

Boulder City Council STUDY SESSION

**Wednesday
November 12, 2014**

**5-6 PM
Boulder Energy Challenge Award Reception
in the Municipal Lobby**

**6-7 PM
NRG Energy Inc. Presentation**

**7-9 PM
Climate-Energy Framework and Program Updates**

**Council Chambers
Municipal Building
1777 Broadway**

Submit Comments to City Council
Email: [council @bouldercolorado.gov](mailto:council@bouldercolorado.gov)

or

Attention: Alisa Lewis, City Clerk
PO Box 791, Boulder, CO 80306
Fax: 303-441-4478

MEMORANDUM

TO: Members of City Council

FROM: Jane S. Brautigam, City Manager
David Driskell, Executive Director of Community Planning and Sustainability
Susan Richstone, Deputy Director of Community Planning and Sustainability
Heather Bailey, Executive Director of Energy Strategy and Electric Utility Development
Chris Hagelin, Senior Transportation Planner
Sarah Huntley, Media Relations/Communication Manager
Brett KenCairn, Senior Environmental Planner
Jonathan Koehn, Regional Sustainability Coordinator
Yael Gichon, Energy Sustainability Coordinator
Kelly Crandall, Energy Strategy Coordinator
Kendra Tupper, Energy Services Manager/Lead Strategist
Elizabeth Vasatka, Business Sustainability Coordinator

DATE: Nov. 12, 2014

SUBJECT: Study Session: Climate-Energy Framework and Program Updates

I. EXECUTIVE SUMMARY

This study session has five main purposes:

- To provide the results of assessments on the potential emission reduction contributions through 2050 of existing and planned energy related programs;
- To outline next steps and timeframes for refining goals, strategies, and targets for Boulder's Climate Commitment;
- To identify key energy-related elements of the 2015 work plan;
- To provide updates about several of the city's current work areas – demand-side management programs, development of a commercial and industrial energy ordinance, a local generation analysis– and demonstrate their relationship to this climate-energy focus; and
- To hear from NRG Energy, Inc. on how utilities are transforming their business model and offering new services to customers.

Council is asked to provide feedback on the following questions:

1. *Does council have feedback or questions on the findings related to current and potential energy related initiatives and their contribution towards reaching an 80 percent emissions reduction goal by 2050?*
2. *Does council have feedback or questions about the proposed next steps and timeframes for work related to Boulder's Climate Commitment?*
3. *Does council have any comments or questions on the 2015 work plan, specifically the proposed process and timeline to develop a commercial energy efficiency ordinance?*
4. *Are there additional ideas for community engagement related to creating a community energy vision that staff should consider?*

This study session memo provides information and updates on two primary areas of work:

- 1. Boulder’s Climate Commitment: Update and Next Steps**
- 2. 2015 Integrated Energy Work Plan**

Climate Commitment

Over the past year, staff has conducted a series of assessments and analyses to determine the viability of achieving an 80 percent emissions reduction by 2050. This has included development of analytic models capable of projecting the emissions reduction potential of existing and planned energy efficiency initiatives in both buildings and transportation as well as estimated emissions reductions for different levels of clean electricity.

Initial findings suggest that it is possible for Boulder to achieve deep emissions reductions within this timeframe and possibly achieve an 80 percent emissions reduction goal. However, it is also clear that achieving reductions of this magnitude will require broad energy system changes that include but are larger than switching electricity sources. It is also evident that the scale of action will require broad participation of all sectors of the community and a comprehensive community energy vision that aligns an energy system transition with core community values, benefits and aspirations. Based on the analysis of existing programs just completed, staff is currently developing a proposed pathway for next stage climate action that will include a new goal framing, integrated strategies, and specific targets set in decadal timeframes. Staff proposes to present this to council by early in the second quarter of 2015. As part of the broader community energy vision development, staff has initiated efforts to convene a gathering of leading energy experts, researchers and other cities to jointly take the next steps in developing an energy system “blueprint” for transitioning to a predominantly clean energy system. The blueprint would identify the steps necessary to address the impacts of all energy sectors, including natural gas and transportation-related fuels. The first stages of this process are described as part of this memo.

2015 Integrated Energy Work Plan

The existing energy related programs and initiatives are providing a solid foundation of emissions reductions and many associated social and economic co-benefits. This memo provides updates on programs including 2014 achievements and 2015 budget allocations. Additionally, it outlines the proposed process and timeline related to developing a commercial and industrial energy efficiency ordinance.

Updates include:

- Demand Side Management (DSM) strategy
- Commercial and Industrial (C&I) Energy Efficiency Ordinance
- SmartRegs
- EnergySmart
- Pilots and cross-cutting efforts (such as the Boulder Energy Challenge)
- Municipalization
- Local generation options analysis

II. BOULDER'S CLIMATE COMMITMENT: UPDATE AND NEXT STEPS

A. Past Year's Actions

In the July 2013 Study Session on Boulder's Climate Commitment, council gave staff provisional guidance to evaluate the viability of a goal to reduce greenhouse gases by 80 percent by 2050. Over the past 15 months the city has continued to implement a wide range of programs and initiatives designed to achieve significant greenhouse gas reduction. Staff also conducted a series of assessments to verify the reduction capacity of existing programs and assess the potential of several additional measures.

Key focus areas during 2014 have included:

- The creation of a new municipal and community GHG inventory system. This system is being used to complete a 2012 emissions inventory for the city organization. This inventory is nearly complete. A final report will be available for the community by January of 2015.
- An extensive analysis of Boulder community transportation emissions including reduction potentials associated with the recently approved [Transportation Master Plan](#) update.
- Development of a projection model to estimate emissions reductions associated with current and predicted new energy efficiency and demand side management programs coordinated by the city.
- Initiation of a local generation analysis that will begin by conducting a solar capacity analysis of every structure within city limits. This analysis is the next phase of the localization report completed in 2011.
- The first stages of analysis and coordination around [electric vehicle infrastructure](#) development and adoption issues and opportunities.
- Solicitation and selection of six pilot projects, as part of the [Boulder Energy Challenge](#) that address emissions reduction challenges in transportation, energy efficiency, manufacturing, and household-scale clean energy development.
- Continued operations of existing energy efficiency programs including significant refinements and expansions outlined later in this document.
- Coordination of clean energy and emissions reduction innovations within the city organization, including assessments of biogas and [solar energy development](#), [employee energy efficiency](#), electric vehicle commuting options and on-site solar energy storage and management initiatives.

These actions are already helping to reduce greenhouse gas emissions, save money and drive innovation. They are also providing valuable information to improve and focus existing and potential new programs and actions. The next section provides a summary of key findings that have emerged from the city's climate action efforts over this past year.

B. Major Findings Shaping Next Stage Efforts

Over the past year, a series of new assessments and analyses have been published highlighting the increasingly urgent imperative to dramatically reduce greenhouse gases in order to stabilize the global climate and reduce the likelihood of associated local impacts. A number of these assessments, including a recent Colorado Climate Change report, are summarized and linked for reference in **Attachment A**. A clear and consistent theme across all of these assessments is the finding that climate change is already taking place. These reports conclude that the timeframes

within which actions can be taken to avoid severe impacts are now likely to be shorter than previously projected.

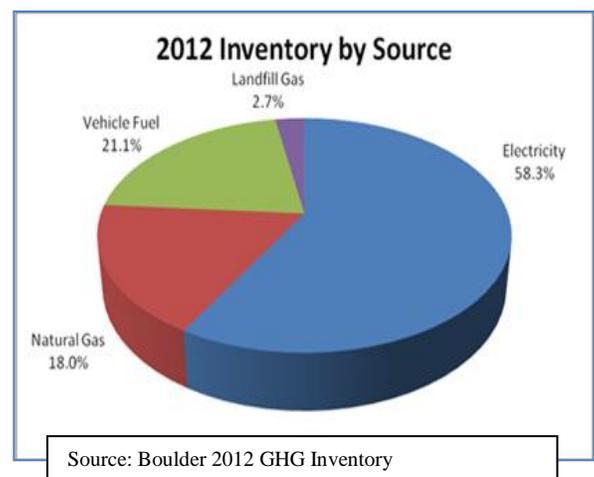
While these assessments outline a potentially daunting call to action, there are positive elements to the challenge we now face. Boulder and communities that choose to be in the forefront of addressing this issue have unique opportunities – not just in mitigating risk but also in positioning themselves to prosper socially and economically. These leading-edge communities will create the solutions that can be shared and implemented regionally, nationally and internationally.

1. Energy as The Core Focus of Climate Action

A common theme emerging through these reports is the central role that energy plays in climate change. **Attachment B** shows a representation of US greenhouse gas (GHG) emissions and the predominant share (approximately 85 percent) of those emissions attributed to energy-related activities. In the 2012 Boulder greenhouse gas emissions inventory currently being finalized this significant role played by energy is even more pronounced. As Figure 1 displays, energy-related emissions represent more than 95 percent of Boulder’s emissions, encompassing three energy-related emissions sources: electricity (coal and natural gas), natural gas for heating and other processes/uses, and petroleum. Achieving deep emissions reductions related to energy will require coordinated action in three areas: **reduction** of energy usage through conservation (using less) and efficiency (reducing waste); **replacing** fossil fuel energy sources with clean, renewable energy; and **redesigning/redeveloping** core elements of our energy system to accelerate and support both reduction and replacement initiatives.

Figure 1 – Boulder 2012 GHG Emissions by Source

While other aspects of non-energy resource use and management—water, waste, land management—all have important connections to emissions, deep GHG emissions reduction will require the primary focus of Boulder’s climate action to be on strategies that address emissions arising from energy—its production, distribution, management and use. Each of the three core areas of action are described in more detail below.



2. Reduction—Potentials from Known or Anticipated Efficiency and Conservation Programs

Buildings and Related Energy Uses (about 76 percent of total emissions)—Table 1 below summarizes total estimated emission reductions from Boulder’s existing and proposed building-related energy efficiency efforts.

The table reflects a number of assumptions regarding program reach, level of public and private investment, regulatory requirements, and rate of property redevelopment and investment. The

projection tool also includes the significant efficiency-based reductions projected by CU Boulder as part of its Climate Action Plan. It should be noted that the findings are preliminary. The projection model is being refined to include all of the available information on existing and anticipated programs. However the analysis does create the first synthesis of all existing and planned programs and reasonable estimates for the levels of reduction that could be achieved by each program through 2050.

As shown, the analysis indicates that close to 25 percent of an 80 percent emissions reduction goal by 2050 could be achieved through continued implementation of the existing and planned energy efficiency efforts. These include the implementation of a 2030 net zero energy building code goal¹, the ongoing implementation of Boulder’s EnergySmart and SmartRegs programs, and the development and implementation of a commercial and industrial energy efficiency ordinance. It is important to note that these projections assume the continued funding of EnergySmart and SmartRegs programs through the existing CAP Tax funding stream or similar mechanisms.

