SUBJECT: DISCUSSION/DIRECTION – POTENTIAL BALLOT ISSUES FOR 2020 ELECTION

DATE: JUNE 16, 2020

PRESENTED BY: MEGAN DAVIS, DEPUTY CITY MANAGER
EMILY HOGAN, ASSISTANT CITY MANAGER FOR COMMUNICATIONS AND SPECIAL PROJECTS

SUMMARY:
On May 19, 2020 City Council discussed six policy issues that were identified during the 2020 work planning process, and which would require voter consideration or further City Council action. Council requested that staff bring forward options for potential ballot measures for three of these issues: Single use bag ban/tax/fee, tobacco/vaping tax, and community renewable energy.

This communication outlines additional information on each issue and options for City Council to discuss on each potential ballot measure. If Council would like to move forward with any ballot measures for voter consideration in 2020, staff will work with the City Attorney to draft ballot language for first reading on July 14 and for second reading on July 28. For any revenue generating ballot issues, staff will also work with Bond Counsel on the ordinance and TABOR Notice. The measure(s) would then be placed on the ballot for City of Louisville voter consideration in the November 2020 election.

1) SINGLE USE BAG TAX:
During the previous discussion on potential ballot issues, Council directed staff to bring back options for a single use bag tax. The City’s Sustainability Action Plan identifies several strategies aimed at “achieving zero waste and managing resources responsibly and effectively”. External strategies developed to achieve this goal include “promoting recyclable substitutes/replacements for single-use, throw-away items”. The estimated total of single-use bags distributed in Louisville is approximately 4.5 million bags or 25 tons per year.

Program Options:
(These scenarios reflect a $0.10/bag tax)
Scenario 1 – All Retailers in Louisville
Revenue for a tax is based on the rate of behavior of change after a tax is implemented. Below are several scenarios if the City were to adopt the bag tax for all retailers in Louisville:
### Rate of Behavior Change

<table>
<thead>
<tr>
<th>Rate of Behavior Change</th>
<th>65%</th>
<th>75%</th>
<th>85%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change</td>
<td>2.9 million bags</td>
<td>3.4 million bags</td>
<td>3.8 million bags</td>
</tr>
</tbody>
</table>

### Benefits

<table>
<thead>
<tr>
<th>Description</th>
<th>65%</th>
<th>75%</th>
<th>85%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction in waste</td>
<td>$64,000</td>
<td>$45,000</td>
<td>$27,000</td>
</tr>
<tr>
<td>Revenue generated</td>
<td>$160,000</td>
<td>$112,500</td>
<td>$67,500</td>
</tr>
<tr>
<td>Business/City breakdown</td>
<td>$64,000/$96,000</td>
<td>$45,000/$67,500</td>
<td>$27,000/$40,500</td>
</tr>
</tbody>
</table>

### Costs

<table>
<thead>
<tr>
<th>Description</th>
<th>65%</th>
<th>75%</th>
<th>85%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marketing/Training</td>
<td>$60,000 (year 1 only)</td>
<td>$60,000 (year 1 only)</td>
<td>$60,000 (year 1 only)</td>
</tr>
<tr>
<td>Education/outreach &amp; administration*</td>
<td>$30,000 (ongoing)</td>
<td>$30,000 (ongoing)</td>
<td>$30,000 (ongoing)</td>
</tr>
<tr>
<td>Low income resources**</td>
<td>$15,000 (ongoing)</td>
<td>$15,000 (ongoing)</td>
<td>$15,000 (ongoing)</td>
</tr>
</tbody>
</table>

### Total

<table>
<thead>
<tr>
<th>Description</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Net revenue for City</td>
<td>Year 1: ($9,000)</td>
<td>Year 1: ($37,500)</td>
<td>Year 1: ($64,500)</td>
</tr>
<tr>
<td></td>
<td>Year 2+: $51,000</td>
<td>Year 2+: $22,500</td>
<td>Year 2+: ($4,500)</td>
</tr>
</tbody>
</table>

*$25,000 was included for part-time staff and software modifications to administer the program for the City. Staff finds that administering the tax for all retailers in Louisville would be burdensome and require additional staff time to track and follow-up on for compliance. The remaining $5,000 is for ongoing education/outreach.

**$15,000 was included for low income resources. Low-income funding could be used for targeted outreach with rebates and resources and/or reusable bag program.

In summary, as the rate of behavior increases and the number of single-use bags is reduced, the program’s cost increases.

### Scenario 2 – Only Food Stores/Other Retail in Louisville

There are 145 total retailers in Louisville that a bag tax could apply to. These include:

- 2 – building materials
- 26 – general merchandise
- 18 – food stores (includes grocery, liquor, marijuana, etc.)
- 3 – gas stations
- 10 – apparel and accessories
- 7 – home décor/furniture/appliance
- 78 – restaurants
  
  "Excludes businesses in CTC and Centennial Valley (largely manufacturing/commercial business park and service-based businesses such as salons, spas, medical, etc.)"

Staff used the following estimates for single use bag generation by retailer type:

- 60% - supermarkets (2,700,000 bags in Louisville)
- 15% - other food and restaurants (675,000)
- 10% - general merchandise and apparel (450,000)
- 9% - other retail (405,000)
- 6% - fast food and convenience (270,000)

Staff has provided scenarios if the City were to adopt a bag tax that was similar to Boulder's and only applies to food stores/other retail in Louisville:

<table>
<thead>
<tr>
<th>Rate of Behavior Change</th>
<th>65%</th>
<th>75%</th>
<th>85%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefits</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduction in waste</td>
<td>2 million bags</td>
<td>2.3 million bags</td>
<td>2.6 million bags</td>
</tr>
<tr>
<td>Revenue generated</td>
<td>$108,675</td>
<td>$77,625</td>
<td>$46,575</td>
</tr>
<tr>
<td>Business/City breakdown (40%/60%)</td>
<td>$43,470/$65,205</td>
<td>$31,050/$46,575</td>
<td>$18,630/$27,945</td>
</tr>
<tr>
<td>Costs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marketing/training</td>
<td>$40,000 (year 1 only)</td>
<td>$40,000 (year 1 only)</td>
<td>$40,000 (year 1 only)</td>
</tr>
<tr>
<td>Education/outreach &amp; administration*</td>
<td>$10,000 (ongoing)</td>
<td>$10,000 (ongoing)</td>
<td>$10,000 (ongoing)</td>
</tr>
<tr>
<td>Low income resources**</td>
<td>$10,000 (ongoing)</td>
<td>$10,000 (ongoing)</td>
<td>$10,000 (ongoing)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net revenue for City</td>
<td>Year 1: $5,205</td>
<td>Year 1: ($13,425)</td>
<td>Year 1: ($32,055)</td>
</tr>
<tr>
<td></td>
<td>Year 2+: $45,205</td>
<td>Year 2+: $26,575</td>
<td>Year 2+: $7,945</td>
</tr>
</tbody>
</table>

*$5,000 was included for software modifications to administer the program for the City. Staff finds that administering the tax for food stores/other retail only would not require a significant amount of staff time to track and follow-up on compliance and the administrative burden would be minimal. The remaining $5,000 is for ongoing education/outreach.

**$10,000 was included for low income resources. Low-income funding could be used for targeted outreach with rebates and resources and/or reusable bag program.

As the rate of behavior increases and the number of single-use bags is reduced, the program’s cost increases. However, the revenue/program costs are lower if the tax is only adopted for food stores/other retail.

**Peer Communities:**
The City of Boulder adopted a single use bag fee in 2013, which is $0.10 per disposable plastic or paper bag used at checkout. $0.04 of the fee is to be retained by the retailer to
cover costs of ordinance compliance and $0.06 is to be remitted to the City. The fee is to be remitted quarterly with a return form that will be mailed to each affected business. The fee does not apply to anyone who participates in federal or state food assistance programs. Boulder’s ordinance adopting the fee is attached.

At the time of adoption, Boulder estimated 33 million checkout bags were used per year by food stores. Boulder’s fee only applies to food stores, which are defined as those within city limits that operate year-round and sell a line of staple foodstuffs, meats, produce, dairy products or other perishable items. All stores must record the number of disposable bags provided and the total amount of the fee charged on the customer’s receipt for auditing purposes. Between 2013 and 2018, Boulder’s fee collected approx. $1,000,000 (or $200,000 per year).

Boulder’s fee currently allows $0.04 of the $0.10 fee to be retained by the food stores to cover their cost of compliance with the ordinance. The remaining $0.06 is remitted to the City for the following uses:

- Administrative costs associated with developing and implementing the fee
- Providing reusable bags to the community
- Educating residents, businesses and visitors about the impacts of disposable bags
- Funding programs and infrastructure that allows the community to reduce waste associated with disposal bags
- Purchasing and installing equipment to minimize bag pollution, such as recycling containers
- Funding community cleanup events
- Mitigating the effects of disposable bags on the City’s drainage system and environment

Boulder experienced a 70% decrease in single use bags immediately following adoption of the bag fee. However, that trend leveled off quickly according to staff. Several other communities in Colorado have adopted a similar fee. The charge ranges from $0.10 to $0.20 (see attached).

**Legal Analysis:**
Per the City Attorney, the City could draft ballot issue language that provides that the tax would no longer be in effect if single use bags are later prohibited within the City, but this would not be necessary because if there was a ban, there would be no taxable transactions. Council also has the authority to eliminate the tax if the State lifts the local preemption and Council votes to ban single-use bags.

**DISCUSSION/DIRECTION:**
In order to draft the ballot language, staff is seeking input on the following questions:

- **Which retailers should the tax apply to?** Options include:
o All retailers in Louisville
o Only food stores/other retail
o Other combination

• **What should be the amount charged for the tax?** Options include:
  o $0.10 per bag with $0.04 retained by retailer for cost of compliance and $0.06 remitted to the City (similar to Boulder’s fee)
  o $0.20 per bag with $0.10 retained by retailer for cost of compliance and $0.10 remitted to the City
  o Other amount
  *Staff recommends that retailers retain their portion of the tax for compliance as a vendor fee rather than remitting the entire tax to the City and receive a refund.

