of recycled C&D waste in 2006 and 19,000 tons in 2010.

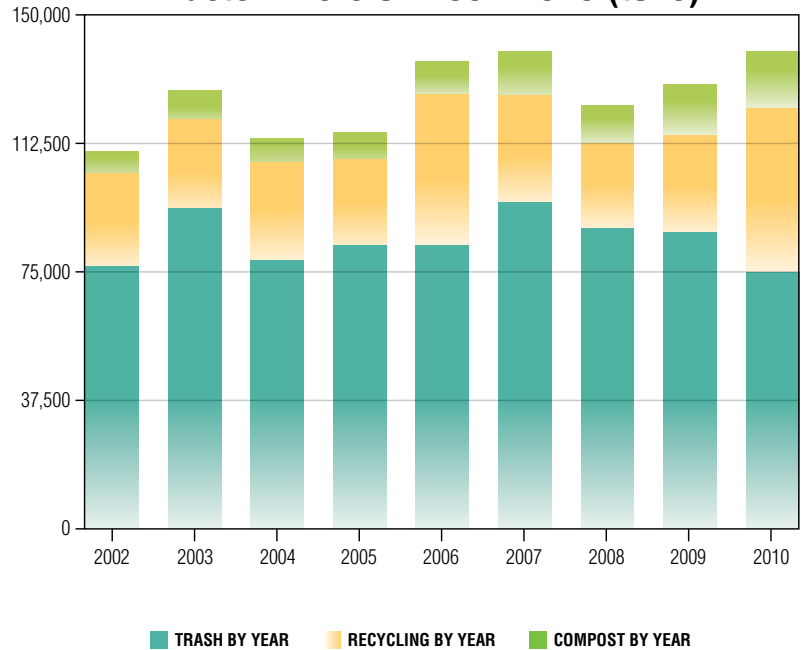
## RESOURCES

### For Residents and Students in Single-Family and Multi-family Housing

- Recycling and compost collection guidelines can be obtained from your waste hauler, with printable guidelines available on most haulers' websites. Boulder County



## Waste Diversion 2002-2010 (tons)



provides comprehensive guidance to waste disposal at: [www.bouldercounty.org/sustain/zerowaste/](http://www.bouldercounty.org/sustain/zerowaste/).

- With funding from the city, the nonprofit Eco-Cycle provides low-cost recycling services for scrap metal, electronics, unusual plastics, and other materials at its **Center for Hard-to-Recycle Materials (CHaRM)**: [www.EcoCycle.org/charm/](http://www.EcoCycle.org/charm/). General information about hard-to-recycle materials can be found at [www.EcoCycle.org](http://www.EcoCycle.org).
- **University of Colorado students** can learn more about waste management and reduction through the Environmental Center, which also provides outreach to student housing through Green Teams: [ecenter.colorado.edu/recycling](http://ecenter.colorado.edu/recycling).
- Guidance on residential **construction and demolition waste** management and recycling is available at: [www.bouldergreenpoints.com](http://www.bouldergreenpoints.com).
- Learn about the **6400 Arapahoe** project at: [www.bouldercolorado.gov/LEAD](http://www.bouldercolorado.gov/LEAD).

### For Businesses

- **Information on City of Boulder programs**, including the Zero Waste Start-Up Rebate, the Business Recycling Coupon, the Commercial Compost Incentive, and PACE Zero-Waste Technical Assistance and Certification is available at: [www.bouldercolorado.gov/LEAD](http://www.bouldercolorado.gov/LEAD).
- **Recycling** and compost collection guidelines can be obtained from your waste hauler, with printable guidelines available on most haulers' websites. PACE Zero-Waste Advisors can also provide guidelines and signage for your business.



## APPROACH

- Plant more trees and protect the existing urban forest.

Trees reduce the harmful effects of greenhouse gases by sequestering CO<sub>2</sub> and creating shade and wind protection that reduce building energy needs. Other benefits include improving our air, protecting our water, reducing stormwater runoff, and improving economic sustainability. Moreover, they enhance the charm of our urban areas and keep our parks and natural areas lush.

Boulder is home to more than 100 species of trees lining residential and commercial areas, city parks, greenways, and open-space areas. In 2005, the [US Forest Service](#) estimated that the city's urban forest created over 4,000 mtCO<sub>2</sub>e reduction through both carbon sequestration and energy use reduction. While the Boulder community inventory does not currently account for tree planting as a form of carbon sequestration, continuing to maintain and expand tree cover can contribute not only to reduced carbon emissions and energy use, but also to enhancing Boulder's livability.

## 2010 PROGRAMS AT-A-GLANCE

- In 2010, the city Parks & Recreation Urban Forestry staff and volunteers planted 411 trees on city property, including parks, rights-of-way, and medians. This includes 155 trees in residential areas, 56 in the Downtown Boulder Improvement District, and 200 trees planted in city parks. With a tree replacement ratio of 1.4:1 compared to 1:1 in 2009, the Urban Forestry section is getting closer to its internal goal of a 2:1 tree replacement ratio.
- Thirty of the trees planted in 2010 were cherry trees planted at Scott Carpenter Park. They were donated by the Boulder Yamagata Sakura Project to support Boulder's Sister City relationship with Yamagata, Japan.
- As part of the Trees Across Boulder program, Forestry provided 100 trees for sale to residents through the Center for ReSource Conservation.
- Boulder has 83 trees on the Colorado Tree Coalition's State Champions list, with eight new trees submitted in 2010.
- Currently, Boulder has over 11,000 square feet of green roofs, and the city's development review staff encourage new developments to consider adding green roofs when and where appropriate.

Currently,  
Boulder has over  
11,000 square feet  
of green roofs.



## 2011 NEW CLIMATE ACTION PLAN STRATEGY PROGRESS AND PLANS

### Urban Forestry Tree Planting Programs

The City of Boulder Urban Forestry section manages approximately 26,000 street trees and 10,000 park trees in Boulder. It is committed to maintaining a healthy and safe urban forest as well as preserving an extensive and diverse tree cover for future generations. Forestry manages the Street Tree Planting Program for commercial and residential areas to increase Boulder's tree cover, in addition to maintaining tree health and providing emergency response in major weather events. The [2006 Parks & Recreation Master Plan](#) paves the way for an upcoming urban forest management plan that will articulate long-term goals and prioritize future tree planting opportunities.