Transportation Related (about 20 percent of total emissions)—Boulder has already worked for over 3 decades to curb vehicle miles travelled (VMT) growth. Boulder residents’ per capita VMT is less than half the regional average, and VMT peaked in Boulder a decade before the rest of the region. This success is a result of the synergy between land use policies, and transit and bike/ped investments the city has made over three decades. These efforts have already reduced VMT and thereby GHG emissions by over 30 percent below what they would have been without these actions.

As part of an extensive transportation emissions assessment completed during the recent Transportation Master Plan (TMP) update², an analysis was conducted to determine the additional emissions reductions that could be achieved through full implementation of the TMP. Table 1 provides estimates for the levels of transportation emissions reduction achieved through two primary areas—TMP related programs and the emissions reductions anticipated through ongoing implementation of the federal CAFE vehicle fuel efficiency standards (Corporate Average Fleet Efficiency). Together these measures are projected to contribute an additional 10-11 percent in overall emissions reductions by 2050.

In summary, the total anticipated emissions reduction potential by 2050 for existing and anticipated programs in buildings and transportation is around 32 percent. This is consistent with similar analysis conducted by RMI for the city of Fort Collins as part of its current Climate Action Plan update process.³ When combined with the projected emissions reductions associated with Xcel’s currently published plans for replacing some of its fossil fuels generation with cleaner energy, the total projected 2050 reduction potential for conservation, efficiency and clean source change across all sectors is approximately 43 percent.

¹ Projections included both new construction and the anticipated proportion of property redevelopment that will come under the “path to net zero” code changes.

² The 2014 TMP update can be found [here](#).

³ [“Stepping Up: Benefits and Costs of Accelerating Fort Collins’ Energy and Climate Goals” Rocky Mountain Institute 2014](#)

Table 1 – Emissions Reduction Projections for Efficiency and Conservation Programs by Sector with Existing Utility

2005 Emissions Baseline	1,798,066
80% Reduction Target	359,613

Clean Energy Source Change	Annual Projected Reduction (MTCO₂e/yr)			
	2020	2030	2040	2050
Projected Emissions from Utility Portfolio	1,700,000	1,700,000	1,700,000	1,600,000
Reduction below Baseline	98,066	98,066	98,066	198,066
% GhG Reduction Goal	6.8%	6.8%	6.8%	13.8%
Remaining Reduction to Meet Goal	1,340,387	1,340,387	1,340,387	1,240,387

Conservation and Efficiency Strategies by Sector	Annual Projected Reduction (MTCO₂e/yr)			
	2020	2030	2040	2050
Buildings & Related Uses (76% of Emission)				
NZE Code - Commercial	17,000	44,000	72,000	97,000
NZE Code - Residential	13,000	40,000	65,000	76,000
EnergySmart - Residential	6,000	12,000	18,000	23,000
EnergySmart - Commercial	18,000	34,000	48,000	61,000
SmartRegs - Residential	6,000	12,000	18,000	23,000
Commercial-Indust Energy Ordinance	9,000	22,000	37,000	38,000
CU Climate Action Plan	53,000	67,000	58,000	65,000
Sub-total Buildings	122,000	231,000	316,000	383,000
% GhG Reduction Goal	6.8%	12.8%	17.6%	21.3%
Transportation (21% of Emission)				
Transportation Master Plan Actions	20,856	43,299	58,307	73,234
Federal Vehicle Efficiency	33,453	78,250	106,041	119,816
Subtotal Transportation	54,309	121,549	164,348	193,050
% GhG Reduction Goal	3.0%	6.8%	9.1%	10.7%
Total Reductions: Efficiency & Source	274,375	450,615	578,414	774,116
% GhG Reduction Goal	15.3%	25.1%	32.2%	43.1%

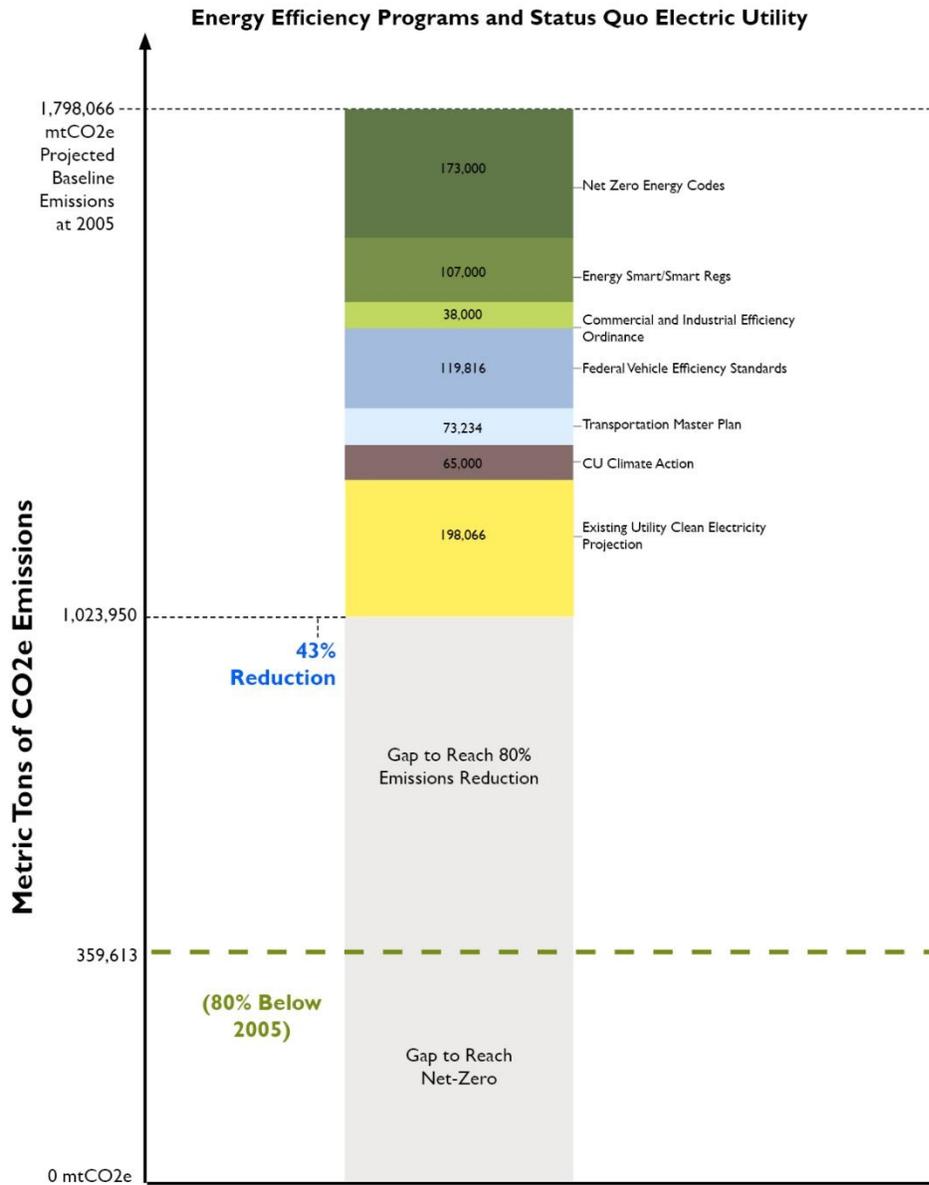
Source: Brendle 2014 Emissions Projection Model

The emission reductions outlined in Table 1 associated with Boulder’s efficiency and conservation efforts in both buildings and transportation are based on achievable but ambitious objectives. A significant portion of the remaining reductions needed to achieve Boulder’s overall Climate

Commitment goal will need to come from energy source replacement in both the building and transportation sectors.

Figure 2 illustrates the total contributions of existing efficiency programs in relation to the overall reductions necessary to achieve an 80 percent reduction in emissions by 2050. The potential additional contributions that could be achieved through changes in energy source are discussed in the next section.

Figure 2 –Proportion of Climate Goal Achieved through Existing Efficiency & Conservation Programs



Source: Brendle 2014 Emissions Projection Model

3. Replacement—Emissions Reduction Potential from Energy Source Replacement Strategies

As noted in the previous section, there are three primary emission sources based on energy usage: electricity (coal and natural gas), natural gas for other uses, and petroleum. The following summarizes efforts associated with each of these three emission sources.

Electricity (about 60 percent of emissions)—Of the three energy sources and their associated emissions, electricity is the area in which the most substantive analysis, strategy development and action have taken place. One of the core objectives of the municipalization initiative has been to create a pathway to significantly replace the heavily coal and natural gas dominant electricity with a significantly higher percentage of clean, renewable energy. The initial analysis conducted to satisfy the Charter metrics determined that there was a high probability of achieving the metrics even while shifting to approximately 50 percent of electricity from non-fossil fuel sources.

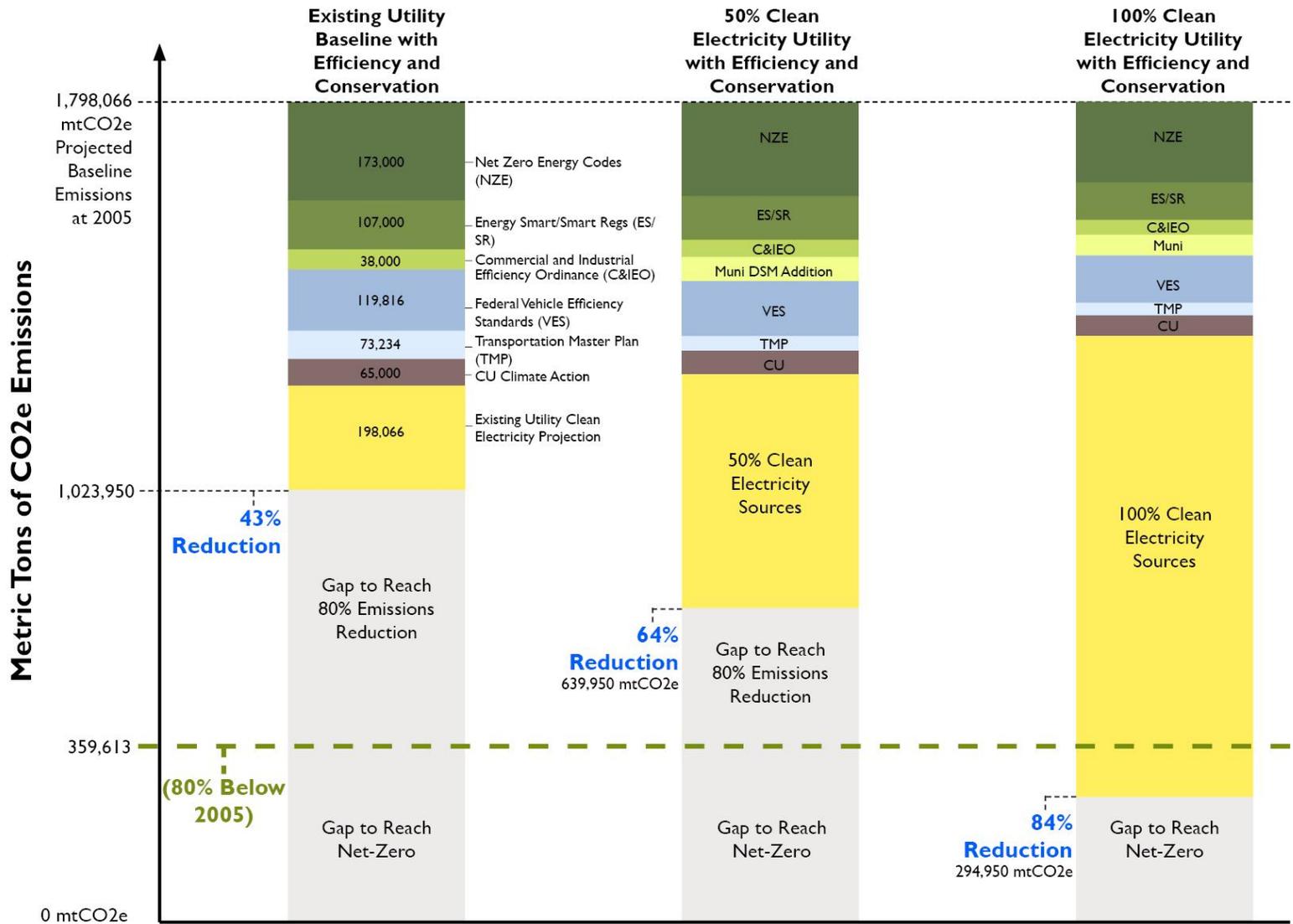
Additional analysis to determine the opportunities and constraints around development of a significantly larger proportion of renewable electricity sources will need to take place once the current uncertainties around acquisition costs and timeframes are resolved. However, initial estimates of the combined emissions reduction potential of both efficiency and expanded renewable energy source substitution have been developed using the initial analysis conducted for the municipalization assessment coupled with a projections tool built for the city by The Brendle Group.