• **Should revenue from the tax be used for program administration and other sustainability-related initiatives or be left as unrestricted?** Options include:
  o Tax revenue should only be used for program administration and other sustainability-related initiatives
  o Tax revenue should remain unrestricted

• **When should the City start collecting the tax?** Options include:
  o January 1, 2021
  o January 1, 2022
  o January 1, 2025
  *It should be noted that King Soopers will not discontinue use of plastic bags until 2025. Additionally, many businesses are not currently allowing use of reusable bags as a result of COVID-19. It is believed that single use bags are less likely to transmit the virus.

2) **TOBACCO, NICOTINE, VAPING TAX**

During the previous discussion on potential ballot issues, Council directed staff to bring back more information and options for a local tax on vaping, nicotine and/or tobacco products. In November 2019 the City Council imposed a local ordinance prohibiting the sale of tobacco, e-cigarettes, vaporizers and similar products to persons under the age of twenty-one. Council indicated their goals for a tobacco, nicotine and/or vaping tax would be to reduce the use of tobacco and nicotine products and the associated health impacts on youth and others.

According to the [Healthy Kids Colorado Survey](#), Colorado has the highest rate of vaping in teens, at 27%, which is twice the national average. The attached City Council packet from December 3, 2019 includes additional background information on the public health impacts of tobacco and nicotine use among youth and adults. This communication includes responses to several City Council questions regarding existing tobacco taxes and specifics around a potential local tax.
Products To Be Taxed:
The State of Colorado currently imposes a 4.2 cent excise tax per cigarette ($0.84 per pack), levied on the sale of cigarettes by wholesalers and is assessed at a fixed amount on each single cigarette sold. In addition, the State imposes a 40% excise tax on invoice price paid by distributors to manufacturers or suppliers of other tobacco products. This tax applies to all tobacco products other than cigarettes, including cigars, pipe tobacco, chewing tobacco, and snuff, at the time when they are manufactured, brought into the state, or shipped to retailers. The state excise tax does not apply to vaping products. The state also applies their standard 2.9% state sales tax on the sale of cigarettes and all tobacco products (including vaping products). The State will continue to impose their regular sales tax and cigarette excise tax on cigarettes and other tobacco products regardless of whether the City imposes a special tax.

Twenty-seven percent of the state-generated revenue from the cigarette excise tax is distributed to local governments based on the amount of revenue collected within a given city or county. Louisville currently receives approximately $40,000 annually as its share-back allotment of the State Cigarette Tax. CRS § 39-22-623(1)(a)(II)(A), as amended by HB19-1033, provides that in order to qualify for distributions of state income tax money, local governments are prohibited from imposing a tobacco tax on cigarettes. If the City were to implement a tax on vaping products only, it would still qualify for the state share-back from the state tobacco tax collections. Only if the City were to implement a cigarette tax would it lose the state share-back funding.

The taxing options for the City include a tax on cigarettes, and/or vaping products, and/or other tobacco products.

Other tobacco products (OTP) is the widely used acronym to refer to all tobacco products other than cigarettes. The state definitions include “cigarette, tobacco product, or nicotine product” in CRS § 18-13-121, and this definition is incorporated by reference into the cigarette tax statutes in CRS § 39-28-112(8)(a), as follows:

(I) A product that contains nicotine or tobacco or is derived from tobacco and is intended to be ingested or inhaled by or applied to the skin of an individual; or (II) any device that can be used to deliver tobacco or nicotine to the person inhaling from the device, including an electronic cigarette, cigar, cigarillo, or pipe (with an exception for a product the FDA has approved as a tobacco use cessation product).

The City has defined “tobacco product” in LMC § 9.78.020.

Tobacco product means:

1. Any product containing, made, or derived from tobacco or that contains nicotine or synthetic nicotine that is intended for human consumption or is
likely to be consumed whether smoked, heated, chewed, absorbed, dissolved, inhaled, snorted, sniffed, or ingested by any other means, including, but not limited to cigarettes, cigars, little cigars, chewing tobacco, pipe tobacco, snuff or snus, but excluding any product made from or derived from tobacco and approved by the FDA for use in connection with cessation of smoking.

2. Any electronic smoking device; or

3. Any tobacco paraphernalia.

City Council asked if there is an option to exempt specific products, specifically “premium cigars”. The City has not exempted cigars from its definition of tobacco products, but may exempt specific tobacco products from a ballot measure if desired. If Council would like to discuss exemptions, staff recommends this is discussed in the context of the goals of enacting the tax and how the exemptions either positively or negatively impact the goals. There may be policy considerations regarding any real or perceived equity issues associated with exemption of certain products.

Type and Level of Tax:
In previous discussions, City Council expressed a preference for an excise tax over a sales tax. The City attorney and staff have further evaluated the process and feasibility of implementing an excise tax. The City may impose an excise tax, but staff have not found any examples of municipal excise taxes, they all appear to be special sales taxes. An excise tax would be based on the occupation or privilege of selling cigarettes, tobacco products, or nicotine products, so would be a tax on the seller rather than the purchaser. As mentioned previously, the state excise tax is paid by wholesalers, so is not a point-of-sale tax.

In order to levy an excise tax the City would need to identify the manufactures and impose the tax there, which would be a new process and could be burdensome for staff. This is likely the reason that the taxes applied by other municipalities have been sales tax, as the infrastructure is in place and excise tax requires new infrastructure to administer.

Staff understands the benefits of an excise tax would be to include the tax in the purchase price of the product instead of at check out - after the decision to purchase the product has been made. One option to address this issue is to require in the ordinance that the retailer provide signage reflecting the full purchase price with the tax at the point of sale, so that consumers are aware of the full price of the product with tax prior to purchase. This has been done in other municipalities to address this issue, and the language is included in the City of Boulder ordinance.
Staff would recommend a special sales tax with required signage instead of an excise tax to ease administration.

The City may impose a special sales tax at any level. The most common local government increases range from $3 – $4 per pack of cigarettes and 30% - 40% on other tobacco products. The City of Aspen implemented a graduated price per pack on cigarettes, with an incremental increase from $3 to reach $4 per pack.

**Estimating Tobacco Sales Tax:**
Due to TABOR, the ballot language must include the estimated amount of revenue the City anticipates the new sales tax will generate in the first full fiscal year. Any revenues collected above that amount must be returned to the taxpayers.

Staff has talked to other municipalities and reviewed comparison data to understand how revenue was derived and how their original estimates compared to the actual revenues. Estimation of revenue from all tobacco products has been a challenge for many municipalities. Below is a table that illustrates some municipalities share-back, their revenue estimate included in their ballot measure, and the actual revenues received.

<table>
<thead>
<tr>
<th>Municipality</th>
<th>Shareback Received (2017)</th>
<th>Estimate</th>
<th>Actual Revenues Received</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspen</td>
<td>$63,556.85</td>
<td>$325,000</td>
<td>$436,622</td>
</tr>
<tr>
<td>Avon</td>
<td>$38,812.33</td>
<td>$600,000</td>
<td>1st Quarter 2019 - $92,175</td>
</tr>
<tr>
<td>Basalt</td>
<td>$15,676.45</td>
<td>Between $27,000- $29,000 for first quarter</td>
<td>(Voted on April 3, 2018) July 2018 – December 2018 - $175,567.52</td>
</tr>
</tbody>
</table>

City staff have completed estimates for revenues associated with a local sales tax on both cigarettes and other tobacco products. The data the City has used to calculate the amount of potential sales tax was based on the currently taxed tobacco retailers and revenue generated from state cigarette taxes. This does not include vaping products, and so the City doesn’t have a strong comparison basis for calculating estimates on electronic smoking devices. Therefore, staff have made a conservative (high) estimate for the potential revenue associated with the sale of these products.

It is estimated that retailers in the City of Louisville sell between $1.8 - $2.2 million dollars of cigarettes each year. This number includes sales made by grocery, convenience, and liquor stores, as well as other licensed retailers. The (3) convenience stores sell the largest overall percentage of cigarettes at 51%, followed by (8) grocery/liquor stores at 37%, and the remaining other licensed retailers at 12%.
The estimated special sales tax revenue amount was derived by taking the maximum estimate for cigarette sales at those locations cited above, $2.2M, tripling that number to represent other tobacco-related product sales at all retailers on an annual basis $6.6M, and then adding the annual revenue of the businesses that sell only tobacco-related products $1M.

### Louisville Tobacco Tax Estimates – for Cigarettes

<table>
<thead>
<tr>
<th></th>
<th>Current</th>
<th>10%</th>
<th>20%</th>
<th>30%</th>
<th>40%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current cigarette sales</td>
<td>$2,200,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estimated vaping/other tobacco sales</td>
<td>$6,600,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tobacco-only stores sales</td>
<td>$1,000,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total estimated sales</td>
<td>$9,800,000</td>
<td>$9,800,000</td>
<td>$9,310,000</td>
<td>$8,844,500</td>
<td>$8,402,275</td>
</tr>
</tbody>
</table>

Impact on demand (5% decline in sales due to price increase*)

<table>
<thead>
<tr>
<th></th>
<th>-5%</th>
<th>-5%</th>
<th>-5%</th>
<th>-5%</th>
</tr>
</thead>
</table>

Revised sales before applying tax

<table>
<thead>
<tr>
<th></th>
<th>$9,800,000</th>
<th>$9,310,000</th>
<th>$8,844,500</th>
<th>$8,402,275</th>
<th>$7,982,161</th>
</tr>
</thead>
</table>

New Revenue to City

<table>
<thead>
<tr>
<th></th>
<th>$0</th>
<th>$931,000</th>
<th>$1,768,900</th>
<th>$2,520,683</th>
<th>$3,192,865</th>
</tr>
</thead>
</table>

*Includes 5% decline per 10% increase

This represents an estimate based on current sales and assumptions about the sale of other tobacco products that may not currently be taxed. However, based on the information we have received from other communities, where tax estimates have fallen far short of the revenues generated and they either had to take a tax holiday (New Castle, Glenwood Springs) or go back to the voters to allow for the retention of additional revenues (Aspen), staff recommends using the highest-end assumption for making revenue estimates to be included in ballot language.