### The Mile High Million

The Mile High Million program, an initiative of Greenprint Denver, set a goal of planting one million trees in metropolitan Denver by 2025. In partnership with the U.S. Forest Service, the Mile High Million program will complete a tree canopy assessment in 26 metropolitan area communities, including Boulder. This project will assess current tree canopy cover, identify potential new planting sites, and quantify ecosystem services provided by the current urban forest. Mapping is anticipated to be complete by late 2011/early 2012.

## Greening the Hill

In 2010 and to date in 2011, Forestry staff identified good planting sites on University Hill, reached out to individual property owners, planted more than 130 trees and watered the trees to help get them established. Forestry staff continues to reach out to parts of Boulder with high proportions of renters, who may not otherwise request tree planting.

## RESOURCES


- The City of Boulder **Urban Forestry Section** is responsible for tree planting, protection, inspection, removal, and emergency response. Visit [www.bouldercolorado.gov](http://www.bouldercolorado.gov) > Parks & Recreation > Urban Resources > Forestry.
- Help achieve the **Mile High Million Program's** goal of planting one million trees in the metropolitan area. Find out more at [www.milehighmillion.org](http://www.milehighmillion.org).
- Learn about notable local trees through the **Colorado Tree Coalition** at [www.coloradotrees.org](http://www.coloradotrees.org).

# CITY OPERATIONS

## APPROACH

- Demonstrate leadership by implementing a wide range of facility, fleet and organizational practice improvements that achieve meaningful greenhouse gas reductions in an economically viable manner.

While city operations represent only about 2 percent of overall emissions in the Boulder community, even small reductions — when aggregated — can lead to large results. The city feels strongly that it must act as a model for emissions reductions. City staff is working to reduce internal energy consumption, vehicle fuel emissions, and landfilled waste. The city's approach to greenhouse gas reductions from electricity and natural gas is led by the Energy Strategy Team (EST), an interdepartmental group formed in 2008. In 2010, the EST began developing a greenhouse gas inventory that will enable the city to continue to develop and improve upon city operations emission reduction targets and measures. Currently, a baseline inventory is under development, using emissions data from 2007 to 2009. While most of the city's currently accounted-for emissions are due to electricity consumption — about 80 percent — this baseline is being expanded to include broader emissions such as solid waste, employee commuting and travel, and purchasing patterns. Staff will use this data to develop an Energy Strategy Action Plan for City Operations. This plan can be used as a foundation for the community-wide conversation in 2012 to investigate new inventory metrics and evaluate the future of the community CAP strategy.



The city fleet's vehicle miles traveled (VMT) for 2010 was 2,638,187. This represents a 3 percent decrease since 2009 and a 31 percent decrease from 1995.

## 2010 PROGRAMS AT-A-GLANCE

- As part of Energy Awareness Month in October 2010, the city launched the Power Down campaign to encourage employees to turn their computers off overnight. While 60 percent of regularly used city computers were left on overnight before the month-long campaign, only 23 percent were left on overnight by the end — a reduction of 360 energy vampires.
- The city fleet's vehicle miles traveled (VMT) for 2010 was 2,638,187. This represents a 3 percent decrease since 2009 and a 31 percent decrease from 1995, the highest year on record for city VMT.
- From 2009 through June 2011, 100 percent of new fleet vehicle purchases were alternatively fueled — including biodiesel, electric, and ethanol fuels. Currently, the city has 234 alternative fuel vehicles, totaling 55 percent of the fleet. This includes 37 hybrid vehicles, 98 vehicles that run on 85 percent ethanol, 94 vehicles that run on a 20/80 biodiesel/diesel mix, and five that run on propane.

- In 2010, the city recycled an estimated 72 tons of single-stream paper and containers, a 40 percent decrease from 2009 — but composted 51 tons, an increase of 223 percent from 2009. With 895 tons of waste annually, the city's diversion rate is 12 percent. Further, the city implemented "paperless packets" with a number of its boards and commissions in 2010 – an effort continuing in 2011 – helping to avoid creating paper waste in the first place.
- Eco Passes continued to be available to all city employees in 2010.

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## 2011 NEW CLIMATE ACTION PLAN STRATEGY PROGRESS AND PLANS

### City Facilities

The city has more than 330 facilities totaling over 12.8 million square feet. These facilities use more than 31 million kWh and almost one million therms annually. In 2009, the city entered into an energy performance contract (EPC) to upgrade 66 city facilities in three phases with a goal of reducing the city's overall greenhouse gas emissions by 20 percent. Phases I and II will be complete in late 2011 and have guaranteed annual energy savings of more than \$500,000 with a resulting decrease of 17 percent in greenhouse gas emissions. In addition to weatherizing 43 buildings, replacing boilers and chillers, and upgrading lighting across facilities, 711 kW of solar PV and solar thermal systems will be installed on city buildings. Phase III, to be implemented in 2011-2012, will include another 350 kW of solar PV, additional lighting and HVAC efficiencies, and comprehensive education

for city employees to promote energy efficiency with more advanced building automation systems.

Under Phases I and II of the EPC, the city is guaranteed annual savings of at least 5,740,100 kWh, 163,500 therms, and 2,790 kilogallons of water. These savings will be used to pay back the upgrades, which are also funded by Energy Efficiency Conservation Block Grants, the Colorado Carbon Fund, Xcel's Solar\*Rewards rebates, and a Qualified Energy Conservation Bond. Performance so far indicates that while electricity savings were projected to be around 20 percent, they are closer to 25 percent, meaning utility savings could be higher than the \$507,500 per year that was estimated for the first two phases. Phases I and II are projected to reduce the city's emissions by 5,770 mtCO<sub>2</sub>e annually, with possibly an additional 2,000 mtCO<sub>2</sub>e for Phase III.

### Fleet Services

[Fleet Services](#) coordinates fleet acquisition, repairs, and maintenance for all of the city's vehicles and equipment. The city fleet includes 424 vehicles and more than 500 other types of equipment. In 2006, Fleet Services met its internal goal to reduce emissions by 7 percent below 1990 levels. It has maintained progress into 2011 both by acquiring alternative fuel vehicles and by reducing vehicle miles traveled. Fleet Services is also exploring advanced electric vehicle technologies as part of the Smart Grid Plug-in Electric Hybrid project. In partnership with Boulder County and the University of Colorado, and supported by federal grants through the Department of Energy, the city will expand its electric vehicle infrastructure and test vehicle-to-grid technologies, vehicle-to-building interfaces, and solar PV-connected charging, all using technologies being developed by local companies. The first two of as many as 40 electric vehicle charging stations were

*Solar thermal system at South Boulder Recreation Center.*



installed at the South Boulder Recreation Center in August 2011. The remaining infrastructure is scheduled for installation through March 2012.