Figure 3 shows the potential emissions reductions by 2050 for three configurations of electric utility portfolio in combination with the existing and planned energy efficiency and conservation efforts described earlier:

- **Status Quo**—*Projected emissions levels under existing utility resource plans coupled with city of Boulder initiated efficiency and conservation efforts in both buildings and transportation.* Under this configuration, a total reduction of 43 percent below 2005 baseline is projected at 2050.
- **50 percent Renewable Energy Utility**—*Projected emissions factors utilizing the initial municipalization “low-cost” option discussed in the [July 23rd 2013 Study Session on municipalization](#) (page 5).* This projection also assumes additional efficiency improvements through a municipally run demand side management program. Efficiency rates were based on the performance of other best in class utilities such as Fort Collins. This configuration is projected to achieve a 64 percent reduction from the 2005 baseline.
- **100 percent Renewable Energy Utility**—*Projected emissions based on a 100 percent renewable energy utility.* This projection integrates all of the previous efficiency and conservation elements along with 100 percent clean electricity sources.

It should be noted that the share of reductions associated with efficiency and conservation efforts declines as the source of energy becomes cleaner. Every kilowatt saved or mile of travel reduced accounts for less reduction if the source of electricity or transportation energy comes from cleaner sources. This accounts for the slightly smaller proportion of reductions shown for efficiency and conservation efforts in the two cleaner utility projections.

Figure 3 – 2050 Emissions Reduction Under Three Electric Utility Scenarios



Source: Brendle 2014 Emissions Projection Model

Based on the analysis conducted to date, it appears that Boulder could reach an 80 percent emissions reduction goal by 2050 through a combination of its existing efficiency and conservation programs (in both buildings and transportation) and an electric utility drawing 100 percent of its energy from clean, renewable energy sources. An additional focus on reductions in natural gas and transportation energy source would be valuable to accelerate goal accomplishment (before 2050) or allow for the possibility that the electric utility may not achieve full 100 percent renewable energy by the 2050 target date. A brief summary of efforts to date in these two areas are described below.

Transportation (about 20 percent of emissions)—The transportation emissions assessment identified two areas for additional focus related to clean energy source replacement: transit fleet and personal light duty vehicle use. Efforts to improve transit fleet emissions have been an ongoing focus of staff efforts, primarily directed towards working with Boulder’s regional transit provider RTD who owns and manages the majority of the transit fleet serving Boulder. The role of transit is particularly important given its many beneficial multiplier effects in reducing car use, supporting beneficial land uses, and supporting multiple mobility options.

To address the personal vehicle energy replacement issue, a consortium organized by the city and including Boulder County, CU, BVSD and UCAR has begun to analyze the infrastructure issues associated with promotion of electric vehicle adoption. The city’s own facilities and fleet department is also actively modeling this strategy through exploration of continued expansion of the city’s electric vehicle fleet, including the introduction of electric bicycles.

In order to track progress in this area of action, additional work is now underway to develop new metrics to monitor the overall vehicle fleet efficiency of automobiles being used in Boulder. These actions are described in greater detail in **Attachment C**.

Natural Gas other than Electricity (about 18 percent of emissions)—During 2014, staff worked with a community-based Natural Gas Working Group to examine issues associated with natural gas, primarily associated with the sourcing of lower environmental impact natural gas for electricity generation. This group acknowledged the importance of exploring strategies for building “the other half of the bridge”—strategies for ultimately retiring natural gas as a “bridge” fuel. This would include identifying additional natural gas efficiency opportunities as well as substitution options for replacing natural gas in its current uses—largely heating and industrial processes. However, this topic was largely outside the scope of this working group, and additional staff work has not yet taken place on this topic.

The preceding analysis indicates that it may be possible for Boulder to reach an 80 percent emissions reduction goal with a combination of existing and planned initiatives and our current efforts related to electric utility redevelopment. An important additional insight gained over the past year has been the importance of redesigning key elements of our energy system to support and accelerate these reduction and replacement initiatives. System design is especially significant as a determining factor in the scale and impact of developing local renewable energy resources like solar. It is also a significant factor in the capacity and pace of fostering adoption of clean energy transportation alternatives like electric vehicles, and developing viable replacement options for current non-electricity related natural gas uses. The next section describes proposed efforts to extend current initiatives already underway to explore these aspects of energy system redesign.

4. Energy System Redesign—Creating an Integrated All-Sectors Energy System

A key finding over the past year has been the recognition that the current energy system will have to be strategically redesigned to accommodate a significant expansion of local renewable energy generation and facilitate a rapid conversion of existing natural gas and transportation uses to electricity. This significant energy system transformation intersects with the discussion already underway regarding “the electric utility of the future,” encompassing a much broader range of system redesign issues and opportunities. It will also be necessary to facilitate and support significant efficiency efforts—from the challenges of implementing aggressive new net zero building codes, to the effective implementation of commercial and industrial energy management systems.

A central consideration that will shape this energy system redesign are the choices that will need to be made regarding how new clean energy sources will be developed and implemented. Current utility interests and momentum are pushing for this to take place through large, off-site, privately owned energy development. Conversely, there are potentially significant local economic benefits as well as resilience, capacity building and community development opportunities associated with prioritizing and incenting a more distributed, decentralized approach to renewable energy development. These two paths represent very different sets of choices in how the existing energy infrastructure—electricity, natural gas and transportation energy—is configured, owned, invested in, and managed.

5. A New Energy Systems “Blueprint”

To establish clean energy replacement targets across all energy uses and sources, a comprehensive evaluation and design of the desired energy system will be needed. The design of this system should be driven not only by technical and logistical considerations but also by community values and priorities. Through Boulder’s participation in both national and international fora it is clear that many cities on the leading edge of climate action are coming to a similar conclusion: existing strategies and systems are insufficient to achieve the levels of reduction now being called for, and in many cases are no longer congruent with core community values.

Fundamental energy system transformation is needed for which there are few, if any, functional, comprehensive examples at the present time. As part of the 2015 work plan, staff is working with partner cities and potential funders to lead a first-step “Breakthrough Convening” of leading energy system specialists, energy experts and other vanguard communities to lay the groundwork for a transition blueprint. This blueprint will be a resource that many communities, including Boulder, can use as a building block and tailor to their local values and objectives through a community engagement and co-development process. More detail is provided in the next steps section below.

C. Next Steps – 2015 Climate Commitment Focus Areas

Three core focus areas for Boulder’s Climate Commitment initiative in 2015 are described below.

1. Coordinate and Optimize Existing Initiatives

As the previous sections illustrate, Boulder’s existing program of work is making important advancements toward deep greenhouse gas emissions reductions. Specific efforts for 2015 include:

Complete and Publish the 2012 Community-wide GHG Emissions Inventory—Staff members are in the final stages of reviewing and refining the data reporting necessary to publish the updated community-wide GHG emissions inventory based on the newly developed GHG inventory tool and protocol. Completion and publication is expected in January 2015.

Complete Target Setting Around Conservation and Efficiency Programs—The detailed analysis of building and transportation efficiency initiatives just completed provides the foundation for setting specific targets and timeframes. These will form the basis for ongoing monitoring of progress and program effectiveness. Finalization of target setting will be completed in the first quarter of 2015.

Monitoring and Integration of 2014 Pilot Projects—Several pilot projects were implemented in 2014 that will provide important information and insights into additional efficiency and energy source change opportunities. These include the Community Power Partnership and the six projects funded through the Boulder Energy Challenge. An ongoing priority is the integration of critical lessons learned in order to scale larger emissions reductions actions.

2. Coordinate Analysis and Development of Energy Source Targets

The development of clean energy replacement targets will take place through the coordination of three related initiatives in 2015. Two of these—the municipalization Resource Planning process and a related Local Energy Generation Analysis—were initiated in 2014. The third critical action that will support both energy source target setting and energy system design is the energy system “blueprint” convening noted previously. A brief summary of each area of work is included below.

Municipalization Resource Planning—An essential step in the development of Boulder’s municipal utility will be the development of a long-term energy resource plan that will outline the anticipated balance of different energy sources for a 20-year period. This will provide the first detailed assessment of the options for accelerating the integration of renewable energy sources into the Boulder energy grid.

Local Generation Analysis—A core recommendation of the Solar Working Group was to conduct a community-wide assessment of the solar generation potential for the city. Staff is currently working on an implementation plan to conduct this solar capacity analysis as part of a larger local generation capacity assessment that will also inform the municipalization Resource Plan mentioned above. The first steps were taken during 2014 by identifying resources to conduct the solar analysis including the creation of a partnership with NREL to assist in the synthesis and processing of city satellite data that will be used in this analysis. A more detailed description of this work plan item is included as part of the Integrated Energy Plan described below.

Drawing on this analysis of energy source targets and the refinement and coordination of energy efficiency program capabilities described in the next section, staff proposes returning to council in early second quarter 2015 with a final proposal for Boulder’s next-generation Climate Commitment vision/goal, strategies, targets and timeframes.