If Council decides to apply the tax to only vaping, the amount of revenue generated from this product would be lower. Staff estimates that of one-third of the estimated other tobacco products would be attributed to vaping products, at $2.2 million + half of the tobacco products only stores at $500,000 = $2.7 million in revenue per year. With a 40% tax the City would estimate a minimum annual tax revenue on vaping products only of $1.08 million. This seems reasonable given that the City of Boulder revenue estimate for vaping products only was $2.5 million.

If the City approves a tobacco tax of any kind, all state taxes and the standard City sales tax would continue to be applied to these products. Below are a few examples of
what a purchase of tobacco products would include in Louisville with the state and local taxes applied, using current state tax levels and a $4/40% local tax. This does not include the RTD (1.1%) and County sales taxes (.985%) which may apply. Keep in mind that the price of the tobacco product already incorporates the applied State excise tax.

<table>
<thead>
<tr>
<th>Type of tobacco product</th>
<th>Current purchase* (state sales tax)</th>
<th>Purchase w/new local tax (new local tax)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cigarettes</td>
<td>$8 (price of pack) +2.9% = $8.23</td>
<td>$8 + $2.9% + $4 (new local tax) = $12.23</td>
</tr>
<tr>
<td>Vaping starter kit</td>
<td>$25 (price of kit) + 2.9% + 3.65% (Louisville sales tax) = $26.64</td>
<td>$25 + 2.9% + 3.65% + 40% (new local tax) = $36.64</td>
</tr>
<tr>
<td>Vaping pods (pack of 4)</td>
<td>$15 + 2.9% + 3.65% = $15.99</td>
<td>$15 + 2.9% + 3.65% + 40% = $21.99</td>
</tr>
<tr>
<td>Chewing tobacco</td>
<td>$4 (can) + 2.9% + 3.65% = $4.30</td>
<td>$4 + 2.9% + 3.65% + 40% = $5.90</td>
</tr>
</tbody>
</table>

*Price figures not actual, for illustrative purposes only.

Use of Tax Revenues:
The ballot language may outline how the tax revenue will be utilized. Staff proposes the following use of tax revenues:

- The administrative cost of the tax – Staff estimate that this tax will be relatively inexpensive to administer. There will be some costs associated with setting the tax up for collection in the online payment system, collection and auditing.
  - The maximum cost of administering the program would include hiring an account tech with an approximate cost of $63,000. Depending on voter approval of various issues, this cost can be shared with other tax revenue sources.
- Education programs regarding nicotine product use including enforcement – Louisville PD would work to educate retailers on city ordinances related to tobacco sales. The City would conduct educational messaging and programming in conjunction with Boulder County Public Health and other partners.
  - Funding for education and enforcement could be scalable, with an initial investment of approximately $10,000. Revenues could be used to increase enforcement of tobacco regulations in the City, including the sale of tobacco products to minors.
  - Additional education to retailers and sales outlets could occur through a City led promotion program, or in partnership with BCPH.
• Health promotion – The City does not have public health programming, but would partner with Boulder County Public Health on local campaigns and programs associated with tobacco use prevention and cessation.
  o Depending on revenues generated, the City could invest in a Louisville specific campaign around tobacco use and cessation. This type of investment would be scalable.
• Any remaining funds would be available for general government services, including library, police, fire, parks, transportation and general government administration.
  o Revenues could support youth/teen specific programming at the Library or Recreation Center.

Program Options:
There are several options City Council may consider in a potential tobacco sales tax. More details on each option and how the tax would be structured is included in the table below.

<table>
<thead>
<tr>
<th>Proposed tax structure</th>
<th>Tax</th>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
</table>
| Local special sales tax on tobacco (per pack/per cigarette) + OTP (on all other tobacco products and electronic smoking devices) | $4 per pack/40% OTP -or- $3 per pack/30% OTP -or- Other options | • Addresses public health goals  
• Parity between all tobacco and nicotine products  
• Ease of administration across all products at all locations  
• Simple for retailers to understand | • Loss of share-back of state tobacco tax |
| Local special sales tax on tobacco (per pack/per cigarette) + OTP with exemptions | $4 per pack/40% OTP -or- $3 per pack/30% OTP -or- Other options | • Partially addresses public health goals  
• Could cover specific products of concern by Council | • Would not cover all products equally  
• Require more retail education of what is taxed/not taxed |
| Local special sales tax on e-cigarettes/vaping (electronic smoking devices) products only | 0 - 40% on all vaping products | • Do not lose state share-back  
• Partially addresses public health goals | • Would not cover all products equally  
• May result in shifting of use from vaping to other tobacco products. |

DISCUSSION/DIRECTION:
In order to guide the drafting of the ballot language, staff is seeking input on the following questions:
• Which tax structure option would the City Council like to pursue?
o Option 1 - Local sales tax on tobacco (per pack/per cigarette) + OTP (on all other tobacco products)
o Option 2 - Local sales tax on tobacco (per pack/per cigarette) + OTP with exemptions
• If this option is selected, what exemptions are desired?
o Option 3 - Local sales tax on e-cigarettes/vaping (electronic smoking devices) products only
• What tax rate would City Council like to apply?
  o If Option 1 or 2 - $4 and 40%, $3 and 30% or other?
  o If Option 3 – 40%, 30%, other?
• Would Council like to include a signage requirement for retailers?
• Is City Council satisfied with the proposed estimate for the tax revenues?
• Does City Council wish to earmark use of tax revenues?
• Is City Council satisfied with the proposed use of the revenues?
• When should the sales tax go into effect?

3. COMMUNITY RENEWABLE ENERGY
During the previous discussion on potential ballot issues, Council directed staff to bring back options for a community-wide renewable energy tax. In 2019, City Council adopted renewable energy and carbon emission reduction goals for municipal operations and the larger community. The goal for the community in regards to renewable energy is to generate 75% of Louisville’s residential and commercial/industrial electric needs from carbon-free sources by 2030. As of May 2020, approximately 24% of Louisville’s residential and commercial/industrial electric needs come from carbon-free sources.

Renewable Energy Credits:
In 2019, 30% of the electricity that Xcel generated in Colorado came from carbon-free sources, according to Xcel’s recently released Corporate Responsibility Report on its operations.

Carbon-free sources include the clean energy that customers consume from Xcel’s carbon free electricity on the system, which is certified through a process called the Certified Renewable Percentage (CRP). Energy that has a Certified Renewable Percentage has not been double counted toward the carbon free goals of any other entities.

The following graph details the company’s planned trajectory over the next 6 years for its CRP, which is a complex calculation detailing the actual energy that Louisville’s customers are expected to consume and generally not exactly the same as the energy that is generated due to factors including inefficiencies from line loss. It is in this way that Xcel has calculated the gap between the amount of carbon-free energy Louisville currently consumes and the City’s goal of 100% carbon-free.
In an effort to make progress on Louisville’s community-wide carbon reduction goals, the City has partnered with Xcel Energy to explore innovative solutions for community-wide renewable energy. There are a couple of approaches that communities are taking to reach their carbon free electricity goals. Some communities either operate an electric utility already or are attempting to operate one, and they have set goals similar to Xcel’s to clean their generation by decommissioning traditional power plants and replacing them with carbon free generation options.

Other communities, like Aspen, have been purchasing clean energy to cover the load that is not met by carbon-free sources that are either local or that are provided by the wholesale supplier of the city’s electricity. Aspen identified the gap between its available renewable energy sources and 100% renewable energy and then went to the marketplace and purchased enough renewable energy to make up the difference. Conversely, individual property owners with electric meters can invest in renewable options either by installing solar panels or turbines on their own property or participating in programs like solar farms. Colorado uses a system of Renewable Energy Credits (RECs) to account for all renewable energy that is generated and to whom the attributes of that green energy can be attributed to.

In many of the arrangements in solar farms and rooftop solar, the RECs are retired on behalf of the subscribing customer. For example, Windsource customers receive the RECs while Solar Rewards customers do not. In the case of Aspen, however, the RECs are retired on behalf of the entire city. This is the approach that Louisville is considering with Xcel.
There are both positive and negative arguments to purchasing RECs to achieve carbon free goals. Proponents may argue:

- The ability to get more carbon free energy through RECs that exists today
- Some RECs do lead to additional capacity to the grid
- Purchasing RECs increases the demand for renewables and can encourage the market to add more capacity
- By purchasing RECs you can access clean energy but not have to get into the maintenance and distribution business of an electric utility
- Without operating a utility, there is no way to transmit clean power that you might generate to other users off-site without using some accounting systems like RECs

Opponents may argue:

- You could use funds to invest directly in new generation of renewables rather than buying the green attributes of energy that has already been generated
- RECs do not have to be retired in the year they were produced, so you could pay for energy that was generated years ago, although this is normal practice and is permitted by law
- Renewable energy is less expensive to operate than traditional power plants, so there should be a way to realize cost savings rather than having to pay more for clean energy

For more information on the City’s emissions and background, please see the reports below:

- Boulder County GHG Inventory (see attached)

**XCEL Proposal:**

Through the City’s partnership with Xcel and the Energy Future Collaboration Program, Xcel has provided a proposal for the City that would retire RECs on behalf of the community in the amount needed to get to 100% carbon free electricity. Each year Xcel would calculate the amount of energy that the City would need to purchase. For example, in 2021, Xcel has estimated that the City would need to purchase an anticipated volume of 157,400 MWh, or a total estimated cost of $629,600 per year, to bring the city’s total electric consumption to 100% renewable. This equates to approximately $80 per household per year. Each year, as Xcel moves closer to its own carbon free 2050 goal, the amount the City would need to purchase should decrease.