### Waste Reduction

The city has had an Environmental Purchasing Policy since 2002, and is currently considering updates to it. As part of the City Organization Zero Waste Program, as of June 2011, more than 45 city facilities participated in single-stream recycling and composting.

### RESOURCES

- To learn more about the city's **Energy Performance Contract**, visit: [www.bouldercolorado.gov/publicworks/EPC](http://www.bouldercolorado.gov/publicworks/EPC).
- For more information on the **Smart Grid Plug-in Electric Hybrid project**, visit: [projectgetready.com/city/partner-city/greater-denver-colorado](http://projectgetready.com/city/partner-city/greater-denver-colorado).
- To monitor the **performance of the city's solar panels**, visit [www.egauge.net/devices/](http://www.egauge.net/devices/) and select the devices labeled "CoB."

*Celebrating the installation in city facilities of over 700 kW of site-based solar PV, solar thermal systems for two city pools, energy efficiency measures and 2 of 40 planned electric vehicle charging stations.*



# REGIONAL SUSTAINABILITY

### APPROACH

- Engage with local and regional partners to advance the Boulder community's climate action objectives and serve as a leader for broader change.

The Boulder community — home to a flagship university, national labs, vibrant industry, and cleantech innovation — influences sustainability efforts at the state and federal levels, often through partnerships with other local governments. The following section describes some efforts underway in the community that have the potential to affect regional issues and spur broader action on climate change issues.

### INNOVATION AND FORESIGHT

#### Climate Change Adaptation

To effectively address the challenges that a changing climate could bring, the city began collaborating with Boulder County in 2010 to start the process of developing a [Climate Resiliency Strategy](#). The strategy development process will consider the city's and region's ability to manage climate risks through adaptation, taking into consideration factors such as economic resources, technology, infrastructure, institutional support and effective governance, public awareness, access to the best available scientific information, natural resources management, and equity in access to these resources. The process will also summarize the best-known science on climate change impacts in order to assess vulnerabilities and to outline possible solutions that can foster resiliency.

#### Boulder Valley Comprehensive Plan

The [Boulder Valley Comprehensive Plan](#) (BVCP) is a joint plan between the city and Boulder County, providing shared land use decision-making in the Boulder Valley. The BVCP 5-year update was completed by the city in 2011. It includes goals that continue to protect the Boulder Valley's natural environment while ensuring it remains livable, vibrant, and sustainable. The major update incorporated a number of climate action goals into the core policies of the plan, laying the groundwork for the city's different master plans to carefully consider the ways in which they intersect with and affect the community's climate action objectives.

#### Boulder's Energy Future

By passing the Climate Action Plan tax in 2006, Boulder made a commitment to reducing its carbon footprint in response to the climate change crisis. The city wants to ensure that it is planning for an [energy future](#) that is both economically sustainable

# SOCIAL MOBILIZATION

## APPROACH

- Collect input from our community to help shape policies, services, and plans.
- Educate the public about sustainability options and services through community events and local non-profit organizations.
- Mobilize residents and businesses to take part in Boulder's climate action efforts.

Full engagement is critical to reaching our community's climate action goals. The city collects input from the public to shape Boulder's policies and programs and better serve our residents and businesses.

In 2010, Boulder renewed its commitment to community engagement and worked with more than 60 community members on a regular basis to connect our services with residents' lifestyles. Over the course of 2010, six "[CAP technical teams](#)" met to develop the details of new and enhanced programs and services; and Boulder's Energy Future project was launched. Throughout 2011, The [Environmental Advisory Board](#) and the Clean Energy Technical Team continued their roles as consultants and eyes-on-the-ground to help the city refine its programs and services.

Also in 2010, rather than hosting gatherings to collect input from the community, city staff placed themselves where residents spend their time, like the grocery store, the library, the soccer fields, coffee shops, and at local group meetings. In doing so, the city informed the public about Boulder's climate action efforts at the Boulder Farmer's Market and Open Space and Mountain Parks' popular Meadow Music events as well as bike races, fundraisers, neighborhood meetings, and large events like the Hometown Fair, Fall Festival, and Open Arts Festival.

## ENGAGING THE COMMUNITY

The city continues to partner with local organizations and events to effectively reach and mobilize a diversity of groups. These joint efforts include partnerships with:

- **University of Colorado at Boulder.** CU-Boulder is home to 30,000 undergraduates, accounting for roughly one-third of the Boulder population. To reach this significant portion of our community, the city funds several different programs that are run out of the CU Environmental Center: the CU Energy and Water Green Teams and the CU Recycling Green Teams allows student employees and volunteers to reach out to their peers.

and environmentally responsible. In the process of restructuring the CAP strategy, it became apparent that conservation and efficiency demand-side programs could, at best, address a portion of the problem. Beginning in 2010 and continuing into 2011, the city engaged in a process to more carefully consider its options related to its current and future energy supply. That effort resulted in significant new information and understanding, as well as two ballot options that will be considered by Boulder voters in November 2011. Regardless of the outcome of those specific measures, the city will continue to pursue the overall policy objective of ensuring that Boulder customers have access to power that is reliable, competitively priced and increasingly clean.

### ICLEI Star Community Designation

In conjunction with the city's efforts to more comprehensively track diverse sustainability indicators and to make them more transparent and meaningful to the community, Boulder has been named a beta community in the [Local Governments for Sustainability \(ICLEI\) Star Community Index](#) pilot. This pilot will develop and test approximately 80 different sustainability indicators that can be used for tracking and reporting.

### IBM Smarter Cities Challenge

The City of Boulder was one of 24 cities to earn a grant from IBM in 2011 as part of IBM's philanthropic efforts to "contribute to the improvement of high-potential cities around the world." During a 3-week period in May 2011, a team of six IBM executives worked in the city to develop and deliver their [recommendations](#) on the utilization of Xcel's SmartGridCity™ to achieve Boulder's community energy objectives. The team's conclusion was that the infrastructure installed by Xcel provides a potential value to Boulder, but that this value has not yet been visible or directly benefitted Xcel's customers. The infrastructure was deemed to require significant supplemental functionality to realize customer benefits or increased renewable energy penetration on the grid. The information provided by IBM informs the city's and community's efforts to meet our greenhouse gas reduction goals.