Energy “Blueprint Development”—The city has applied for a USDN⁴ Innovation Grant to support a "Breakthrough Convening" which would focus on a deep analysis of local energy system transitions. The proposed convening will bring together urban sustainability directors from leading-edge cities with thought leaders and energy systems specialists already engaged in energy systems change and “utility of the future” conversations. The purpose will be to develop a shared vocabulary, understanding and vision for the coming (and necessary) energy system transformation as well as a strategic framework for making that vision locally relevant and achievable in light of differing city-specific constraints and opportunities.

The policy and program recommendations that staff anticipates emerging from this process will form the basis for a “blueprint” that Boulder and other participating communities can work from and adapt as their own. It is envisioned that the blueprint will be a comprehensive approach that guides local energy decisions, and includes short-term “no regret” strategies along with longer term initiatives that build on the success of existing efforts. It is envisioned that these outcome will be captured in both a detailed report as well as in a more accessible and compelling summary format, such as an infographic or motion-graphic video that presents the feasibility and desirability of a fundamental energy system transformation to a wide audience.

Additionally, Boulder is one of a handful of cities worldwide that have been invited to be in the first-tier of vanguard cities in the Carbon Neutral Cities Initiative. This new initiative, linked to USDN as well as C40 Cities, had a launch workshop in Copenhagen in 2014. The initiative is currently seeking funding for its first three years of operation, including technical assistance and research grants that could similarly support work on the energy transformation blueprint. Initiative members to date include Boston, Copenhagen, London, New York, Melbourne, Minneapolis, Oslo, Portland, San Francisco, Seattle, Stockholm, Sydney, Vancouver, Washington DC, and Yokohama, in addition to Boulder.

3. Community Energy Vision Development

The significant energy system changes and related actions required to reduce GhG emissions 80 percent (or more) by 2050 (or sooner) will require broad collaboration across public institutions, private sector businesses, civic associations and individual households. This will depend on both a significant dialogue and information sharing between the city and larger community, and development of new ways to understand and portray the larger vision and motivation for this change. This community energy vision will need to be tangible and connect to the personal experience and priorities of community members. A brief summary of the strategy for initiating and coordinating this community energy vision development is provided in the closing section of this memo.

The next segment of the memo provides updates on a number of major energy related program areas integral to achieving both the city’s Climate Commitment and other important community values and objectives.

⁴The Urban Sustainability Directors Network (USDN) is a peer-to-peer network of local government professionals from cities across the United States and Canada dedicated to creating a healthier environment, economic prosperity, and increased social equity.

III. 2015 INTEGRATED ENERGY WORK PLAN

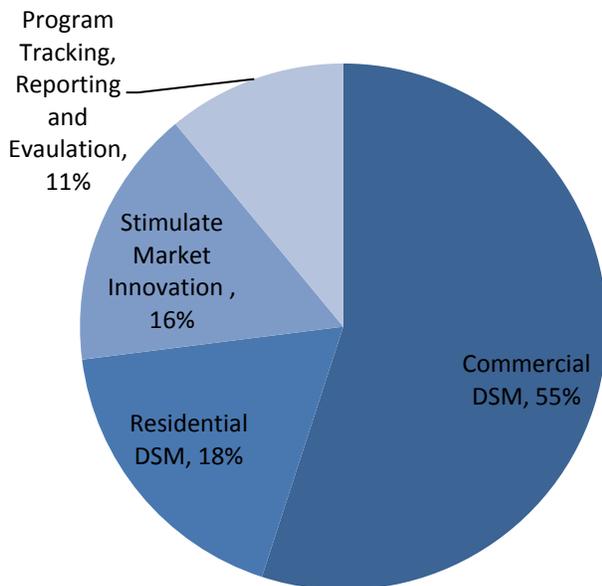
Consistent with the framework of the climate commitment, the city’s Integrated Energy Work Plan is organized into four functional work areas:

- Demand Side Management programs
- Pilots and cross-cutting efforts
- Municipalization
- Local generation options and analyses

These efforts are primarily funded by the Climate Action Plan (CAP) tax and the Energy Future budget. For more information on the 2015 Energy Future budget, please see the [Sept. 9, 2014 City Council memo](#). The 2013 and 2014 budget for CAP tax energy efficiency initiatives allocate programmatic funds by the approximate percentages council agreed to in 2012.

The annual estimated CAP tax revenue for 2015 is \$1.8 million, and will be allocated as follows:

Figure 4: 2015 CAP Tax Allocation



Commercial Demand Side Management (DSM)

- Commercial EnergySmart: provides business and commercial building owners energy advising services and rebates
- Commercial & Industrial Energy Efficiency Ordinance

Residential DSM

- SmartRegs: licensed rental housing energy efficiency requirement and energy advising services and rebates through EnergySmart

Stimulate Market Innovation

- Boulder Energy Challenge – grant program funding innovative solutions from the community to reduce emissions

Program Tracking, Reporting and Evaluation

- A database warehouse to track and display energy and GhG emission reductions, showing progress toward the climate goal

Table 2: Summary of 2015 Integrated Energy Work Plan

Work Plan Area	Programs and Projects (<u>detailed update to follow</u>)
<p>Demand Side Management Programs</p> <p>DSM refers to anything that modifies consumer demand for energy. It includes energy efficiency, demand response and combined heat and power (CHP). This work area includes our current energy efficiency programs and requirements, as well as future strategy efforts.</p>	<ul style="list-style-type: none"> • Develop 3-year <u>DSM strategy</u> • Develop a Commercial and Industrial (C&I) Energy Efficiency Ordinance (rating & reporting and efficiency requirements) • <u>SmartRegs</u>: Implementation strategy for the next four years • Delivery of existing energy efficiency programs (i.e. <u>EnergySmart</u>) • Coordination with the following: Energy Services portion of the municipalization transition plan, new construction energy codes, and efficiency efforts for city owned facilities (managed by FAM)
<p>Pilots and Cross-Cutting Efforts</p> <p>Includes pilot projects as well as programs and strategies that span multiple work areas and departments.</p>	<ul style="list-style-type: none"> • Initiate development of Energy System Transformation Blueprint • Create/maintain data systems to support energy efforts • Community GHG Inventory Reporting • Sustainability Dashboard: online, interactive, visual representation of energy and climate goals and metrics • Community Power Partnership (CPP): Pilot w/ Pecan St. Institute to understand the value of circuit level energy and water data. • Administer <u>Boulder Energy Challenge</u> grants and track progress of the six chosen innovation projects • Update Green Building Green Points Code • Coordinate with Transportation Master Plan (TMP) • Non-Muni PUC efforts and filings around a number of issues, such as improved data access for governments and bldg owners
<p>Municipalization</p> <p>The transition plan will guide the city from an Xcel-run electric utility system to a city-operated local electric utility. The plan is a working tool that will be updated on a regular basis as legal issues are addressed, tasks are refined, and work is completed.</p>	<p>Implement the municipal electric utility <u>transition work plan</u> which encompasses the following functional areas:</p> <ul style="list-style-type: none"> • Construction, Operations, and Maintenance • Customer Experience • Energy Services • Finance and Accounting • Planning and Engineering • Power Supply & Delivery • Legal/Regulatory • Support Services
<p>Local Generation Options and Analyses</p> <p>Involves understanding theoretic and real limitations, and the type of resource (solar, storage, CHP, etc) available for local, distributed generation (DG). These efforts will identify challenges to DG adoption and projected generation capacity of various technologies.</p>	<ul style="list-style-type: none"> • Update to Solar Grants program and evaluation process • Project any significant changes to annual load from DG and DSM for resource planning purposes (contract needs) • <u>Local generation analyses</u> to understand solar capacity, potential solar incentive structures and key regulatory/legislative issues. • Finalize recommendations for natural gas replacement options • Continue efforts in community local generation projects (i.e. Western Disposal, WWTP, FAM projects)

IV. KEY PROGRAM UPDATES

Demand Side Management Programs	Pilots and Cross-Cutting Efforts	Municipalization	Local Generation Options and Analyses
<ul style="list-style-type: none">• EnergySmart and SmartRegs• DSM Strategy• C&I Energy Efficiency Ordinance	<ul style="list-style-type: none">• Boulder Energy Challenge	<ul style="list-style-type: none">• Update on transition plan and visioning work	<ul style="list-style-type: none">• Local generation analyses

A. DSM Programs: EnergySmart and SmartRegs

1. EnergySmart

As the city and Boulder County continue to partner on the successful implementation of the EnergySmart programs, a few updates are worth noting.

- EnergySmart has enrolled more than 12,000 homes and provided advising services to more than 3,200 businesses countywide. Over 60 percent of the homes (more than 7,000) and 64 percent (over 2,000) business are being served in Boulder.
- In customer satisfaction surveys, 98 percent of participants would recommend the service to their neighbor and they are doing so, as word of mouth is the leading way people enroll in the program. Additionally, advisors are consistently rated five out of five on the surveys.
- Advising to action (or upgrade) conversion rates continue to be much higher than the traditional utility demand side management programs. In Boulder, owner occupied units are experiencing an advising to action rate of more than 75 percent and businesses have over a 45 percent rate.

For more detail, third quarter reports can be viewed at [Residential EnergySmart](#) and [Commercial EnergySmart](#).

In 2010, Boulder County awarded Populus (a local Boulder company) the contract for the residential EnergySmart program administrator. Over the years, Populus has been recognized as an innovator in the energy services industry. In August, the [company announced](#) it has been acquired by a national energy efficiency firm, [CLEAResult](#), a leading provider of energy efficiency programs and services to electric and gas utilities, governments, schools and businesses. The EnergySmart advisor model of delivering energy efficiency services was created in Boulder and is now integrated in energy efficiency programs all over the country. This is a great example of Boulder exporting energy innovation.

In February 2015, due to the county's contracting requirements, it will be issuing a new Request for Proposals (RFP) for residential EnergySmart services. Since a SmartRegs compliance path is offered through the county's EnergySmart contracted services as well as city SmartRegs assistance and rebate services, the city will join the county and combine EnergySmart and SmartRegs assistance in one RFP. A contractor for residential EnergySmart and SmartRegs assistance services will be selected by April. Staff will update council on the outcome of this process in the second quarter of 2015.

2. *SmartRegs*

SmartRegs, the city's rental housing energy efficiency requirement, is halfway through the eight-year implementation phase, with approximately one quarter of the city's licensed rental housing units certified as compliant with the requirements. City staff has been implementing recommendations from the 2013 [Cadmus Report](#)⁵ to improve the city's residential energy efficiency strategies, including streamlining the compliance elements of the program. The city's SmartRegs progress report can be viewed on the city's website.

Additionally, staff is moving to better integrate SmartRegs into the city's Rental Housing Licensing (RHL) program. The ordinance language provides that, "...if the energy efficiency requirements are not met at the time of applying for a new or renewal rental license, the license will be issued at a reduced term." Since rental licenses are issued for a four-year timeframe, from January 2015 and beyond, any new or renewal rental licenses that are not SmartRegs compliant will receive a reduced-term license with a Dec. 31, 2018, expiration date, the predetermined SmartRegs deadline. If SmartRegs compliance is demonstrated prior to the deadline, the term will be extended to the full four-year term from the date of issuance.