The RECs the City would be purchasing in bulk are produced in Colorado and non-compliance, retired on behalf of the City of Louisville. For comparison, Windsource RECs are priced at $15/KWh and by purchasing RECs in bulk for the entire community,
Xcel is able to offer the City a price of $4/KWh. The RECs the City would purchase from Xcel would be produced by Colorado-located wind and solar farms, while 90% of the proceeds would be deposited into the state’s Renewable Energy Standard Adjustment account to be used for future renewable energy purchases.

In order to fund this initiative, the City could ask voters to adopt a tax in which revenue would be used on a bulk purchase of RECs until the time that Xcel can reach its own 100% carbon free goal.

Tax Structures:
Below is a summary of potential tax structures that could be used:

1. Fund with existing City revenue
   a. Use General Fund to cover annual expense
   b. Pros
      i. No additional cost for residents or businesses
   c. Cons
      i. Not feasible due to COVID financial impacts and uncertainty around future revenues

2. Sales tax
   a. Approximately 0.13% increase in sales tax rate (currently 8.635% - 3% sales/use tax, 0.375% open space, 0.125% historic preservation, 0.15% recreation).
      i. The estimated annual cost per household would be $31 per year.
      ii. Annual revenue would fluctuate based on the amount of annual taxable sales.
   b. Pros
      i. Reduces cost burden on residential/commercial/industrial sector since tax would be applied to all eligible purchases in Louisville
      ii. City can administer easily since tax already exists
   c. Cons
      i. Lacks incentive to prioritize renewable energy and energy efficiency since the tax is not directly tied to energy use
      ii. No nexus to the work being funded
      iii. Funding mechanism can be volatile due to external circumstances
      iv. Enrollment for Xcel REC programs may fluctuate; however, Xcel programming is still being utilized
      v. Will need to re-evaluate as Xcel’s renewable mix increases over time
      vi. Sales taxes are inherently regressive
      vii. Additional cost burden during COVID
3. Property tax
   a. Approximately 0.934 mill levy increase. Assuming a residence with a $500,000 market value, the amount generated would be $33 per year.
      i. Estimate is based on the current assessment rates and ratios.
      ii. Annual revenue would fluctuate based on the amount of annual net assessed valuation.
   b. Pros
      i. City can administer easily since tax already exists
      ii. Property tax is less regressive than sales tax
      iii. Property taxes in area are generally less volatile than sales tax
   c. Cons
      i. While not tied directly to energy use, cost burden is placed on home and business owners
      ii. Lacks incentive to prioritize renewable energy and energy efficiency since the tax is not directly tied to energy use
      iii. The nexus to the work being funded is only directionally correct, and not directly tied to the work being funded (while it is not always the case, electric use is generally greater in larger properties and in commercial properties)
      iv. Customers already enrolled in Xcel renewable programs or that have on-site generation would pay twice
      v. Enrollment for Xcel REC programs may fluctuate; however, Xcel programming is still being utilized
      vi. Will need to re-evaluate as Xcel’s renewable mix increases over time
      vii. Additional cost burden during COVID

4. Climate tax
   a. New climate tax to help achieve community goal for renewable energy
   b. Tax to be applied by kilowatt hour with maximum amount to be collected through tax
   c. Exempt customers who are already enrolled in Xcel renewable programs (i.e. Windsorce, Renewable Connect) where RECs are allocated
   d. Would not exempt gas/electric services for manufacturing entities similar to sales tax
   e. Includes resources for low income households and resources/rebates for commercial/industrial partners
   f. Pros
      i. Similar tax already adopted by City of Boulder
      ii. Climate tax is specific to what City is trying to accomplish (i.e. increasing of renewable energy sources, efficiency measures)
iii. Eliminates fluctuation in Xcel program enrollment since existing customers enrolled in Xcel programs where RECs are allocated would be exempt
iv. Xcel administration of tax would alleviate burden on City
v. Some commercial and industrial entities have set renewable targets and this program could supplement those goals
vi. Consistent funding mechanism
g. Cons
i. Customers who participate in Xcel’s solar garden program would not be exempt since there are no RECs associated with it
ii. Commercial/industrial users will pay more since the tax is applied by kilowatt hour and commercial/industrial entities use more energy
iii. If priced lower than other Xcel programs, enrollment in those programs may fluctuate; however, Xcel programming is still being utilized
iv. Will need to continue to evaluate as Xcel’s renewable mix increases over time
v. Xcel has not committed to collecting tax through customer bill and applying to bulk purchase and the City would need to negotiate an agreement on how this tax would be applied
vi. Additional cost burden during COVID

It should be noted that as new renewable energy programs become available that may be more cost effective (i.e. Renewable Connect), the City can transition funding from a REC purchase to those programs. Per the City Attorney, the City can draft ballot issue language to give the City more flexibility in using tax revenues. If voters were to approve a ballot issue containing broad funding objectives related to renewable energy, the City would not need to go back to voters for approval were the City to transition its use of revenues from the bulk purchase of renewable energy to a different renewable energy program.

**Peer Communities:**
The City of Boulder is one of the only communities in the region to adopt a climate tax. Boulder’s Climate Action Plan (CAP) tax, was adopted in 2006 and recently extended in 2015 to continue through March 31, 2023. The tax generates approximately $1.8 million per year. The tax is levied on residents and businesses based on the amount of electricity they consume. Tax rates are different depending on the sector. The annual average costs are $21 for residential, $94 for commercial and $9,600 for industrial.

Per the City Attorney, current PUC rules or relevant statues do not prevent the City from implementing a carbon tax similar to Boulder’s. There is no constitutional prohibition on
carbon taxes. Pursuant to Charter Sections 12-2 and 12-3, the City may adopt the tax by ordinance, but the tax must first be approved by the registered voters.

While the City does not need Xcel’s approval to pass a climate tax, Xcel would need to agree to collect and remit the tax if the City wanted to charge the tax through Xcel bills (as Boulder has done). Xcel’s cooperation would also be needed for data and information sharing related to energy usage. An agreement regarding Xcel’s collection and remittance of the tax could be pursued through an amendment to Xcel’s Franchise Agreement.

Program Costs:
Potential program costs include: education/outreach ($5,000), low income programming ($5,000) and additional resources/rebates for commercial and industrial entities through partnerships like Partners for a Clean Environment (PACE) ($10,000). The estimated annual cost for these is $25,000.

Staff does not anticipate a need for additional staffing if Xcel agrees to administer a climate tax. Similarly, staff does not anticipate a need for additional staffing if the sales or property tax rates are increased to account for community-wide renewable energy.

DISCUSSION/DIRECTION:
In order to draft the ballot language, staff is seeking input on the following questions:

- **Which type of tax should the City pursue?** Options include:
  - None – use existing revenue
  - Sales tax
  - Property tax
  - Climate tax

- **Should there be different pricing for residential/commercial/industrial users?** Options include:
  - Yes – similar to Boulder’s CAP tax, there should be different tax rates for each sector
  - No – all sectors should have the same tax rate

- **What should be the maximum amount to be collected by the tax?** Options include:
  - $629,600 – the annual amount estimated by Xcel
  - Higher amount – could allow for floating tax based on use by kilowatt hour

- **When should the City start collecting the tax?** Options include:
  - January 1, 2021
  - January 1, 2022
  - January 1, 2025

- **Should there be a sunset date for the new tax?** Options include:
  - Yes – January 1, 2030
  - No
Aspen also operates their own utility and uses RECs to close the final gap to 100% renewable. They use hydroelectric and additional reliable renewable energy for the last ~20%. The RECs that Aspen purchases are out-of-state RECs https://www.aspentimes.com/news/aspen-is-third-u-s-city-to-reach-100-renewable-energy/.

**FISCAL IMPACT:**
Each ballot measure has a separate fiscal impact on City revenue and expenditures, those details are contained within the analysis for each issue.

Independently, the ballot measures could likely be administered within existing City staffing and resources. However, when combined, the three ballot measures would have a more significant administrative impact on the Finance department, and they would require additional staff time to administer. The two sales taxes would have the greatest administrative impact, with the community renewables administrative impact dependent on the type of tax and how it’s collected. The additional workload would include:

- Set-up costs (recoding tax accounts for new taxes, creating online forms for remitting)
- Forms/remittal processing
- Auditing
- Enforcement

The administration of these taxes would require one additional staff to administer. The cost of one additional employee at this level would be $63,000, including benefits. The revenue generated from the three taxes could be utilized to fund this position.

Boulder County administers elections for the City, and there is also a cost to the City to place ballot measures on the ballot. The City has budgeted funds to support election costs associated with municipal ballot measures, and the inclusion of these measures on the ballot would be within our current budget.

**PROGRAM/SUB-PROGRAM IMPACT:**
These ballot measures would support several of the City’s program and subprogram areas. The Governance and Administration subprogram of governance based on thorough understanding of the community’s diverse interests executed through clear and effective policy direction. Sustainability subprogram to actively pursue energy efficient upgrades to realize cost savings and reduce environmental impacts. And Community Design to sustain an inclusive, family-friendly community with a small-town atmosphere.

**RECOMMENDATION:**
Staff is seeking Council input and direction on each of the proposed ballot measures.
ATTACHMENT(S):
1. City of Boulder Disposable Bag Fee Ordinance
2. Summary of Communities' Bag Fees
3. Link to December 3, 2019 City Council Packet for Tobacco sales ordinance
5. Presentation

STRATEGIC PLAN IMPACT:

| ☒ | Financial Stewardship & Asset Management | ☐ | Reliable Core Services |
| ☒ | Vibrant Economic Climate | ☒ | Quality Programs & Amenities |
| ☒ | Engaged Community | ☐ | Healthy Workforce |
| ☐ | Supportive Technology | ☒ | Collaborative Regional Partner |
ORDINANCE NO. 7870


BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF BOULDER, COLORADO:

Section 1. A new Chapter 6-15, "Disposable Bag Fee," B.R.C. 1981 is added as follows:

Title 6 Health, Safety and Sanitation

Chapter 6-15 Disposable Bag Fee

6-15-1

(a) Purpose: It is the purpose of this chapter to protect the public health and safety and implement the city's Climate Action Plan, Zero Waste Master Plan and the Boulder Valley Comprehensive Plan.