### Congressional Field Hearing on Energy

In August 2011, the city coordinated with US Congressman Jared Polis to co-host a [Congressional Field Hearing](#) on Energy at the University of Colorado Law School. In attendance were Senators Michael Bennet and Mark Udall as well as representatives from the Environmental Protection Agency and the Department of Energy. The theme, strengthening the community and the economy through energy innovation in the 21st century, drew on the expertise of representatives from industry, government, and academia to speak to the importance of federal support for energy innovation. Congressional representatives and agency leaders left the field hearing with an action list that will enable them to enhance collaboration between the public and private sectors.

The City of Boulder was one of 24 cities to earn a grant from IBM in 2011 to "contribute to the improvement of high-potential cities around the world."

- **Eco-Cycle.** The city partners with Eco-Cycle, a local nonprofit organization dedicated to building a zero-waste community, to bring the fundamentals of recycling education to elementary schools in Boulder. In the spring of 2011, three schools participated in the Litterless Lunch Project, which examines the history of packaging and the importance of waste reduction. Three additional schools visited a community garden, compost site, and organic farm as part of the Growing Green Tour, and a further six schools participated in a Wise With Waste Tour which took students to visit local recycling centers.
- **Center for Resource Conservation (CRC).** In 2010, the city teamed up with the CRC to provide Boulder residents with energy efficiency and conservation services through the Residential Energy Action Program (REAP) as well as to assist residents and contractors with increasing waste diversion for home remodels and additions through deconstruction professional services. CRC educates the Boulder community by connecting residents with information on CRC's ReSource Yard; hosting tours, workshops, and community events associated with environmentally sustainable living; and by providing education and outreach at local events.

### Community Events

The city supports action for sustainability by helping sponsor community events such as:

- 2010 and 2011 Boulder Green Streets, a large-scale street liberation project that advocates for active, healthy living, sustainability, and a strong community by encouraging residents to experience streets in a new way;
- ReDirect Guide's 2010 Green Frontier Fest, a celebration of healthy and green living;
- Walk and Bike Month, which is dedicated to encouraging residents to recognize the personal, environmental, and global impacts of commuting in a private automobile and consider using a healthier and more sustainable method of transportation;
- Boulder 350 Global Work Party on 10/10/10, a celebration of climate change solutions; and
- 2010 Solar Homes Tour and 2011 Tour of Sustainable Homes.





# APPENDIX A



## APPENDIX A: ASSUMPTIONS FOR CALCULATING THE 2010 INVENTORY

Boulder's community greenhouse gas inventory was developed in 2004 by WSP Environment & Energy (formerly Ecoenergy). It draws on the Greenhouse Gas Protocol Initiative's GHG Protocol Corporate Standard ("Corporate Standard"). This protocol is widely used by local governments, corporate entities, and universities<sup>1</sup>.

The Corporate Standard includes three scopes, depending on whether emissions are direct or indirect. Scope 1 direct emissions include emissions from sources owned or controlled by the reporting entity. Scope 2 indirect emissions come from purchased electricity and natural gas. Scope 3 indirect emissions are a consequence of the reporting entity's activities but occur from sources outside its ownership or control. Scope 3 emissions are optional for reporting purposes.

The Boulder community emissions inventory thus includes scopes 1 and 2, and some scope 3, emissions within Boulder's boundaries. Scope 1 emissions are primarily due to vehicular travel within the city limits. Scope 2 emissions include emissions resulting from electricity and natural gas use in the residential and commercial/industrial sectors, and from street lighting. Scope 3 emissions reported here are largely based on landfilled solid waste. Renewable energy credit (REC) retirements from hydroelectric generation, Windsource purchases and other retail purchases are subtracted as offsets. In developing the Boulder community inventory, two decisions were made to increase the simplicity of data collection<sup>2</sup>. First, while the Corporate Standard addresses all six of the "Kyoto gases" (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs, PFCs, and S<sub>6</sub>), Boulder's inventory focuses primarily on CO<sub>2</sub>; solid waste emissions include methane converted into a CO<sub>2</sub> equivalent (CO<sub>2</sub>e) so the overall inventory is expressed in those units. Second, the community inventory traditionally excludes *de minimis* emissions sources — those that are small (and extremely difficult to collect). This includes, for example, fuel consumed at the Boulder Municipal Airport and methane produced during wastewater treatment.

Recent changes in best practices for greenhouse gas emissions accounting mean that the Boulder community may need to adapt its inventory in future years to be more accurate and transparent. New protocols are emerging that seek to create emissions "footprints" for communities: to factor in life-cycle carbon emissions from fossil fuel extraction, commuting and air travel, food, water treatment, and building construction. These new protocols can increase reported emissions in existing inventories dramatically<sup>3</sup>, but they also attempt to distribute emissions equitably, based on consumption of resources. Boulder may consider adopting a new method of accounting as it gets closer to 2012, when new emissions goals are likely to be set. In 2011 and 2012, the city organization is developing an Energy Strategy Action Plan that

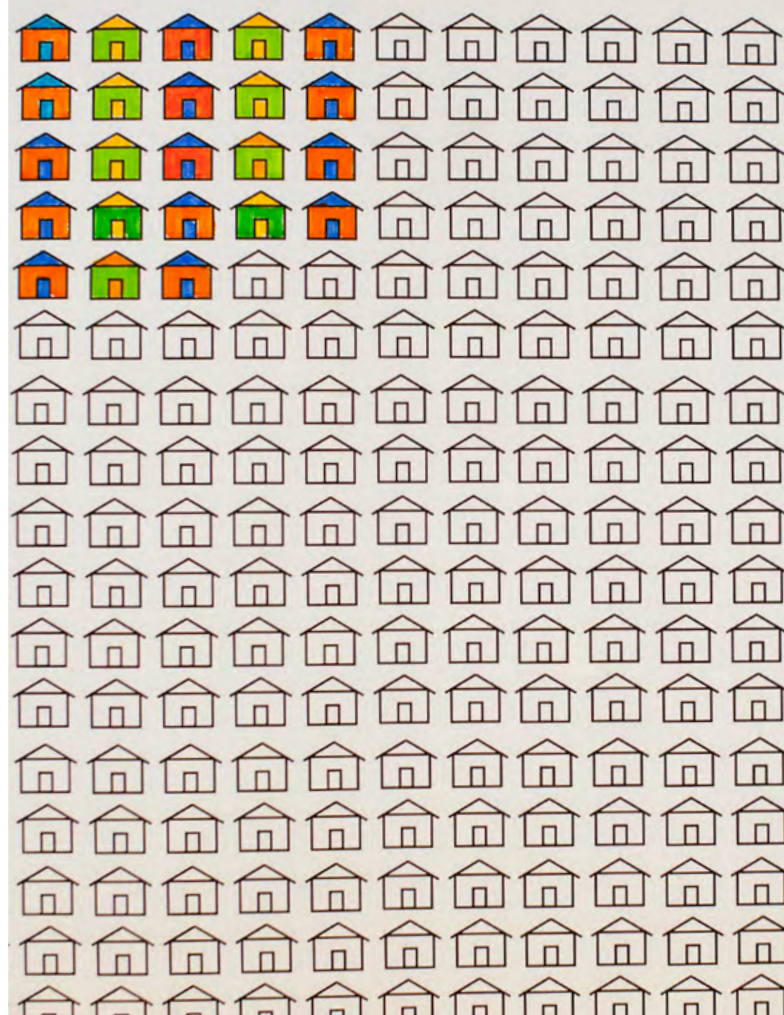
will include these broader sources of emissions. This plan can be used as a way to assess its viability for a community-wide CAP in 2012 and beyond.