A large number of rental licenses are due for renewal in 2015 (see Table 3 below) and staff is both coordinating with CLEAResult to increase the capacity to assist a larger number of SmartRegs customers as well as increasing outreach and program marketing to encourage compliance with rental license renewals.

The goal is to move rental property owners through the SmartRegs compliance process parallel to a new or renewal rental license application. Streamlining SmartRegs and RHL administration is key to ongoing program success, especially after 2019. A comprehensive review of the RHL and SmartRegs program will be presented to council in 2015 to address a multitude of topics around the full cost of implementing both programs together.

⁵ The report is found on page 27 of the linked memo packet.

Table 3: SmartRegs Progress to Date and Goals to 2019

Year	Approx. # of Rental Units Renewed or Newly Licensed	Units Inspected in Year	Units Compliant in Year	Compliant by Exemption (Cumulative)***	Units Compliant (Cumulative)	% Units Compliant (Cumulative)**
2011	<i>Not available</i>	2,135	917	<i>Not available</i>	917	4%
2012	4,630	2,906	1,702	128	2,619	13%
2013	4,274	1,300	1,314	135	3,933	19%
*2014	3,687	1,257	1,514	547	5,447	26%
2015	7,100					
2016	4,000					
2017	3,500					
2018	4,800					

*2014 progress to date (as of Q3 Reports)

**Based on 20,652 licensed rental properties in Landlink

***These units are included in the total compliant number

Anticipated rental units licensed for 2015-2019 are estimates based on expected renewals.

B. DSM Programs: Evolution of Demand Side Management Strategy

Due to the significant level of engagement with the business community around flood recovery efforts and the exploration of municipalization, last year the city refrained from launching new energy efficiency requirements targeted at the commercial and industrial (C&I) sector. During that time, the city focused its C&I efforts on delivering existing programs, data collection, analysis of the market and energy use of that sector, and piloting new programs and approaches.

With the development of the municipal utility in progress and the recent hiring of a new Energy Services Manager, staff is now moving forward to develop a comprehensive demand side management strategy that includes the development of new programs targeted at the commercial and industrial sector. Demand side management (DSM) is broader than just energy efficiency and refers to anything that modifies consumer demand for energy. It includes energy efficiency, demand response and combined heat and power (CHP)⁶; it does not include local generation (e.g., rooftop solar).

This broader strategy will encompass future DSM energy services under the Electric Utility of the Future, as well as future mandatory requirements for commercial and industrial buildings (referred to as the Commercial and Industrial Energy Ordinance).

Commercial and Industrial (or C&I) includes all non-residential buildings except for multi-family. Industrial buildings are those whose primary use is assemblage, processing, and/or manufacturing products from raw materials or fabricated parts. This includes warehouses and distribution and maintenance facilities.

⁶ CHP refers to recovering and reusing waste heat, typically in industrial facilities

1. Goal and Objectives of DSM Strategy

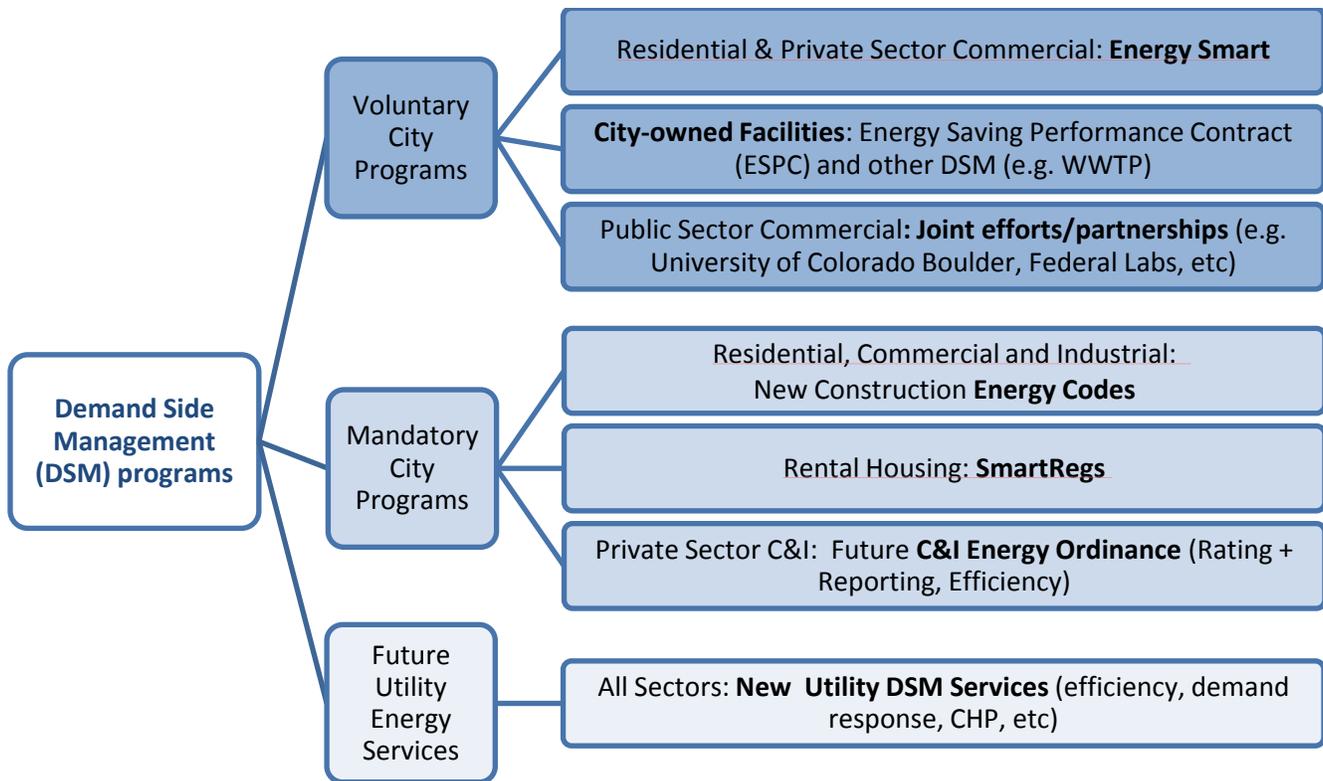
Staff proposes the following goal for this DSM strategy. This goal is consistent with the climate commitment, as well as the sustainability framework.

GOAL: To create demand side management programs that accelerate the widespread reduction of greenhouse gas (GHG) emissions, foster economic vitality, and have the flexibility to adapt to changes in community needs and external influences.

This goal will guide evaluation of existing efforts and development of future DSM programs. This will also inform the allocation of resources according to potential impact on climate commitment goals. With this in mind, staff proposes the following framework (see Figure 5). This framework reflects the need for voluntary and mandatory programs, as well as future energy services offered by the utility. It also illustrates which sectors are impacted by each program; for instance, public sector buildings would be exempt any future ordinance, but would still benefit from future utility energy services.

In Boulder’s residential sector, voluntary energy efficiency programs have been in place for over a decade, and a mandatory energy efficiency requirement (SmartRegs) has been in motion for rental housing for four years. In this next generation of private sector C&I programs, staff will develop options for a C&I energy efficiency ordinance that would potentially make rating and reporting, as well as some energy efficiency, mandatory.

Figure 5: Existing and New DSM Programs



The next steps are to fully develop a three-year DSM Strategy concurrently with key efforts such as the development of a C&I energy ordinance and the implementation and enforcement of SmartRegs.

Table 4: Timeline for Development of DSM Strategy

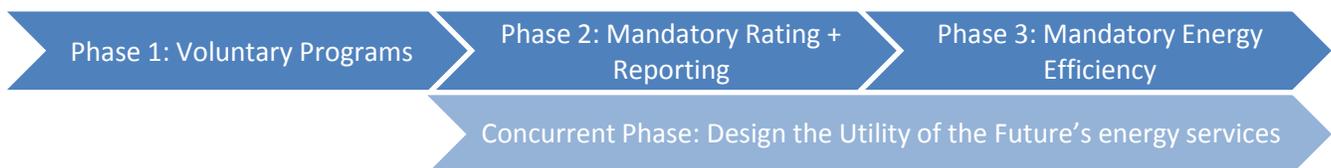
	Key Efforts	Description
Oct 2014 – Aug 2015	Develop Commercial Energy Efficiency Ordinance	The proposed ordinance will require certain actions on the part of the commercial building owners, to improve the quality and energy performance of their buildings. This could include rating and reporting and/or various prescriptive energy requirements such as energy audits or commissioning.
Oct 2014 - 2016	Develop “Day 1” DSM Energy Services through the city’s Utility of the Future	As part of the municipalization transition plan, staff will develop a plan for offering energy services to utility customers. The new DSM services will be coordinated as part of the overall strategy.
Jan 2014- 2016	Develop and execute implementation strategy for SmartRegs	Staff is working to integrate SmartRegs into the Rental Licensing process – the focus is on integration, understanding full program costs and compliance with license renewals.
Oct 2014 – Dec 2015	Develop 3-year DSM Strategy	For each DSM program/project, the following will be provided: <ul style="list-style-type: none"> • Scope • Goals and Objectives • Budget/ Staffing/ Detailed work plan

C. DSM Programs: Commercial and Industrial Energy Ordinance

City Council identified a commercial and industrial energy ordinance as a high priority at its 2014 retreat.

1. Proposed Approach and Scope

The intent is to continue with the three-phase approach last discussed at council’s [May 22, 2012 Study Session](#), modified to reflect the integration with the municipalization effort:



A Commercial and Industrial (C&I) Energy Ordinance would move beyond voluntary programs, requiring actions that would reduce energy use and improve the quality of the building stock. This follows the model of what has been done in the residential sector, with successful voluntary programs (EnergySmart) leading up to energy efficiency regulation on the rental housing stock (SmartRegs).

Options for the ordinance are anticipated to include rating and reporting (or “benchmarking and disclosure”) and possibly some efficiency measures, such as the phasing out of old, inefficient lighting technologies, or requiring energy audits or retro-commissioning⁷ at regular time intervals.

2. *Proposed Objectives and Timeline*

The proposed objectives of the ordinance include:

- 1 Improve the quality of the city’s nonresidential* building stock
- 2 Realize the cost-effective energy savings in the city’s nonresidential building stock
- 3 Enable building owners to better understand and manage energy use of their buildings
- 4 Gather valuable data to inform future program design and energy service offerings
- 5 Increase overall awareness and understanding of efficiency opportunities with key stakeholders (building owners, property managers, business associations, etc)

** Nonresidential refers to commercial and industrial buildings (does not include multi-family)*

In order to achieve these objectives, staff is dedicating resources to research, ordinance development, and community engagement. The major efforts are described below.