(b) Findings: The City Council finds as follows:

(1) The city, through its policies, programs, and laws, supports efforts to reduce the amount of waste that must be land-filled and pursue "zero waste" as a long term goal by emphasizing waste prevention efforts;

(2) That the use of single-use disposable bags has severe impacts on the environment on a local and global scale, including greenhouse gas emissions, litter, harm to wildlife, atmospheric acidification, water consumption and solid waste generation;

(3) Despite recycling and voluntary solutions to control pollution from disposable carryout bags, many disposable single-use bags ultimately are disposed of in landfills, litter the environment, block storm drains and endanger wildlife;

(4) Boulder consumers use approximately 14.3 million disposable bags from food stores each year; and

(5) The city's taxpayers bear the costs associated with the effects of disposable bags on the solid waste stream, drainage, litter and wildlife.

(c) Intent: The disposable bag fee is necessary to address the environmental problems associated with disposable bags and to relieve city taxpayers of the costs imposed upon the city associated with the use of disposable bags. The City Council intends that the requirements of this chapter will assist in offsetting the costs associated with using disposable bags to pay for the mitigation, educational, replacement, and administrative efforts of the city.
6-15-2 Definitions.

The following terms used in this chapter have the following meanings unless the context clearly indicates otherwise:

“Disposable Bag” means a bag that is not a Reusable Bag.

“Disposable Bag” does not include:

(a) Bags used by consumers inside stores to:
    (1) Package bulk items, such as fruit, vegetables, nuts, grains, candy or small hardware items;
    (2) Contain or wrap frozen foods, meat, or fish;
    (3) Contain or wrap flowers, potted plants, or other items where dampness may be a problem;
    (4) Contain unwrapped prepared foods or bakery goods; or
    (5) A non-handled bag used to protect a purchased item from damaging or contaminating other purchased items when placed in a recyclable paper bag or reusable bag.

(b) Bags provided by pharmacists to contain prescription drugs.

(c) Newspaper bags, door-hanger bags, laundry-dry cleaning bags, or bags sold in packages containing multiple bags for uses such as food storage, garbage, pet waste, or yard waste bags.

“Food Store” means a retail establishment or business located within Boulder city limits in a permanent building, operating year round, that is a full-line, self-service market and which sells a line of staple foodstuffs, meats, produce or dairy products or other perishable items.

“Food Store” does not include:

(a) Temporary vending establishment for fruits, vegetables, packaged meats and dairy;

(b) Vendors at farmer’s markets or other temporary events;

(c) Businesses at which foodstuffs are an incidental part of the business. Food sales will be considered to be “incidental” if such sales comprise no more than 2 percent of the business’s gross sales in the city as measured by the dollar value of food sales as a percentage of the dollar value of total sales at any single location.

“Recycled Paper Bag” means a paper bag that is 100 percent recyclable and contains at least 40 percent post-consumer recycled content.

“Reusable Bag” means a bag that is:

(a) Designed and manufactured to withstand repeated uses over a period of time;
(b) Is made from a material that can be cleaned and disinfected regularly;
(c) That is at least 2.25 mil thick if made from plastic;
(d) Has a minimum lifetime of 75 uses; and
(e) Has the capability of carrying a minimum of 18 pounds.

"Disposable Bag Fee" means a city fee imposed and required to be paid by each consumer making a purchase from a Food Store for each Disposable Bag used during the purchase assessed for the purpose of mitigating the impacts of Disposable Bags.

6-15-3 Disposable Bag Fee Requirements.

(a) For each Disposable Bag provided to a customer, Food Stores shall collect from customers, and customers shall pay, at the time of purchase, a Disposable Bag Fee of $0.10.

(b) Food Stores shall record the number of Disposable Bags provided and the total amount of Disposable Bag Fees charged on the customer transaction receipt.

(c) A Food Store shall not refund to the customer any part of the Disposable Bag Fee, nor shall the Food Store advertise or state to customers that any part of the Disposable Bag Fee will be refunded to the customer.

(d) A Food Store shall not exempt any customer from any part of the Disposable Bag Fee for any reason except as stated in section 6-15-7, "Exemptions," B.R.C. 1981.

6-15-4 Retention, Remittance, and Transfer of the Disposable Bag Fee.

(a) A Food Store may retain 40 percent of each Disposable Bag Fee collected, which is the "Retained Percent."

(b) The Retained Percent may only be used by the Food Store to:

   (1) Provide educational information about the Disposable Bag Fee to customers;
   (2) Provide the signage required by section 6-15-5, "Required Signage for Food Stores," B.R.C. 1981;
   (3) Train staff in the implementation and administration of the fee;
   (4) Improve or alter infrastructure to allow for the implementation, collection, administration of the fee;
   (5) Collect, account for and remit the fee to the city;
   (6) Develop and display informational signage to inform consumers about the fee, encourage the use of reusable bags or promote recycling of plastic bags; and
   (7) Improve infrastructure to increase plastic bag recycling.
(c) The Retained Percent shall not be classified as revenue for the purposes of calculating sales tax.

(d) The amount of the Disposable Bag Fee collected by a Food Store in excess of the Retained Percent shall be paid to the city and shall be used only as set forth in subsection (g) to mitigate the effects of Disposable Bags in Boulder.

(e) A Food Store shall pay and the city shall collect all Disposable Bag Fees. The city shall provide the necessary forms for Food Stores to file with the city, to demonstrate compliance with the provisions of this ordinance.

(1) If payment of any amount to the city is not received on or before the applicable due date, penalty and interest charges shall be added to the amount due as described in section 6-15-8, “Audits and Violations,” B.R.C. 1981.

(f) The Disposable Bag Fee shall be administered by the city manager. The city manager is authorized to adopt interpretive rules pursuant to chapter 1-4, “Rulemaking,” B.R.C. 1981, to implement this chapter, prescribe forms and provide methods of payment and collection and otherwise implement requirements of this chapter.

(g) Funds from the Disposable Bag Fee shall be used only for the expenditures that are intended to mitigate the effects of Disposable Bags, including without limitation the following:

(1) Administrative costs associated with developing and implementing the Disposable Bag Fee.

(2) Activities of the city to:

(A) Provide reusable carryout bags to residents and visitors;

(B) Educate residents, businesses, and visitors about the impact of Disposable Bags on the city’s environmental health, the importance of reducing the number of single-use carryout bags entering the waste stream, and the expenses associated with mitigating the effects of single-use bags on the city’s drainage system, transportation system, wildlife and environment;

(C) Fund programs and infrastructure that allow the Boulder community to reduce waste associated with Disposable Bags;

(D) Purchase and install equipment designed to minimize bag pollution, including, recycling containers, and waste receptacles associated with Disposable Bags;

(E) Fund community cleanup events and other activities that reduce trash associated with Disposable Bags;

(F) Mitigate the effects of Disposable Bags on the city’s drainage system, transportation system, wildlife and environment;
(G) Maintain a public website that educates residents on the progress of waste reduction efforts associated with Disposable Bags; and

(H) Fund the administration of the Disposable Bag Fee program.

(h) No Disposable Bag Fees collected in accordance with this ordinance shall be used only for general government purposes.

(i) Disposable Bag Fees collected in accordance with this chapter shall be continually available for the uses and purposes set forth in subsection (g) of this section without regard to fiscal year limitation. No Disposable Bag Fee funds shall be used for any purpose not authorized in this chapter.

6-15-5 Required Signage for Food Stores.

Every Food Store subject to the collection of the Disposable Bag Fee shall display a sign in a location outside or inside of the business, viewable by customers, alerting customers to the city of Boulder's Disposable Bag Fee.


No Food Store shall provide any paper bag that is not a Recycled Paper Bag.

6-15-7 Exemptions.

A Food Store may provide a Disposable Bag to a customer at no charge if the customer provides evidence that he or she is a participant in a federal or state Food Assistance Program.

6-15-8 Audits and Violations.

(a) Each Food Store licensed pursuant to the provisions of this chapter shall maintain accurate and complete records of the Disposable Bag Fees collected, the number of Disposable Bags provided to customers, the form and recipients of any notice required pursuant to this chapter, and any underlying records, including any books, accounts, invoices, or other records necessary to verify the accuracy and completeness of such records. It shall be the duty of each Food Store to keep and preserve all such documents and records, including any electronic information, for a period of three years from the end of the calendar year of such records.

(b) If requested, each Food Store shall make its records available for audit by the city manager during regular business hours for the city to verify compliance with the provisions of this chapter. All such information shall be treated as confidential commercial documents.

(c) If any person fails, neglects, or refuses to collect the Disposable Bag Fee, or underpays the Disposable Bag Fee, the city manager shall make an estimate of the fees due, based on available information, and shall add thereto penalties, interest, and any additions to the
The manager shall serve upon the delinquent Food Store personally, by electronic mail or by first class mail directed to the last address of the Food Store on file with the city, written notice of such estimated fees, penalties, and interest, constituting a Notice of Final Determination, Assessment, and Demand for Payment, (also referred to as “Notice of Final Determination”) due and payable within 20 calendar days after the date of the notice. The Food Store may request a hearing on the assessment as provided in section 6-15-9, “Hearings,” B.R.C. 1981.

(d) If payment of any amount of the Disposable Bag Fee to the city is not received on or before the applicable due date, penalty and interest charges shall be added to the amount due in the amount of:

1) A penalty of ten percent of total due;
2) Interest charge of one percent of total penalty per month.

6-15-9 Hearings.

(a) A Food Store may request a hearing on any proposed fee imposed under this title after receiving a Notice of Final Determination, by filing a written request for hearing within 20 calendar days of the date of mailing of the Notice of Final Determination. The request for hearing shall set forth the reasons for and amount of changes in the Notice of Final Determination that the Food Store seeks and such other information as the manager may prescribe.