Appendix A highlights the metrics and assumptions used in calculating the Boulder community inventory and annual emissions reductions, separated into four categories: energy, transportation, waste, and offsets. Demographic data is also provided.

### ENERGY

Energy-based greenhouse gas emissions are considered Scope 2 (indirect) emissions sources under the Corporate Standard. We use several assumptions when calculating these emissions:

- For consistency, the 2010 inventory continues to use the latest eGRID emissions factor developed by the Environmental Protection Agency (see also Section 2: 2010 Greenhouse Gas Emissions Inventory). For 2010, this figure was 1,906.06 lbs/MWh, which represents 2007 data (version 1.1). Avoided emissions from energy efficiency and renewable energy are estimated using the eGRID Rocky Mountain region non-baseload output emissions factor, 1,554.38 lbs/MWh.





- While the Corporate Standard encourages the use of the eGRID factor, there are other options that the inventory could adopt in the future. For example, Xcel publishes an emissions factor for the Public Service Company of Colorado service territory in its annual Corporate Responsibility Reports. This figure of 1,678 lbs/MWh in 2010 may be a more accurate representation of Colorado’s emissions intensity under the Renewable Energy Standard, and the University of Colorado used the 2009 version in its emissions inventory for that year. With electricity being such a large component of Boulder’s inventory<sup>4</sup>, using Xcel’s factor puts the community about 6 percent closer to meeting the Kyoto goals. However, city staff have not been able to independently verify how this factor is calculated.
- Line losses — electricity that is lost when it is transmitted to end users — are not currently accounted for in Boulder’s inventory. Traditionally, the Corporate Standard treats line losses as Scope 3 (indirect) emissions, for which reporting is optional, although the eGRID Technical Support Document encourages reporting them<sup>5</sup>. The city is evaluating whether these emissions should be included in future inventories. Because line losses in Xcel’s service territory are around 6 to 7

percent<sup>6</sup>, the community’s electricity-based emissions would be increased accordingly. However, where there are electricity savings due to efficiency and conservation, those savings could also be proportionately increased for reporting purposes to account for savings from electricity not generated.

- Unless stated otherwise, year-to-year changes in greenhouse gases are not weather-normalized. Boulder traditionally does not weather-normalize its overall inventory, as it is not required by the Corporate Standard. However, un-normalized data may not give a full sense of whether changes in energy-related emissions are due to transient weather effects or lasting efficiency and conservation measures. Weather normalization is becoming an increasingly important component of measuring the effectiveness of city programs.
- Xcel’s annual report for 2010 combines commercial and industrial (C&I) electricity consumption. Because C&I consumers vary widely, it may be useful in future years to obtain more granular information. According to monthly CAP tax reports, which do separate commercial from industrial consumers, approximately 58 percent of C&I electricity consumption could be attributed to commercial consumers in 2010. However, the total kWh consumption in the annual report differs from the total kWh consumption in the CAP tax reports. Therefore, we have chosen to continue using the annual report data for the 2010 inventory to maintain consistency.

Energy Metrics		
Metric	Value	Source
Annual electricity consumption	1,349,488,508 kWh	Xcel Energy Annual Report (2010)
Annual natural gas consumption	61,419,250 therms	Xcel Energy Annual Report (2010)
Electricity emissions factor (RMPA total output)	1,906.06 lbs/MWh	eGRID2010 Version 1.1, year 2007, Environmental Protection Agency (EPA)
Electricity emissions factor (RMPA non-baseload output)	1,554.38 lbs/MWh	eGRID2010 Version 1.1, year 2007 (EPA)
Pounds per metric ton	2,205 lbs/mtCO <sub>2</sub> e	Standard conversion factor
Natural gas emissions intensity factor (national average)	0.005306 mt-CO <sub>2</sub> e/therm	Voluntary Reporting of Greenhouse Gases Program, Energy Information Administration (EIA)

- Boulder’s biggest energy consumers — including large businesses, national labs, and the University of Colorado — are not separated out, even though many of them have their own climate action programs that include substantial purchases of renewable energy and carbon offsets. For example, in 2009 (the last year it reported its emissions), the university consumed 126,447,221 kWh, or 11.5 percent of the electricity used by commercial and industrial consumers in Boulder<sup>7</sup>. At the same time, using their calculations, the university purchased 1,565 mtCO<sub>2</sub>e in RECs from Community Energy and 2,408 mtCO<sub>2</sub>e in local offsets through the Colorado Carbon Fund (CCF). While the Boulder inventory includes REC purchases from Community Energy, it does not include offset

purchases through organizations like the CCF because it is unclear where the renewable energy is being generated. Because the Boulder community inventory takes into account electricity consumed by large organizations like the university — their consumption is aggregated in Xcel’s annual reports — it seems appropriate to acknowledge their purchases of renewable energy or carbon offsets more completely in future progress reports.

- Kilowatt-hour generation from solar PV systems is calculated using the PVWATTS v.1 online tool developed by the National Renewable Energy Laboratory. PVWATTS provides Boulder-specific solar generation estimates using default panel placement and operation assumptions<sup>8</sup>.

## TRANSPORTATION

Estimates for transportation-related greenhouse gases are primarily based on average daily vehicle miles traveled (VMT) in the Boulder Valley area. The Denver Regional Council of Governments (DRCOG), the planning entity for the eight-county Denver metropolitan area, calculates daily VMT based on regional models. Daily VMT are multiplied by the number of days in the year to create annual VMT. Annual VMT are then attributed to the state’s approximate vehicle class mix to calculate emissions. This approach estimates driving within the city, but it omits important traffic patterns: most notably, commuters who live outside Boulder but work within the city. The greenhouse gases emitted by a commuter driving from Denver to Boulder may be fully captured within the VMT of the various cities the commuter passes through, but this process does not create a comprehensive “footprint” for the city and should be evaluated in the future. Furthermore, there are small contributors — such as airplane fuel at the Boulder Municipal Airport — that are currently regarded as *de minimis* but may need to be considered in future inventories to create a fuller picture.