⁷ Retro-commissioning is a process that seeks to improve how building equipment and systems function together. Depending on the age of the building, retro-commissioning can often resolve problems that occurred during design or construction, or address problems that have developed throughout the building's life. In all, retro-commissioning improves a building's operations and maintenance (O&M) procedures to enhance overall building performance.

Table 5: 2015 Draft Timeline for Development of C&I Energy Efficiency Ordinance

	Key Efforts	Description
Oct 2014 – Feb 2015	Stakeholder Engagement for proposed C&I Ordinance	<ul style="list-style-type: none"> Phase 1: Convene working group of affected stakeholder (building owners, property managers, etc) to help develop options for a commercial energy ordinance Phase 2: Broader outreach to the commercial building community to solicit feedback on the recommended options
Dec 2014 – June 2015	Develop options and recommendations for a C&I Energy Ordinance	Will include options and recommendations for: <ul style="list-style-type: none"> Covered buildings and exemptions Timing/Phasing of ordinance Public disclosure Enforcement and administration Recognition and incentives
June – Aug 2015	Develop draft ordinance for council approval	Draft ordinance language for rating + reporting and efficiency requirements, including proposed enactment & enforcement schedules. * MILESTONE: Ordinance Adopted, Aug 2015
Aug 2015 - 2016	Develop systems and tools for implementing the Ordinance	Prior to any compliance date, the city will develop: <ul style="list-style-type: none"> A website for the ordinance Implementation guides for owners and tenants Educational and training opportunities Administration and enforcement systems and procedure
Aug 2015 - 2016	Communication and Education Efforts	Prior to any compliance date, the city will communicate the goals and logistics of these requirements to affected community members.
Early 2017	First compliance date	Targeted compliance date for the first buildings that will have to comply (e.g. commercial and industrial buildings > 50,000 sf). * MILESTONE: First Compliance Date, 2017

Based on lessons learned from other communities and the creation of SmartRegs, staff is currently estimating a year and a half to develop systems, processes and tools to administer and enforce the ordinance. The preliminary thinking is to have a goal of adopting the ordinance in August of 2015, it wouldn't go into effect until early 2017. Staff is working with the Department of Energy and other municipalities with similar ordinances to better understand the processes that may work best for the City of Boulder.

D. Pilots and Cross-Cutting Efforts: Boulder Energy Challenge

The Boulder Energy Challenge was launched in June with the main objective of supporting the development and commercialization of innovative GHG emission reducing technologies and strategies in Boulder. Thirty projects applied and were evaluated by a team of community experts and staff. The evaluation process concluded with six finalists presenting their ideas at a Community Pitch Night held on Aug. 7 at Impact Hub Boulder. The event included public polling of favorite projects and the announcement that the Challenge would fund all six finalist projects, totaling \$337,500.

The 2014-2015 Boulder Energy Challenge projects are:

- *Boulder Housing Partners: Affordable Energy Empowerment.* This project will use a combination of energy feedback hardware/software and a resident empowerment program to reduce electricity consumption in two low-income housing complexes. Currently energy is “invisible” in these complexes due to consumption data only being available at the building level and the fact that residents do not pay their electric bill.
- *eGo Carshare: TripSmart Pilot Project.* eGo Carshare will assess the ability to impact the mode choice of residents through targeted transportation advising. eGo staff and partners will conduct free individual transportation audits in person and online, then recommend customized solutions tailored to the individual’s needs in an effort to reduce the use of single occupancy vehicles.
- *Evolution7 Labs: Solar-Plus-Storage Demonstration Project.* This project will construct two residential and one commercial demonstration sites for premises-based solar-plus-storage installations. The sites will include an advanced *Transverter* inverter/charger, solar arrays, batteries, and electric car charger, and smart appliances integrated using the on-site *PowerStation* energy management gateway and application platform.
- *Lightning Hybrids: Hydraulic Hybrid Pilot Project.* Lightning Hybrids will install one of their hydraulic hybrid systems onto a shuttle bus owned and operated by Via Mobility Services. Following installation the system will be assessed over time to measure the effectiveness of the system in reducing fossil fuel consumption and GHG emissions.
- *Snugg Home: Bundling Electric Vehicles with Solar PV and Energy Efficiency.* Snugg Home recently performed a study to determine the financial benefits of combining home energy efficiency retrofits, solar photovoltaic’s, and electric vehicles under one financing mechanism with fast payback periods. For this project Snugg Home will develop a user-friendly calculator to demonstrate the idea, and then build a business model to market and sell the bundling of these upgrades through partnerships with manufacturers, distributors, local installers, and local financiers.
- *Superior Ecotech: Algae Greenhouse for CO2 Capture.* Superior Ecotech will build a pilot 1,000 square foot algae greenhouse at their partner brewery, Upslope Brewing. This first of its kind greenhouse will use waste CO2 from the fermentation process and convert it to healthy, valuable Omega-3 oils via the growth of algae.

More information about the projects is available on the program website BoulderEnergyChallenge.com. The projects will be tracked over the next year with the assistance of technical advisors facilitated by the [Colorado Clean Energy Cluster](#) and the [Rocky Mountain Innosphere](#). Updates on the projects will be posted on the website, and after the conclusion of the one-year grant period the program will be evaluated and improved upon before launching for a second cycle in early 2016.

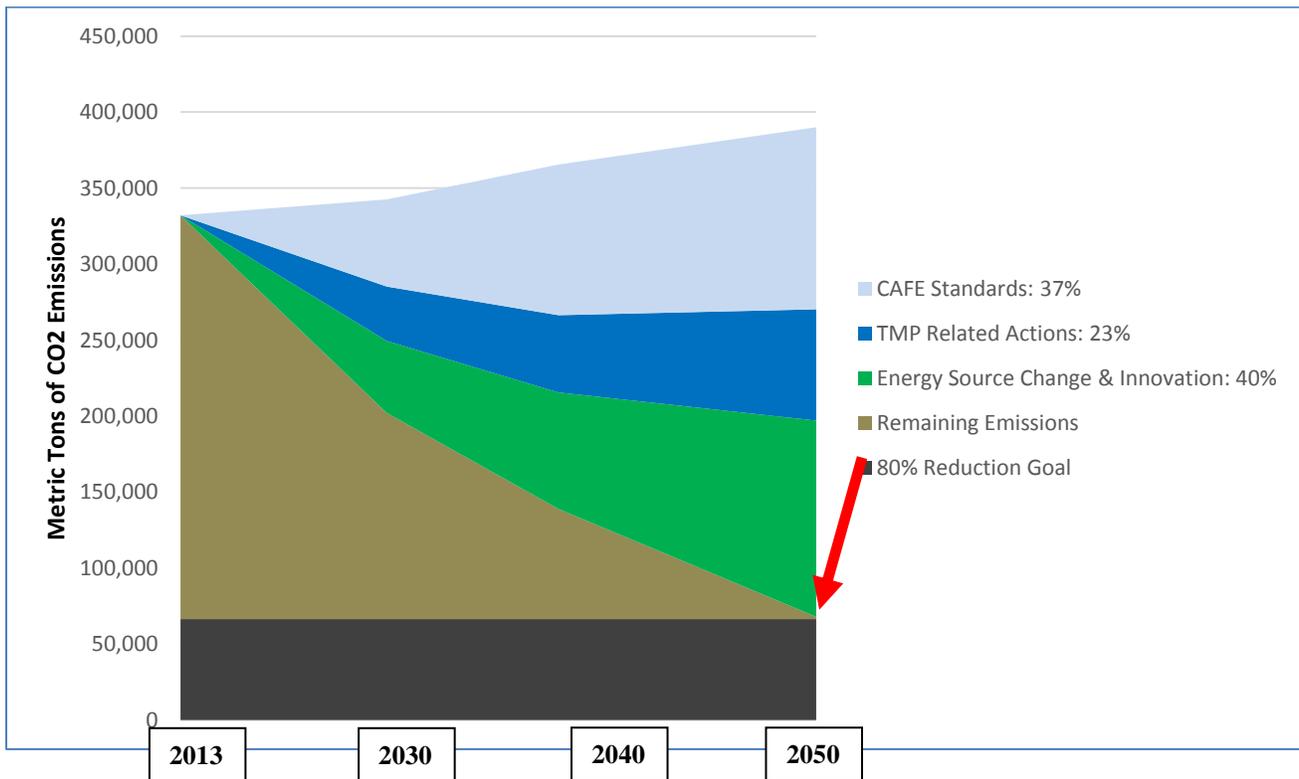
E. Pilots and Cross-Cutting Efforts: Coordination with Transportation Master Plan (TMP)

In one of the first initiatives to integrate climate action into a master plan, a cross-departmental team and consultants worked with transportation staff to conduct an extensive analysis of Boulder’s transportation-related GHG emissions as part of the recent Transportation Master Plan update. This work significantly updated and refined previous analyses that were largely based on regional transportation models. The new, more localized analysis utilized the city’s extensive travel survey data as well as new traffic count information using more refined counting technology (infrared counters vs. air hose counters). The analysis also integrated the new ICLEI US community GHG protocols, which call for taking responsibility for half of all trips originating from or heading to Boulder. For example, only half of a non-resident employee’s round trip commute distance is included in the inventory.

Seven major travel sectors were analyzed: residents, non-resident employees, students, visitors, transit, freight and the Boulder airport. A detailed summary of emissions from each group is included as part of “**Error! Reference source not found.**”.

This data was then used to conduct projections for future transportation emissions and the anticipated emissions reductions that could be achieved through the extensive travel demand management, transit expansion and multi-modal transportation system development proposed in the TMP. This analysis, conducted by the Southwest Energy Efficiency Project, is presented in Figure below.

Figure 6: Projected GHG Reductions by Action Area⁸



⁸ From Southwest Energy Efficiency Project 2014 Analysis

Three of the major findings discussed in Attachment C are summarized below.

1. *New transportation GHG reduction metrics are needed*

Building on the foundation of the updated TMP measurable objectives, additional metrics are needed to further track progress in the area of transportation-related GHG analysis.

Finding--Existing GHG metrics are based exclusively on tracking vehicle miles travelled. This can underestimate and undervalue the efforts to create other non-vehicle related travel options. Existing VMT metrics also make it difficult to track changes in vehicle fleet change efforts—expanded use of high efficiency vehicles and electric vehicles.

Action--Based on these issues, staff are exploring the development of a “personal miles travelled” (PMT) metric as a way to monitor overall system mobility. Staff is also examining the potential use of a whole fleet “miles per gallon equivalent” (MPGe) that would enable more specific target setting for efforts to induce or encourage low or no-carbon vehicle usage.

2. *Existing travel demand management, transit and multi-modal efforts are critical elements of a GHG reduction strategy*

Finding--Existing strategies that maintained the pattern of no VMT growth over the past 20 years have been critical to controlling transportation GHG emissions growth. Still, the much more ambitious goal now being considered will require additional transportation measures to reduce VMT below current levels over the next two to three decades.