(b) The city manager shall conduct the hearing under the procedures prescribed by chapter 1-3, "Quasi-Judicial Hearings," B.R.C. 1981, except that the manager shall notify the Food Store in writing of the time and place of the hearing at least ten days before it is scheduled, unless the Food Store agrees to a shorter time. The hearing shall be held within 60 days of the date of receipt of the request for a hearing, unless the Food Store agrees to a later date.

6-15-10 Criminal Sanctions.

(a) The city attorney, acting on behalf of the people of the city, may prosecute any violation of this title in municipal court in the same manner that other municipal offenses are prosecuted.

(b) The maximum penalty for a first or second conviction within two years, based on date of violation of this section, is a fine of $500.00. For a third and each subsequent conviction within two years, based upon the date of the first violation, the general penalty provisions of section 5-2-4, "General Penalties," B.R.C. 1981, shall apply.

Section 3. The provisions of this ordinance relating to the collection of the Disposable Bag Fee and required store signage shall become effective July 1, 2013. All other provisions shall be effective 30 days from the date of passage. The city manager shall develop and
implement the administrative and financial processes for the collection of the fee between the effective date of this ordinance and June 30, 2013.

Section 4. If any section, subsection, sentence, clause or phrase of this chapter is for any reason held invalid or unconstitutional by the decision of any court of competent jurisdiction, such decision shall not affect the validity of the remaining portions of this chapter.

Section 5. This ordinance is necessary to protect the public health, safety, and welfare of the residents of the city, and covers matters of local concern.

Section 6. The City Council deems it appropriate that this ordinance be published by title only and orders that copies of this ordinance be made available in the office of the city clerk for public inspection and acquisition.

INTRODUCED, READ ON FIRST READING, AND ORDERED PUBLISHED BY TITLE ONLY this 2nd day of October, 2012

Mayor

Attest:

City Clerk
READ ON SECOND READING, AMENDED, ADOPTED, AND ORDERED
PUBLISHED BY TITLE ONLY this 16th day of October, 2012.

Attest:

[Signature]
City Clerk

READ ON THIRD READING, AMENDED, ADOPTED, AND ORDERED
PUBLISHED BY TITLE ONLY this 1st day of November, 2012.

Attest:

[Signature]
City Clerk

READ ON FOURTH READING, PASSED, ADOPTED, AND ORDERED
PUBLISHED BY TITLE ONLY this 15th day of November, 2012.

Attest:

[Signature]
City Clerk
# Colorado Communities with Bag Fee

<table>
<thead>
<tr>
<th>City</th>
<th>Year</th>
<th>Fee per bag</th>
<th>Ordinance</th>
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<tbody>
<tr>
<td><strong>APPROVED</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aspen</td>
<td>2011</td>
<td>$0.20</td>
<td>Title 13, Chapter 13.24</td>
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<tr>
<td>Avon</td>
<td>2017</td>
<td>$0.10</td>
<td>No. 17-08</td>
</tr>
<tr>
<td>Boulder</td>
<td>2013</td>
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<td>No. 7870</td>
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<tr>
<td>Breckenridge</td>
<td>2013</td>
<td>$0.10</td>
<td>Ch. 12</td>
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<td>Crested Butte</td>
<td>2018</td>
<td></td>
<td>No. 5, Series 2016</td>
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<td>Telluride</td>
<td>2010</td>
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<td>No. 1340, Series of 2010</td>
</tr>
<tr>
<td>Town of Carbondale</td>
<td>2011</td>
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<td></td>
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<tr>
<td>Vail</td>
<td>2015</td>
<td>$0.10</td>
<td></td>
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<tr>
<td><strong>PENDING</strong></td>
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<td></td>
<td></td>
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<tr>
<td>Mountain Village</td>
<td>considering</td>
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<tr>
<td>Steamboat Springs</td>
<td>considering</td>
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<tr>
<td><strong>REJECTED</strong></td>
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<td>Basalt</td>
<td>2012 (failed)</td>
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<td>Durango</td>
<td>2013 (voters rejected)</td>
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<td>No. 0-2013-11</td>
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<tr>
<td>Fort Collins</td>
<td>2014 (city repealed)</td>
<td>$0.10</td>
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</tbody>
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BOULDER COUNTY’S 2016 GREENHOUSE GAS EMISSIONS INVENTORY AND MODELING REPORT

June 2018

lotus engineering & sustainability
# TABLE OF CONTENTS

**EXECUTIVE SUMMARY** .................................................................................................................. 1

**Key Findings from 2016 Inventory** .................................................................................................. 1

**Overview of 2016 Emissions by Sector, Source, and Municipality** .................................................. 2

**INTRODUCTION** ............................................................................................................................. 10

**INVENTORY METHODOLOGY** ......................................................................................................... 10

**2016 Inventory Methodology** .......................................................................................................... 10

**Previous Inventory Methodologies** .................................................................................................. 14

**Overview of Boulder County’s 2016 GHG Emissions** .................................................................... 14

**Community Indicator Trends** ........................................................................................................ 14

**Energy Source Emissions** ............................................................................................................. 16

**Transportation Source Emissions** ................................................................................................ 20

**Waste Source Emissions** ................................................................................................................ 22

**Industrial Processes and Product Use Source Emissions** ............................................................... 24

**Agriculture, Forestry, and Other Land Use Source Emissions** ....................................................... 25

**Boulder County’s Potential to Reduce Greenhouse Gas Emissions** ............................................... 28

**Community-Wide GHG Reduction Goals** ..................................................................................... 30

**GHG Savings Over Time** ............................................................................................................... 33

**Contributions from Different Strategies** ......................................................................................... 34

**APPENDIX A: MUNICIPALITY OVERVIEWS** .............................................................................. 36

**Overview of Municipalities GHG Emissions** ................................................................................ 36

**City of Boulder** .............................................................................................................................. 38

**City of Lafayette** .......................................................................................................................... 40

**City of Longmont** ........................................................................................................................ 42

**City of Louisville** .......................................................................................................................... 44

**Town of Lyons** ............................................................................................................................... 46

**Town of Nederland** ....................................................................................................................... 48

**Town of Superior** ......................................................................................................................... 50

**Unincorporated Boulder County** ................................................................................................... 52
LIST OF FIGURES

Figure ES- 1. 2016 Emissions by Sector .................................................................2
Figure ES- 2. 2016 Emissions by Source ...............................................................3
Figure ES- 3. 2016 Emissions by Municipality ......................................................3
Figure ES - 4. 2030 GHG Emission Reduction Potential Projections ..................8
Figure ES - 5. 2050 GHG Emission Reduction Potential Projections ..................8

Figure 1. Energy Emissions Sources, 2016 ............................................................17
Figure 2. Emissions from Transportation Sector, 2016 ........................................21
Figure 3. Emissions from Waste Sector, 2016 ......................................................23
Figure 4. Emissions from IPPU Sector, 2016 .......................................................25
Figure 5. Emissions from AFOLU Sector, 2016 ....................................................26
Figure 6. 2030 GHG Emission Reduction Potential Projections .......................31
Figure 7. 2050 GHG Emission Reduction Potential Projections .......................31
Figure 8. Impacts from GHG Emission Reduction Strategy Savings Over Time ....33
Figure 9. GHG Emission Reduction Potential from Each Strategy .......................34
Figure 10. GHG Emissions by Municipality, 2016 .................................................36
Figure 11. Emissions by Sector by Municipality, 2016 .........................................36
Figure 12. Emissions by Source by Municipality, 2016 .........................................37
Figure 13. GHG Emissions by Sector for the City of Boulder, 2016 ......................38
Figure 14. GHG Emissions by Source for the City of Boulder, 2016 ....................39
Figure 15. GHG Emissions by Sector for the City of Lafayette, 2016 .....................40
Figure 16. GHG Emissions by Source for the City of Lafayette, 2016 ....................41
Figure 17. GHG Emissions by Sector for the City of Longmont, 2016 ..................42
Figure 18. GHG Emissions by Source for the City of Longmont, 2016 .................43
Figure 19. GHG Emissions by Sector for the City of Louisville, 2016 ....................44
Figure 20. GHG Emissions by Source for the City of Louisville, 2016 ....................45
Figure 21. GHG Emissions by Sector for the Town of Lyons, 2016 ......................46
Figure 22. GHG Emissions by Source for the Town of Lyons, 2016 ......................47
Figure 23. GHG Emissions by Sector for the Town of Nederland, 2016 ...............48
Figure 24. GHG Emissions by Source for the Town of Nederland, 2016 ...............49
Figure 25. GHG Emissions by Sector for the Town of Superior, 2016 .................50
Figure 26. GHG Emissions by Source for the Town of Superior, 2016 ..................51
Figure 27. GHG Emissions by Sector for Unincorporated Boulder County, 2016 ....52
Figure 28. GHG Emissions by Source for Unincorporated Boulder County, 2016 ....53
LIST OF TABLES

Table ES - 1. Summary of GHG Emission Reduction Potentials by Sector .............................................6
Table ES - 2. Comparison of Model Predictions Against County’s GHG Emission Reduction Goals ..........7

Table 1. Sector, Source, and Municipality List ..........................................................................................11
Table 2. GHG Emission Sources ..............................................................................................................12
Table 3. Global Warming Potentials, 2016 ..............................................................................................13
Table 4. Changes in Community Indicators .............................................................................................15
Table 5. Normalized Emissions Data .......................................................................................................16
Table 6. Electricity Consumption and Emissions .....................................................................................17
Table 7. Normalized Electricity Data ......................................................................................................18
Table 8. Natural Gas Consumption .........................................................................................................19
Table 9. Normalized Natural Gas Data ....................................................................................................19
Table 10. On-road Transportation Trends ...............................................................................................21
Table 11. Normalized Transportation Data ..............................................................................................22
Table 12. Landfilled, Composted and Recycling Tonnage .....................................................................24
Table 13. Livestock Data (Number of Animals in Boulder County) ..........................................................27
Table 14. GHG Reduction Strategies by Sector .......................................................................................29
Table 15. Comparison of Model Predictions Against Boulder County’s GHG Emission Reduction Goals ...30
Table 16. GHG Reductions by Strategy ..................................................................................................35
Table 17. Overview of Emissions per Municipality ..................................................................................37
Table 18. Changes in Electricity Emission Factors ...................................................................................55
Table 19. GHG Reduction Strategies by Sector .......................................................................................58
ACRONYMS