Transportation Metrics		
Metric	Value	Source
Boulder Valley vehicle miles traveled (VMT)	2,460,000 VMT daily x 365 days	Denver Regional Council of Governments (DRCOG)
Division of VMT into 8 vehicle classes	33.6% LDGV, 44.1% LDGT12, 15% LDGT34, 1.9% HDGV, 0.03% LDDV, 0.22% LDDT, 4.84% HDDV, 0.28% MC	Colorado Department of Public Health & Environment, Pollution Control Division
Fuel economy for each of 8 vehicle classes	Average miles per gallon (MPG)	Cities for Climate Protection
Biodiesel purchased in Boulder	80,689 gallons (B100 equivalent)	Barktus Oil, Boulder Valley School District, Boulder County Transportation, Gunbarrel Philips, Boulder Gas
Ethanol purchased in Boulder	84,824 gallons (E100 equivalent)	Barktus Oil, Boulder Valley School District, Boulder County Transportation, Gunbarrel Philips, Boulder Gas

## WASTE

Boulder’s waste-related emissions are based on estimates of landfilled, recycled, and composted solid waste provided in annual haulers’ reports. Recycling and composting data are used to calculate diversion rates, and the inventory only attributes emissions to landfilled solid waste. Landfill emissions include carbon dioxide and methane (converted to a carbon dioxide equivalent) from the decomposition of solid wastes. Accounting practices for solid waste emissions are changing and we will investigate other options as part of future CAP updates.

Solid Waste Metrics		
Metric	Value	Source
Landfill waste	75,447 tons	Annual Hauler Reports, Boulder County Hazardous Materials Management Facility, and University of Colorado
Recycled waste	47,629 tons	Annual Hauler Reports, Eco-Cycle for CHaRM, Boulder County for Drop-Off Center and Hazardous Materials Management Facility, Center for ReSource Conservation for ReSource Yard, and University of Colorado
Composted waste	16,533 tons	Annual Hauler Reports, Western Disposal for Wood and Yard Waste Drop-Off Center, and University of Colorado



## OFFSETS

Renewable energy credits (RECs) are subtracted from the inventory based on the Corporate Standard. RECs generated in Boulder — such as the city’s hydroelectric RECs — are converted into metric tons of CO<sub>2</sub> based on the non-baseload eGRID factor for the WECC Rockies region. Other RECs, which may be derived from renewable resources of uncertain geographic origin, are converted based on the national average non-baseload eGRID factor. Once these RECs are converted into metric tons of CO<sub>2</sub>, they are subtracted from the emissions inventory to create a final figure for the year. While this is an accepted procedure under the Corporate Standard, counting RECs in this way remains problematic because the production of renewable energy does not always lead to a direct, proportionate reduction in fossil-fuel based generation. Moreover, the eGRID emissions intensity factor is based on generation of electricity by source in each region, meaning that the eGRID factor for the Boulder region is already lower than it might otherwise have been because there is hydroelectric power in the portfolio mix. To subtract hydroelectric RECs from the inventory, then — when hydroelectric power has already served to reduce the emissions intensity of the region — may be considered double-counting. Because of the complexities caused by RECs, the use of RECs is currently being reevaluated under the Corporate Standard and other inventory protocols.

Renewable Energy Offsets Metrics		
Metric	Value	Source
Hydroelectric RECs	23,675,973 kWh	Xcel Energy
Windsources purchases	34,407,422 kWh	Xcel Energy
REC purchases	28,998,789 kWh	Renewable Choice Energy; Community Energy
Electricity emissions factor (national average non-baseload output)	1,520.21 lbs/MWh	eGRID2010 Version 1.1, year 2007 (EPA)

## DEMOGRAPHIC DATA

The city’s internal data collection showed a population increase of 0.78 percent over 2009, from 102,800 people to 103,600 people. According to the US Census Bureau, housing is 47.7 percent owner-occupied and 52.3 percent renter-occupied. The number of workers declined from 97,700 in 2009 to 96,700 in 2010.

## FOOTNOTES

1. The GHG Protocol Initiative was convened in 1998 by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD). More information is available at <http://www.ghgprotocol.org/>.
2. WSP Environment & Energy for the City of Boulder Office of Environmental Affairs, Climate Action Program (CAP) Assessment (2009), at p.8, [http://www.bouldercolorado.gov/files/LEAD/climate%20and%20energy/City\\_of\\_Boulder\\_ALL\\_SECTIONS\\_FINAL\\_072809\\_v9.pdf](http://www.bouldercolorado.gov/files/LEAD/climate%20and%20energy/City_of_Boulder_ALL_SECTIONS_FINAL_072809_v9.pdf).
3. The official University of California, Berkeley greenhouse gas inventory reports approximately half the emissions of a life-cycle model the university is piloting. See <http://rael.berkeley.edu/node/615>.
4. The University of Colorado at Boulder Environmental Center et al., University of Colorado at Boulder Greenhouse Gas Emissions Inventory, Calendar Year 2009 All Scopes & Calendar Years 2005–09 Major Sources Trend (2010), at p.5, [http://rs.acupcc.org/site\\_media/uploads/ghg/714-2009-inventoryreports.pdf](http://rs.acupcc.org/site_media/uploads/ghg/714-2009-inventoryreports.pdf).
5. E.H. Pechan & Associates, Inc., for the U.S. Environmental Protection Agency, The Emissions & Generation Resource Integrated Database For 2010 (eGRID2010) Technical Support Document (2010), at p.17, [www.epa.gov/cleanenergy/documents/egrid2010TechnicalSupportDocument.pdf](http://www.epa.gov/cleanenergy/documents/egrid2010TechnicalSupportDocument.pdf).
6. See, e.g., Xcel Energy, Inc., 2010 Demand-Side Management Annual Status Report, Electric and Natural Gas (2010), at p.90 table 17, available at [https://www.dora.state.co.us/pls/efi/EFI\\_Search\\_UI.Search](https://www.dora.state.co.us/pls/efi/EFI_Search_UI.Search) (search for proceeding 08A-366EG) (citing transmission loss factors).
7. The University of Colorado at Boulder Environmental Center et al., supra note 4, at App. 2.
8. See <http://rredc.nrel.gov/solar/calculators/PVWATTS/version1/US/Colorado/Boulder.html>.