Action--Staff is directing additional attention and effort to increasing efforts to reduce both resident and non-resident employee Single Occupancy Vehicle usage. Efforts in transportation can have significantly greater effects if they are supported by land use and policy changes. Two examples were demonstrated in the sensitivity analysis related to expanded Eco Pass access and managed parking conducted as part of the TMP and AMPS processes.

3. *Additional energy source change initiatives and other innovations are essential*

Finding--There will need to be an additional share of GHG reductions in addition to the reductions provided by both TMP-related mode shift actions and the vehicle efficiency improvements resulting from the implementation of Federal CAFE standards.

Action--A number of initiatives are now in development that will provide valuable information and experience to shape program strategies to reduce GHG emissions through transportation energy source change and other approaches such as land use changes that support both transit and other forms of non-vehicular mobility. These efforts, described in more detail in “**Error! Reference source not found.**,” include:

- EV Infrastructure and Adoption Assessment
- Employee EV Commute Pilot
- Boulder Energy Challenge Pilots
- City Fleet EV Expansion

F. Municipalization Transition Plan

The Municipalization Exploration Project has provided recent updates to council related to the [transition plan](#) and the [recommended 2015 budget](#). At the time this memo was written, the city was awaiting the outcome of three cases at Boulder district court and one case at the Federal Energy Regulatory Commission related to municipalization. The outcomes of these cases could shift the schedule and priorities of the municipalization work plan. Staff will provide regular updates on work plan priorities and schedule.

At its April 24, 2014 Study Session, council discussed the fundamental need to overhaul the existing utility business model in favor of one that accommodates a different energy system and relies on a different revenue model. This transition is vital for Boulder to achieve its climate and energy goals, as the utility plays a central role in ensuring a safe, resilient energy supply while prioritizing a rapid transition from fossil fuels.

The business model associated with the “utility of the future” is different in that it provides “energy as a service.” It sells or facilitates the provision of services that electricity provides—health, comfort, safety, and economic vitality—while reducing its impact on our natural environment and rapidly transitioning from fossil fuels to clean, renewable energy. It will also have a different relationship with customers as it helps them use less energy, manage energy more efficiently, and self-generate where possible. Boulder is looking at a fundamental shift in thinking about the purpose of the utility: how it measures success, how it is organized and operates, how it engages with customers, and how it is financed and made economically viable.

As part of this study session, staff has arranged a presentation by NRG Energy, Inc. NRG is one of the largest independent producers and retail electric companies in the US. While the utility currently generates a significant portion of its energy from fossil fuels, it has developed an aggressive vision that is embracing the energy-as-a-service concept. The utility is implementing an increasingly diverse suite of energy sources, empowering its consumers with real choices and value, and developing and implementing leading-edge efficiency and demand-response initiatives. As Boulder continues to refine its vision of what its own electric utility could look like, hearing from progressive utilities helps define what’s possible – and what is already happening.

In addition to discussions with entities outside Boulder like NRG, municipalization staff recently conducted, in conjunction with Rocky Mountain Institute, a six-hour planning workshop with key customers and community leaders to help demonstrate the power of public-private partnerships in designing and operating the Electric Utility of the Future. A diverse representation of the community were invited to participate in conversations that will help shape the types of services, rate-setting approaches, and innovation priorities the utility sets, both in the short and long terms.

Lastly, the municipalization project staff has begun to seek participants for a series of working groups designed to assist with implementation of the transition plan. The working groups include Energy Services; Resource Acquisition; Customer Experience; Rates; and Reliability/Safety. As a change from the last round of Energy Future working groups, these working groups will be selected through an application process that will seek specific expertise in these areas. Separate outreach will be conducted for a broader group of stakeholders. The application and working group scopes are available on the Energy Future website, www.BoulderEnergyFuture.com.

G. Local Generation Options and Analyses

The development of local energy generation has become a cornerstone of Boulder's short- and long-term energy strategy. It supports the city's existing energy services, promotes a resilient energy supply and provides a basis for a local resource portfolio should the city create a local electric utility.

Local, state and federal policy on renewable and low-carbon energy is moving fast to take into account emerging technologies and targets. In parallel, there has been growing recognition of the qualitative benefit associated with low-carbon, decentralized generation. Many of these benefits were identified in the city's Qualitative Analysis ([Attachment E of the July 23, 2013 Study Session memo to City Council](#)).

These facts come together to present a dynamic backdrop for the local planning of distributed generation and how essential it is that Boulder has a robust understanding of its renewable energy potential. Building on the [recommendation from the Solar Working Group](#), staff has begun efforts associated with a **three-phase local generation analysis process**. The project provides the data required for on-going renewable energy deployment and will also assist in developing policy to support local energy development.

The overall objective of the study is to provide an in-depth assessment of the potential of local generation technologies to meet a significant share of Boulder's electricity demand. The analysis is also intended to explore the implications of achieving significant local generation levels both in terms of potential benefits as well as potential challenges. The project focuses on renewable electricity and heat, including both residential and commercial scale renewables (on-site and building-integrated renewables). Some of the specific objectives include:

- Highlight the potential for solar electricity to significantly impact the electricity generation portfolio and to explore the challenges likely to be encountered as the industry grows;
- Produce energy planning guidance by setting out generation potential, providing guidance on how this should be aligned with economic development, climate and community energy goals;
- Evaluate the upper technical and theoretic bound of the electricity market share that can be captured by solar electricity;
- Identify high value or high reliability locations on the grid, that may strongly benefit from on-site generation for back-up or redundancy;
- Provide the analysis and insights that could help design and implement solar-friendly policies;
- Inform the development of local-generation financing or incentive programs;
- Provide a full resource assessment for low carbon and renewables technology capacity, constraints and opportunities for Boulder; and
- Develop an electricity distribution network capacity assessment to enhance understanding of the areas of the network that have capacity, and those that do not, to connect and accommodate electricity generated from renewable sources.

The specific phases and example work plan components are listed below:

Phase 1: Solar Data Collection and Analysis (September 2014 to July 2015)

The first phase of the local generation analysis is intended to identify overall capacity of solar electricity potential in Boulder. This phase utilizes existing and new data sets to calculate an overall rooftop capacity in megawatts as well as provides the data necessary for future analyses for decision-making.

- Contractor extracts building footprints from Boulder’s 2013 Light Detection and Ranging (LIDAR) data
- LIDAR and building footprint data sets sent to NREL for analysis
- NREL processes Boulder data using their custom built Python script to identify solar site suitability based on NREL assumptions (ft², solar irradiance, slope & orientation).GIS output data from NREL will be overlaid with existing GIS resources associated with historic preservation, leased space, etc

Staff has also selected three CU RASEI⁹ student team project^s to inform the overall local generation analysis. These projects are anticipated to be completed by December 2014. They include:

- Evaluation of existing local, state and federal regulatory barriers, and utility requirements for an investor-owned utility and a municipal utility.
- Analysis of potential incentive structures including pros and cons of various approaches
- Research on Solarize¹⁰ programs and options for collective purchasing efforts for Boulder businesses and neighborhoods.

Phase 2: Advanced Solar Analysis (2015 to 2016)

Phase 2 is intended to utilize the research and data set from “Phase 1” in a number of key decisions. The second phase will also focus on identifying sites that might strongly benefit from on-site generation.

Community solar capacity data used to inform:

- Local generation capacity associated with a local utility resource plan
- Existing and future solar incentive structures
- Existing & potential financing structures for solar investment
- Updates to existing policies and programs
- Grid capacity for solar expansion
- High-reliability zones and critical energy users mapped; specific sites identified as strong candidates for on-site generation and/or storage technology.

Phase 3: Full Local Generation Analysis (2015 to 2016)

Phase 3 builds on the first two phases and identifies “non-solar” resources that support Boulder’s energy goals. This phase would include issues such as site-suitability, economic feasibility and long-term resource planning impacts.

⁹ RASEI is a joint institute between the University of Colorado Boulder (CU-Boulder) and the National Renewable Energy Laboratory (NREL) addressing important, complex problems in energy that require a multidisciplinary, multi-institutional approach. Its mission is to expedite solutions that transform energy by advancing renewable energy science, engineering, and analysis through research, education, and industry partnerships.

¹⁰ Solarize is a Department of Energy supported grassroots campaign effort to increase the number of solar electric (PV) installations in a focused neighborhood or community.

V. COMMUNITY ENGAGEMENT AND COLLABORATION

There is little doubt that the Boulder community is aware of the issue of climate change and committed to addressing it, as demonstrated by voters' continued support for the Climate Action Plan tax and other environmental initiatives. As discussed previously in this memo, the city has a number of significant efforts underway and more planned for the future. The challenge, however, is helping the community understand the relationships between these – and how they will help achieve the Climate Commitment vision. This will be the primary focus of the city's communication and outreach efforts from now through the end of 2015.

Building on the framework presented in this memo, city staff plan to work with Vermilion, a Boulder-based communications firm, to develop compelling materials (likely in the form of a motion graphic, slide show or video) that tell the evolving story of Boulder's climate commitment and the current-day focus on energy as the primary driver of future success.

These materials will be shared widely and made available to staff and community members as they engage with stakeholders and community members about any of the initiatives that fall under this framework, including Energy Future or more specifically, municipalization; the development to of a commercial and industrial energy efficiency ordinance; the Boulder Energy Challenge; the Community Power Partnership; SmartRegs implementation and others. The goal is to create a common understanding about the impetus for the city's efforts and a shared language around the possible solutions.

A key message will be that the community's efforts, right here at home, will make a positive difference both today and for the generations to come in a whole range of ways. Some are environmental, but there are other benefits as well. Some of these include:

- Forging a distinctly Boulder energy economy;
- Supporting a healthy and joyful quality of life;
- Building resilience; and
- Continuing to attract students and visitors to the community.

At the same time, we realize that Boulder is not alone in facing this challenge – nor in finding possible solutions. In recognition of this, the city has initiated efforts to convene the energy systems transformation blueprint development process described earlier in this memo. The results of this work would serve as the basis for the start of a public process in Boulder, likely in the second half of 2015 or 2016, to apply the shared language and principles locally, given our community's priorities and objectives. More details about this will be presented to council as the results of the USDN convening become clear.

In addition to these efforts to bridge the variety of city initiatives with a viable and meaningful long-term framework, many of the current programs have communication and engagement plans that will be carried out at the program level. These will leverage the city's many resources – social media, Channel 8 programs, positive relationships with media outlets – and utilize best practices around stakeholder engagement to seek feedback and keep the community informed about their progress.

VI. ATTACHMENTS

Attachment A: Summary of Recent Climate Change Assessments

Attachment B: US Sources of GHG Emissions

Attachment C: Projected Transportation GHG Reductions by Action Area

ATTACHMENT A

Summary of Recent Climate Change Assessments

Over the last six months, a number of major climate assessments have been released. These assessments, conducted by scientists working across academic and political boundaries, indicate that human-caused climate change is happening and poses unprecedented risks. The research demonstrates that global average temperatures are increasing and extreme events are becoming more prevalent. A number of these assessments suggest there may be only 15 to 20 years to achieve the deep reductions necessary to stabilize the climate at sustainable conditions for many regions of the world.