CACTIS       Colorado Air Compliance Tracking and Inventory System
CDD          Cooling Degree Days
CDPHE        Colorado Department of Public Health and the Environment
C&I          Commercial and Industrial
CO₂e         Carbon Dioxide Equivalent
DIA          Denver International Airport
DRCOG        Denver’s Regional Council of Governments
eGRID        Emissions and Generation Resource Integrated Database
FLIGHT       Facility Level Information on Greenhouse Gases Tool
GDP          Gross Domestic Product
GHG          Greenhouse Gas
GPC          Global Protocol for Community-Scale Greenhouse Gas Emission Inventories
GWP          Global Warming Potentials
HDD          Heating Degree Days
IPCC         Intergovernmental Panel on Climate Change
kWh          Kilowatt Hour
mtCO₂e       Metric Tons of Carbon Dioxide Equivalent
MWh          Megawatt Hour
RECs         Renewable Energy Credits
SAR          Second Assessment Report
VMT          Vehicle Miles Traveled
WWTP         Wastewater Treatment Plants
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Executive Summary

Boulder County is committed to addressing climate change by reducing greenhouse gas (GHG) emissions in accordance with levels specified by the Paris Climate Agreement Goal, which will help prevent a global temperature increase of 1.5 to 2°C. In 2012, Boulder County committed to reduce countywide GHG emissions by 40% by 2020 based on a 2005 baseline, and in 2018, the county committed to reduce GHG emissions by 45% by 2030 and by 90% by 2050 based on a 2005 baseline.¹

To understand how to reduce GHG emissions, Boulder County completed GHG emission inventories in 2005, 2011, and 2016 and modeled the GHG emission reduction potential for GHG emission reduction strategies. The initial inventories provide a baseline of activity, and the subsequent inventories provide insight into Boulder County’s performance and ability to meet its carbon reduction goals. The identification and quantification of GHG emission reduction strategies provides insights as to how certain programs and policies may affect the county’s GHG emissions and recommendations as to where the county should focus its efforts.

Boulder County contracted with Lotus Engineering and Sustainability, LLC (Lotus) to complete their 2016 GHG emission inventory and model potential reductions in GHG emissions based on selected strategies.

Key Findings from 2016 Inventory

Boulder County is committed to addressing climate change at the local level by reducing GHG emissions. To meet GHG reduction goals, Boulder County needs to understand and track community-wide emissions by completing GHG inventories that highlight emissions from each municipality, source, and sector.

To date, Boulder County has completed three GHG inventories (2005, 2011, and 2016), which provide a picture of GHG emissions created by the activities of Boulder County residents, businesses, and industries. This report includes a comparison of Boulder County’s 2011 and 2016 inventories; specifically, changes in actual emissions by sector and source, as well as changes in factors that influence emissions, such as Boulder County’s demographics and utility emission factors. By reviewing and comparing the 2011 GHG inventory to the current 2016 GHG inventory, Boulder County can begin to track and understand trends in emissions from specific sectors, and where Boulder County should focus its efforts to successfully meet GHG reduction goals. This comparison creates a dynamic feedback loop that can inform and shape future improvement strategies.

In recent years, Boulder County experienced significant economic growth that is expected to continue for the foreseeable future. Even with this growth, between 2005 and 2016, countywide

¹ Countywide includes emissions from all municipalities as well as unincorporated Boulder County.
GHG emissions decreased by 3%. The template from which communities can complete comparable and standard emission inventories changed since Boulder County completed the last two inventories. Therefore, if we compare only the emission sources that were in both 2005 and 2016 GHG inventories, Boulder County-wide emissions have been reduced by 18% between 2005 and 2016.

However, Boulder County's growth will lead to an increase in population and building square footage that in turn will inevitably increase the amount of demand for electricity, natural gas, gasoline, diesel, and goods. As a result, Boulder County, the municipalities, and all community members will need to take effective action to continue to reduce GHG emissions countywide.

The 2016 inventory was completed using the framework provided by the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC), which is a global standard for GHG emission accounting and reporting. The GPC was developed and launched in 2014 through the collaboration of key stakeholders across the world and provides a template from which communities can create comparable and standard emission inventories.

**Overview of 2016 Emissions by Sector, Source, and Municipality**

The 2016 Boulder County GHG inventory shows a total emission value of 4,873,034 metric tons of carbon dioxide equivalent (mtCO₂e).

Emissions from commercial and residential building energy use account for 60% of emissions county-wide and emissions from transportation account for 31% of emissions county-wide. Emissions from industrial processes, oil wells, agriculture, solid waste, and wastewater account for the remaining 9% of emissions. Emissions for all sectors are shown in Figure ES-1.

**Figure ES-1. 2016 Emissions by Sector**

Emissions from electricity use and production comprised the highest proportion of emissions by source (41%). Emissions from natural gas (excluding mobile usage) accounts for 18% of emissions.
Mobile gasoline also accounts for 18% of emissions while aviation fuel accounts for 10% of total emissions. The remaining 13% of emissions are produced through various processes and activities, including cement manufacturing, mobile diesel, oil wells, waste, and agriculture. Emissions for all sources are shown in Figure ES-2.

**Figure ES- 2. 2016 Emissions by Source**

Together the Cities of Boulder and Longmont, as well as unincorporated/other\(^2\), account for approximately 32%, 22%, and 30%, respectively, of Boulder County’s total GHG emissions. Lafayette and Louisville accounted for approximately 6% and 5%, respectively. Superior, Lyons, and Nederland together accounted for the remaining 3% of emissions (see Figure ES-3).

**Figure ES- 3. 2016 Emissions by Municipality**

\(^2\)Unincorporated/other includes all unincorporated areas (i.e. Gunbarrel, Hygiene, Niwot, etc.) and a few incorporated municipalities (i.e. Erie, Jamestown, and Ward) in Boulder County that are not explicitly disaggregated in the GHG inventory.
Notable Highlights from the 2016 GHG Emission Inventory

The 2016 inventory showed a very slight (0.4%) decrease in emissions since the 2011 inventory: the 2011 value was 4,890,832 mtCO₂e and the 2016 value was 4,873,034 mtCO₂e.

The slight decrease in GHG emissions experienced by Boulder County to date is partly a result of the different calculation methodologies and emission sources tracked in the 2011 and 2016 inventories. The GPC requires Boulder County to track an additional eight emission sources that were not tracked in 2011. These new emission sources alone account for 14% of Boulder County’s GHG emissions in 2016. If we compare only the emission sources that were in both 2011 and 2016 GHG inventories, Boulder Countywide emissions have been reduced by 16% between 2011 and 2016. For more information on the different inventory methodologies see the subsection Inventory Methodology.

Also, unlike the 2011 inventory, the 2016 inventory does not include renewable energy credits (RECs) or offsets which accounted for a reduction in emissions in the 2011 inventory. In addition, the emissions from the Denver International Airport were also included in the 2016 GHG inventory. The result of the various changes in inventory methodology is that the new 2016 inventory added 770,041 mtCO₂e in emissions that were not accounted for in the 2011 inventory.

This report describes and compares the absolute emissions covered by the respective inventories of 2011 and 2016. Where appropriate, differences in the methodologies are described.

The following highlights and trends in the 2016 inventory are worth noting:

- Total GHG emissions in 2016 for Boulder County is 4,873,034 mtCO₂e. This includes emissions from all municipalities as well as unincorporated Boulder County.
  - Emission reductions from 2011 to 2016 can be compared to growth and economic activity, by normalization, as follows: 6% reduction of emissions per job and 33% reduction in commercial and industrial emissions per square foot.
  - Emissions per capita varied by municipality, ranging from 8.3 mtCO₂e per person to 26.6 mtCO₂e per person; the average emissions per capita for all of Boulder County was 15.1 mtCO₂e per person.
- Emissions due to electricity consumption accounted for 41% of the overall 2016 GHG inventory. Between 2011 and 2016, electricity usage decreased by 1% while emissions from electricity decreased by 25%. This emissions reduction from electricity is caused by significantly lower electricity emission factors due to a cleaner grid from the increase in renewable energy.
  - Electricity emission reductions (625,850 mtCO₂e) were the single largest source of GHG reductions overall between 2011 and 2016.
Between 2011 and 2016, Boulder County’s per household residential electricity consumption decreased 8%, while the number of households increased by 3%. The commercial and industrial (C&I) electricity consumption per square foot decreased by 33% while C&I square footage increased by 23%.

- Emissions due to natural gas consumption accounted for 18% of the overall 2016 GHG inventory. Natural gas consumption can track closely with cold weather since natural gas is the most common fuel used for heating in Boulder County. Since heating degree days (HDD) (i.e. number of days when heating was required) decreased between 2011 and 2016 by 17%, it would be expected that natural gas usage would also decrease; however, natural gas consumption increased slightly.

- Emissions due to transportation accounted for 31% of the overall 2016 GHG inventory.
  - Emissions from on-road transportation decreased by just over 5% between 2011 and 2016.
  - Emissions from aviation fuel use at Denver International Airport (DIA), which was not included in prior inventories but is required by the GPC, accounted for 10% of Boulder County’s emissions.

### Community Trends

Between 2011 and 2016, Boulder County saw population increase by 8%, the number of jobs increase by 7%, and the number of households increase by 3%. During this period, Boulder County’s economy also grew with a 24% increase in Gross Domestic Product (GDP).