A landscape photograph of a green field at sunset. The sky is a mix of blue and yellow, with scattered white clouds. The sun is low on the horizon, creating a bright glow. The field is lush green with small white flowers. A white rectangular box is overlaid on the upper part of the image, containing the text 'APPENDIX B' in bold black letters.

# APPENDIX B

# Programs Summary

Active Programs as of September 2011	Estimated GHGs Avoided in 2011 and 2012 (mtCO <sub>2</sub> e)	CAP Funding 2011 and 2012	CAP \$ per mtCO <sub>2</sub> e	Non-CAP City Funding 2011 and 2012	City of Boulder ARRA Funding	Estimated Private Investment 2011 and 2012
<b>1. Reduce Use</b>						
<b>Commercial EnergySmart</b>						
Discover – Outreach	*	\$102,574	**	\$31,989	\$0	*
Discover – Quick Installs	86	\$1,165	\$14	\$6,250	\$36,850	***
Optimize	5,142	\$789,015	\$153	\$104,043	\$48,950	\$735,000
Upgrade	6,960	\$254,502	\$37	\$57,734	\$132,000	\$356,607
<b>Residential EnergySmart</b>						
EnergySmart Assessments & Quick Installs	2,947	\$40,412	\$14	\$31,224	\$104,500	*
EnergySmart Upgrades (Beyond Quick Installs)	3,338	\$161,059	\$48	\$31,224	\$0	\$1,939,648
<b>Residential SmartRegs</b>						
SmartRegs Assessments & Quick Installs (Primarily Administration)	2,136	\$208,254	\$98	\$31,224	\$0	*
SmartRegs Upgrades (Beyond Quick Installs)	4,101	\$311,294	\$76	\$31,224	\$41,822	\$3,448,158
<b>Other</b>						
10 for Change	7,527	\$124,738	\$17	\$74,807	\$0	*
Public Utilities Commission (Demand)	*	\$75,451	*	\$25,000	\$0	***
Xcel Energy DSM Programs	26,000	*	***	***	\$0	*
<b>Total Reduce Use</b>	<b>58,237</b>	<b>\$1,993,013</b>	<b>\$34</b>	<b>\$424,720</b>	<b>\$364,122</b>	<b>\$6,479,413</b>
<i>Percent of Goal Met</i>	11.2%					
<b>2. Build Better</b>						
New/Remodel Commercial Building Energy Code	2,200	\$1,165	\$1	\$5,000	\$0	*
Existing Commercial Building Code	*	\$51,165	*	\$47,992	\$0	***
New/Remodel Residential Building Energy Code	7,800	\$10,971	\$1	\$5,000	\$0	*
<b>Total Build Better</b>	<b>10,000</b>	<b>\$63,301</b>	<b>\$6</b>	<b>\$57,992</b>	<b>***</b>	<b>*</b>
<i>Percent of Goal Met</i>	1.9%					
<b>3. Ramp Up Renewables</b>						
Solar Grants	310	\$1,165	\$4	\$264,989	\$0	*
Solar Sales Tax Rebates	475	\$1,165	\$2	\$6,244	\$0	\$41,000
Solar PV Installations	4,000	\$0	\$0	*	\$0	*
Solar Gardens	2,056	***	***	*	\$0	*
Energy Localization	*	\$240,589	***	\$25,387	\$0	***
Public Utilities Commission (Supply)	*	\$65,645	***	\$12,500	\$0	***
Windsources and Renewable Energy Credit Purchases	88,496	\$0	\$0	*	\$0	*
<b>Total Ramp Up Renewables</b>	<b>95,337</b>	<b>\$308,563</b>	<b>\$3</b>	<b>\$309,120</b>	<b>***</b>	<b>\$41,000</b>
<i>Percent of Goal Met</i>	18.3%					
<b>4. Drive Less</b>						
CAP contribution to GO Boulder programs (NECO & B-Cycle)	4,367	\$201,165	\$46	\$2,898,244	\$250,000	*
<b>Total Drive Less</b>	<b>4,367</b>	<b>\$201,165</b>	<b>\$46</b>	<b>\$2,898,244</b>	<b>***</b>	<b>*</b>
<i>Percent of Goal Met</i>	0.8%					
<b>5. Waste Not</b>						
Zero Waste Programs and Services	6,982	***	***	\$3,475,558	\$0	*
<b>Total Waste Not</b>	<b>6,982</b>	<b>***</b>	<b>***</b>	<b>\$3,475,558</b>	<b>***</b>	<b>*</b>
<i>Percent of Goal Met</i>	1.3%					
<b>6. Grow Green</b>						
Urban Forestry	*	\$1,165	***	\$1,783,000	\$0	*
<b>Total Grow Green</b>	<b>*</b>	<b>\$1,165</b>	<b>***</b>	<b>\$1,783,000</b>	<b>***</b>	<b>*</b>
<i>Percent of Goal Met</i>	*					
<b>7. City Organization</b>						
Hydroelectric Generation	34,000	\$0	Negligible	\$853,000	***	***
Energy Performance Contracts	13,544	\$0	Negligible	\$1,390,000	\$0	\$262,000
Alternative Vehicle Fleet	234	\$0	Negligible	\$8,074,000	***	***
City Organization Recycling	158	\$0	\$0	\$124,442	***	***
<b>Total City Organization</b>	<b>47,778</b>	<b>\$0</b>	<b>\$0</b>	<b>\$10,441,442</b>	<b>\$0</b>	<b>\$262,000</b>
<i>Percent of Goal Met</i>	21.5%					
<b>TOTAL AVOIDED EMISSIONS</b>	<b>222,701</b>					
Kyoto Protocol Reduction Goal for 2011-2012	521,032					
Gap to Kyoto Protocol Goal	298,331					
Approximate reduction needed in Boulder's carbon emissions intensity to reach Kyoto Protocol Goal	25%					

\* Not Estimated

\*\* Includes marketing and administrative expenses, which are excluded from \$/mtCO<sub>2</sub>e calculations.