At a local level, temperatures have risen in Colorado by 2.5 degrees F in the last 50 years (over 1 degrees Celsius), and some studies project average temperature increases of an additional 2 to 6 degrees Fahrenheit in our state between now and 2067 (1-3 degrees Celsius).

Summaries of a number of these key assessments and link to their full reports are included below



[American Academy of Advanced Sciences—What We Know](#)

User friendly summary of a wide range of other scientific assessments.



[Climate Change in Colorado 2014](#)

Detailed assessments specific to Colorado. This is the most recent and up-to-date analysis of Colorado climate change published.



[Intergovernmental Panel on Climate Change \(IPCC\) Working Group 3 Report](#)

This assessment, the third of five reports to be published, focuses on options for mitigating climate change through emissions reduction strategies.



[International Energy Administration Paper on Energy Technology and Climate](#)

This readable assessment of overall energy policy provides one of the first international reports to focus heavily on the need for a large scale energy system transition away from fossil fuels.

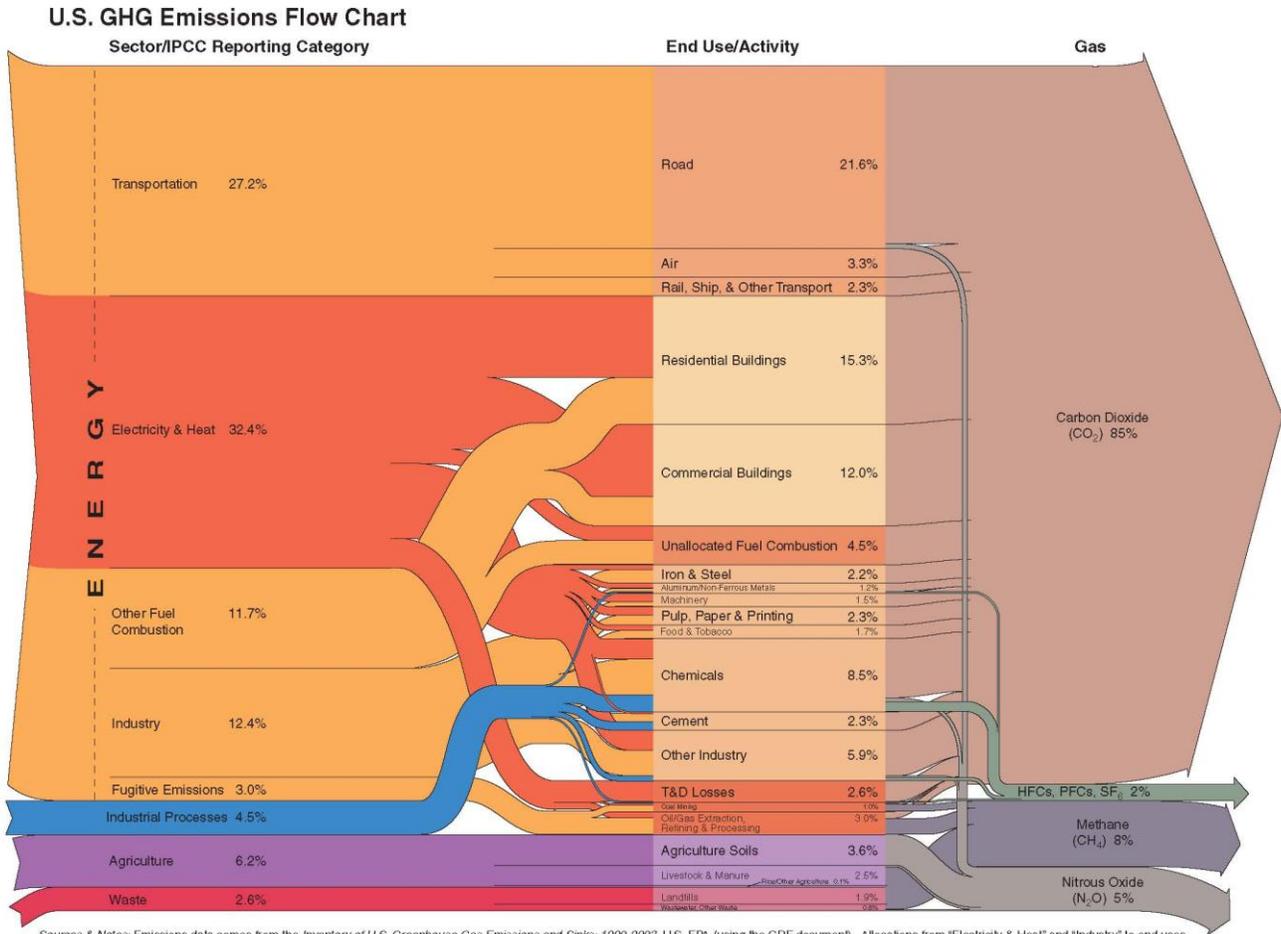


[Kepler-Ross Financial Analysis of Fossil Fuel Investment Risks](#)

This business and investment focused analysis assesses the growing financial risks associated with maintaining current fossil fuel-based energy systems.

ATTACHMENT B

US Sources of GHG Emissions



Sources & Notes: Emissions data comes from the *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2003*, U.S. EPA (using the CRF document). Allocations from "Electricity & Heat" and "Industry" to end uses are WRI estimates based on energy use data from the International Energy Agency (IEA, 2005). All data is for 2003. All calculations are based on CO₂ equivalents, using 100-year global warming potentials from the IPCC (1996), based on total U.S. emissions of 6.978 MTCO₂ equivalent. Emissions from fuels in international bunkers are included under Transportation. Emissions from solvents are included under Industrial Processes. Emissions and sinks from land use change and forestry (LUCF), which account for a sink of 821.6 MTCO₂ equivalent, and flows less than 0.1 percent of total emissions are not shown. For detailed descriptions of sector and

From World Resources Institute 2008 <http://www.wri.org/resources/charts-graphs/us-greenhouse-gas-emissions-flow-chart>

ATTACHMENT C

Projected Transportation GHG Reductions by Action Area

The following summarizes a set of additional efforts in development that are targeting emissions reduction through vehicle efficiency and energy source modification.

Electric Vehicle Charging Infrastructure and Adoption Assessment

Drawing from this analysis, the city has partnered with Boulder County, University of Colorado (CU) Boulder, Boulder Valley School District (BVSD) and UCAR to coordinate a County wide analysis of electric vehicle charging infrastructure issues as well as other key factors in electric vehicle adoption. The Southwest Energy Efficiency Project will be conducting this analysis for this consortium. The study was initiated October 1st with a projected completion date of February 1st, 2015.

The study has three major focus areas:

- *Charging Infrastructure* – A critical factor in support of broader adoption of electric vehicles is the availability of charging infrastructure. SWEEP conducted a preliminary analysis of County wide charging infrastructure in 2011. This study will update both the public charging station analysis and add analysis of home, workplace and public charging infrastructure.
- *Multi-Modal Linkages* -- In the public infrastructure analysis we will give special attention to the potential for creating multi-modal linkages by examining the possibilities of charging infrastructure at park-and-rides and “edge” parking facilities with “last-mile” mode options.
- *Workplace EV Adoption* – One of the strategies for accelerating adoption of EVs in sectors with the greatest GhG emissions reduction impacts is in the potential for workplace commuting. This is also one of the travel categories most difficult to move out of single occupancy vehicles. As part of the analysis, SWEEP will identify issues and opportunities for the city of Boulder to implement an EV commuting pilot project with its own employees. Boulder County, CU, BVSD and UCAR are interested in similar opportunities. This sort of group adoption could create a much more rapid expansion of EV usage, particularly in the longer travel categories with the most emissions reduction potential.

Employee EV Commute Pilot Project

As noted above, the SWEEP assessment will help the study partners evaluate the potential for implementing electric vehicle commuting opportunities for its employees. Given the high proportion of each organization’s employees that commute in to Boulder for work, employee commuting represents one of the largest sectors of GhG emissions for each of these organizations. The Boulder employee EV commute pilot will examine both the potential for alternatively-fueled vehicle options along with other currently used other trip reduction strategies such as vanpooling (including the potential for electric vans), telework options, and other employee commute options that reduce the use of single occupant, low efficiency vehicles.

Boulder Energy Challenge Transportation Pilot Projects

As part of the Boulder Energy Challenge, three projects were selected that have a focus on transportation emissions.

- *eGo Car Share*—Boulder’s highly successful EnergySmart Program has become a national model for effective adoption of energy efficiency measures based in large part on the energy advisor element of its approach. Similar ideas of more personalized assistance in travel

ATTACHMENT C

planning have been considered or tested on a limited scale in other areas. In the project funded by the Energy Challenge, eGo Care Share will implement a pilot advisory model that includes both direct person-to-person support, enhanced web and personal device applications, and a gamification element to incent new and more efficient behavior.

- *Lightning Hybrids*—Lightning Hybrids has developed an after-market regenerative braking system for medium-to-heavy duty transit and freight vehicles that can cut energy usage by as much as 30 percent. In this funded pilot, they will install one of their systems on a VIA transit vehicle and assess the overall energy savings over the course of a year of operations. Given the significant contributions of both transit and freight to the city's overall transportation GhG emissions, this is an exciting opportunity to test new technology that could have a substantial impact on emissions in this category.
- *Snugg Home*—Snugg Home has developed a financing package for homeowners that enables them to bundle the purchase of a photovoltaic electric system, an electric vehicle and a home retrofit at a cost comparable to what they would pay for a car payment and energy costs (including gasoline) and pay off the entire package within five years. If successful, this could offer local residents a significant opportunity to both save money and make a major contribution to local GhG emissions reductions in both electricity, natural gas, and petroleum usage reduction.

City Fleet EV Expansion

The cities Facilities, Fleet and Maintenance Division is in discussions with firms offering new opportunities for significant expansion of the city's hybrid and electric vehicle fleet through an energy services contract similar to those used for other facilities projects. Full implementation may require creating additional partnerships with the County and other municipalities to create an economy of scale sufficient to make this opportunity viable. If successful, this approach could more than triple the number of electric city vehicles,

Transit Fleet Improvements

As part of the GhG emissions analysis conducted during the TMP update, Nelson Nygaard conducted an extensive assessment of the GhG impacts of different transit scenarios being considered in the TMP. These assessments demonstrated the importance of an enhanced focus on improvement of transit fleet efficiency and alternative fuel option development in order to maximize the benefits that the doubling of transit ridership anticipated through implementation of the TMP will create. Transportation staff is working on a range of efforts to improve transit efficiency including both work with RTD and identification of opportunities for piloting new transit options with Via.