\*\*\* Not applicable

# Program Assumptions

2010 Programs	Assumptions for Greenhouse Gas Reduction Calculations
<b>1. Reduce Use</b>	
Commercial EnergySmart	
Discover – Outreach	Avoided emissions are not calculated for marketing and outreach.
Discover – Quick Installs	Based on a goal of reaching 3,000 businesses by early 2013, approximately 2,666 businesses will be reached during 2011-12. Current data indicates that 2,000 businesses will receive quick installs, with average savings of 0.043 mtCO <sub>2e</sub> per business.
Optimize	Staff assume 345 businesses will participate in this tier through the extension of the Small Building Tune-Up Pilot and the refrigeration and A/C tune-up pilots. Small building tune-up participants have an average savings of 15 mtCO <sub>2e</sub> and refrigeration and A/C tune-up pilots have an average savings of 7.7 mtCO <sub>2e</sub> .
Upgrade	Based on current participation data, staff estimate that 464 businesses will participate in this tier, with average avoided emissions of 15 mtCO <sub>2e</sub> each.
Residential EnergySmart	
EnergySmart Assessments & Quick Installs	Based on current participation data, staff assumes approximately 3,400 units will participate in this service, averaging 4 quick installs each and 0.2 mtCO <sub>2e</sub> avoided per quick install.
EnergySmart Upgrades (Beyond Quick Installs)	Based on current participation data, approximately 55% of units that receive assessments will also implement upgrades, with an average of 4 upgrades per unit and 0.4 mtCO <sub>2e</sub> avoided per upgrade.
Residential SmartRegs	
SmartRegs Assessments & Quick Installs (Primarily Administration)	Based on current participation data, staff estimates that approximately 5,400 units will participate in this service, averaging 4 quick installs and 0.01 mtCO <sub>2e</sub> avoided per quick install.
SmartRegs Upgrades (Beyond Quick Installs)	Based on current participation data, approximately 40% of units that receive assessments will also implement upgrades, with an average of 3 upgrades per unit and 0.6 mtCO <sub>2e</sub> avoided per upgrade.
Other	
10 for Change	Avoided emissions are based on approximately 2,510 mtCO <sub>2e</sub> saved in 2010. Similar savings in 2011-12 are realistic but conservative based on both increasing participation and wider access to utility data for measurement and verification.
Public Utilities Commission (Demand)	Avoided emissions are not estimated; includes 2011-12 personnel estimates.
Xcel Energy DSM Programs	Avoided emissions are based on preliminary DSM participation data for Boulder premises provided by Xcel Energy.
<b>2. Build Better</b>	
New/Remodel Commercial Building Energy Code	Emissions avoided are based on the average lbs CO <sub>2</sub> per square foot for a typical office building, calculated by the EPA ENERGY STAR program using the WECC Rockies eGRID factor. Staff isolated the conditioned square footage in new commercial construction and multiplied by this carbon intensity. The avoided emissions are 30% of the CO <sub>2</sub> produced, as commercial construction in Boulder is required to be 30% more efficient than conventional construction.
Existing Commercial Building Code	GHG emissions reductions are not estimated; includes 2011-12 estimates for personnel and consulting in program development.
New/Remodel Residential Building Energy Code	Avoided emissions are based on the average energy consumption of Boulder houses within square footage groups that were developed as part of the Green Building and Green Points program. Staff isolated the number of new residential units within square footage groups in 2010 and projected similar distributions for 2011-12. Remodels and additions are estimated to avoid 3 mtCO <sub>2e</sub> each on average.
<b>3. Ramp Up Renewables</b>	
Solar Grants	Staff assumed approximately 100 kW will be funded per cycle, with 3 cycles in 2011-12. Emissions are based on kWh production from NREL's PV WATTS tool and the eGRID non-baseload output factor. This is a conservative estimate as alternative financing mechanisms are enabling proposals with larger capacity.
Solar Sales Tax Rebates	Rebates were issued for approximately 235 kW of capacity in 2010. Staff assume 230 kW will be rebated each year in 2011-12 and calculated emissions based on kWh production from NREL's PVWATTS tool and the eGRID non-baseload output factor. Future capacity levels may be affected by changes to the Solar*Rewards program but could also be benefited by the availability of alternative financing mechanisms.
Solar PV Installations	Based on an estimate of 2 MW of solar PV added in Boulder each year (1.8 MW added in 2009 and 2.3 MW added in 2010).
Solar Gardens	Staff assume 1 MW of solar PV added per year based on current Colorado Public Utilities Commission direction, with output estimated from NREL's PVWATTS tool and the eGRID non-baseload output factor.
Energy Localization	GHG emissions reductions are not calculated; includes 2011-12 personnel estimates and expenditures for localization portfolio standard development.
Public Utilities Commission (Supply)	GHG emissions reductions are not estimated; includes 2011-12 personnel estimates.
WindSource and Renewable Energy Credit Purchases	Estimated based on WindSource and REC purchases in 2010.
<b>4. Drive Less</b>	
CAP contribution to GO Boulder programs (NECO & B-Cycle)	GO Boulder staff have calculated that each Eco Pass reduces transportation-related emissions by 1.19 mtCO <sub>2e</sub> annually, with CAP funding contributing 5% in addition to 25% subsidy of Neighborhood Eco Passes for 40 neighborhoods (11,010 passes). Funding derives from both LEAD and Transportation, including the Transportation Demand Management and Multimodal Transportation Planning allocations in the proposed 2012 budget.
<b>5. Waste Not</b>	
Zero Waste Programs and Services	Staff projected landfilled solid waste figures for 2011 and 2012 based on the declining linear trend from 2007 to 2010 and converted this figure into mtCO <sub>2e</sub> . Solid waste figures are submitted by trash haulers operating in the city. Non-CAP funding includes trash tax funding projected for 2011-12 in the proposed 2012 budget.
<b>6. Grow Green</b>	
Urban Forestry	GHG emissions reductions are not currently quantified. Funding figures are based on Forestry Operations estimates in the proposed 2012 budget.
<b>7. City Organization</b>	
Hydroelectric Generation	Based on actual production data. Emissions based on non-baseload eGRID factor multiplied by one-half of output in kWh (the amount of RECs retired on behalf of the city annually). Funding figures are for hydroelectric operations in the proposed 2011-12 budget.
Energy Performance Contracts	EPC guarantees savings of approximately 5,772 mtCO <sub>2e</sub> annually for phases I and II, with an additional 2,000 mtCO <sub>2e</sub> possible for phase III.
Alternative Vehicle Fleet	Conservative assumption of 90% of replacement vehicles being alternatively fueled, with 30 replacements each year. In 2010, 0.0009 mtCO <sub>2e</sub> were generated per city fleet VMT, with an average of 5,649 VMT per vehicle annually.
City Organization Recycling	Assumes approximately 120 tons composted and recycled across the organization each year.