In general, a larger population and stronger economy results in increased emissions due to more emission-producing activities and materials being consumed. However, in Boulder County, emissions per resident decreased by 8% and emissions per job decreased by 6%. This is due in large part to both county-supported programs and policies to reduce emissions, and to a greater degree, the decrease in electricity emissions factors (i.e. a decrease in electricity emission factor indicates the grid is increasing the amount of power provided by clean energy as compared to fossil-fuel energy). Emissions factors for all electrical utilities serving Boulder County (with the exception of the Town of Lyons) decreased between 10% and 31%; the emissions factor for the Town of Lyons electrical service increased by 0.6%. Emissions factors for other sources (i.e. natural gas, gasoline, etc.) remained the same or decreased slightly between 2011 and 2016.

### Boulder County’s Potential to Reduce Greenhouse Gas Emissions

Lotus researched a variety of plans and policies and worked with local experts to identify an initial list of GHG emission reduction strategies that have the greatest potential to reduce GHG emissions. The initial list of recommendations was reviewed with Boulder County staff, who provided guidance on a final list of recommended strategies. The list of final GHG emission reduction strategies along with estimated contributions towards overall reductions in GHG emissions is presented in Table ES - 1.
### Table ES - 1. Summary of GHG Emission Reduction Potentials by Sector

<table>
<thead>
<tr>
<th>Sector</th>
<th>Objective</th>
<th>Specific Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation</td>
<td>Increase the adoption of electric vehicles</td>
<td>Accelerate Electric Vehicles: All-of-the-Above Strategy, Support Federal and/or State Clean Car Policies, Expand Public Transit</td>
</tr>
<tr>
<td></td>
<td>Reduce carbon intensity of vehicle travel</td>
<td>Support Federal and/or State Clean Car Policies, Expand Public Transit</td>
</tr>
<tr>
<td></td>
<td>Reduce single-occupancy vehicle travel</td>
<td>Support Federal and/or State Clean Car Policies, Expand Public Transit</td>
</tr>
<tr>
<td>Oil and Gas</td>
<td>Support regional and state efforts to control methane leaks</td>
<td>Adopt and Enforce Leak Detection and Repair, Reduce Food Waste, C&amp;D and Composting Waste to Local Transfer Facility, Promote Zero Waste Education, Strive for Municipal Zero Waste, Conduct Other Efforts as Needed</td>
</tr>
<tr>
<td>Waste</td>
<td>Strive for zero waste</td>
<td>Reduce Food Waste, C&amp;D and Composting Waste to Local Transfer Facility, Promote Zero Waste Education, Strive for Municipal Zero Waste, Conduct Other Efforts as Needed</td>
</tr>
</tbody>
</table>
Boulder County’s GHG Reduction Goals

In 2012, Boulder County committed to reduce countywide GHG emissions 40% by 2020 based on a 2005 baseline. With the additional new GHG reduction strategies described in this report, Boulder County is estimated to achieve 23% emission reductions by 2020.

It is expected that emissions will increase by 7% or 345,387 mtCO2e from 2016 to 2050, in a business-as-usual scenario if no aggressive action is taken by Boulder County and the community. Boulder County is committed to addressing climate change by reducing greenhouse gas (GHG) emissions in accordance with levels specified by the Paris Climate Agreement Goal, which will help prevent a global temperature increase of 1.5 to 2°C. In 2018, the county committed to the following GHG reduction goals based on a 2005 baseline:

1. reduce countywide GHG emissions by 45% by 2030; and
2. reduce countywide GHG emissions by 90% by 2050.

If all strategies were to be implemented, Boulder County can expect to achieve the GHG emission reductions listed in Table ES - 2.

Table ES - 2. Comparison of Model Predictions Against County’s GHG Emission Reduction Goals

<table>
<thead>
<tr>
<th>Year</th>
<th>Boulder County’s GHG Emission Reduction Goal</th>
<th>Model Predictions</th>
<th>Additional Reductions Needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>2030</td>
<td>45%</td>
<td>49%</td>
<td>0%</td>
</tr>
<tr>
<td>2050</td>
<td>90%</td>
<td>61%</td>
<td>29%</td>
</tr>
</tbody>
</table>

Figure ES - 4, and Figure ES - 5 show the relative contribution from each sector’s respective GHG reduction strategies towards the overall GHG emission reduction goal.
Figure ES - 4. 2030 GHG Emission Reduction Potential Projections

Figure ES - 5. 2050 GHG Emission Reduction Potential Projections

Note that COB stands for City of Boulder GHG savings that they have estimated from their GHG reduction strategies. In addition, increased electricity accounts for the electricity demands that will be created through the increase in electric vehicles and fuel switching. Lastly, “Change from BAU” accounts for the increase in emissions expected due to increased population and square footage.
The largest contribution in GHG emission reductions comes from renewable energy, which must overcome electricity consumption not already offset by efficiency measures and additional electricity put on to the grid from stationary fuel switching and electric vehicles. Having a robust and aggressive plan to increase the amount of renewable energy on the grid is essential if Boulder County is to meet its GHG reduction goals.

Contributions from all other sectors vary in each goal year. In 2050, after renewable energy, the next largest contribution comes from building efficiency, followed by transportation, other sector improvements, expected reductions from waste, and oil and gas. If the City of Boulder, and all other municipalities in Boulder County, achieve their GHG reduction goals and implementation plans, it will greatly help in achieving countywide goals. The City of Boulder’s GHG reduction estimates are included in the above charts, as the city has quantified the estimates for 2030 and 2050.

The 2030 interim goal is achievable according to model predictions; however, the longer term, 2050 goal, is more difficult to achieve. This is because the business-as-usual (BAU) projections continue to grow due to expected increases in population and will surpass the 2005 baseline value while the 2030 BAU value is less than the 2005 baseline value. In addition, the strategies tackle key emission sources: electricity, transportation, waste, and oil and gas, but do not affect other emission sources that may be less influenced by Boulder County programs and policies such as airplane travel out of Denver International Airport. Following 2030, Boulder County will need to adopt aggressive actions to further reduce its carbon footprint.
Introduction

Boulder County is committed to addressing climate change by reducing greenhouse gas (GHG) emissions. To understand how to effectively reduce GHG emissions, Boulder County completed GHG emission inventories for calendar years 2005, 2011, and 2016 and modeled the GHG emission reduction potential for numerous GHG emission reduction strategies. Boulder County contracted with Lotus Engineering and Sustainability, LLC (Lotus) to complete their 2016 GHG emission inventory and model potential reductions in GHG emissions based on selected strategies (see Appendix C: Detailed Descriptions of GHG Emission Reduction Strategies).

In 2012, Boulder County committed to reduce countywide GHG emissions 40% by 2020 based on a 2005 baseline. With existing initiatives and partnerships, and additional new strategies described later in this report. Boulder County is estimated to achieve 23% emission reductions by 2020. In 2018, the county committed to reduce countywide GHG emissions 45% by 2030 and 90% by 2050 based on a 2005 baseline.

The initial inventories provide a baseline of activity, and the subsequent inventories provide insight into Boulder County’s performance and ability to meet its carbon reduction goals.

Inventory Methodology

2016 Inventory Methodology

The 2016 inventory was completed using the framework provided by the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC), which is a global standard for GHG emission accounting and reporting. The GPC, which was released in 2014, defines what emissions must be reported and how they are measured and analyzed. The 2016 community GHG inventory was completed to be GPC compliant and will enable Boulder County to track, record, and report their emissions within one workbook. GPC draws on methods from ICLEI-Local Governments for Sustainability’s (ICLEI) U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, which provides more detailed methodology specific to U.S. communities.4

There are two reporting methodologies for the GPC community framework:

- **BASIC**: The BASIC methodology covers stationary energy, in-boundary transportation, and community-generated waste.
- **BASIC+**: The BASIC+ methodology includes BASIC emission sources, as well as a more comprehensive coverage of emissions sources such as trans-boundary transportation; energy transmission and distribution losses; industrial processes and product use; and agriculture, forestry and other land uses.

---

Based on the available data, Boulder County has chosen the BASIC+ reporting level. A full list of sectors, sources, and municipalities that are included in the GHG inventory are listed below in Table 1.

### Table 1. Sector, Source, and Municipality List

<table>
<thead>
<tr>
<th>Sector</th>
<th>Source</th>
<th>Municipality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>Electricity</td>
<td>Boulder</td>
</tr>
<tr>
<td>Commercial</td>
<td>Transmission Losses</td>
<td>Lafayette</td>
</tr>
<tr>
<td>Oil Wells</td>
<td>Natural Gas</td>
<td>Longmont</td>
</tr>
<tr>
<td>Industrial Process</td>
<td>Natural Gas Leakage</td>
<td>Louisville</td>
</tr>
<tr>
<td>Residential</td>
<td>Oil Wells</td>
<td>Lyons</td>
</tr>
<tr>
<td>Transportation</td>
<td>Stationary Diesel</td>
<td>Nederland</td>
</tr>
<tr>
<td>Waste</td>
<td>Mobile Gasoline</td>
<td>Superior</td>
</tr>
<tr>
<td>Wastewater</td>
<td>Mobile Diesel</td>
<td>Unincorporated/Other</td>
</tr>
<tr>
<td></td>
<td>Mobile Electricity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Railways</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Boulder County Airports</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Denver International Airport</td>
<td></td>
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<tr>
<td></td>
<td>Enteric Fermentation</td>
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</tr>
<tr>
<td></td>
<td>Manure Management</td>
<td></td>
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<tr>
<td></td>
<td>Soil Management</td>
<td></td>
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<tr>
<td></td>
<td>Landfill</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Compost</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wastewater</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cement Manufacture</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Refrigerants</td>
<td></td>
</tr>
</tbody>
</table>

GPC does not account for emission reductions based on recycling or the use of renewable energy. In the 2016 inventory, emissions from these items are included as information-only items, which was a different approach from previous inventories. See Table 2 for an overview of sources recorded in the 2005, 2011, and 2016 GHG inventories.

---

5 For more information regarding GPC see [https://www.compactofmayors.org/resources/tools-for-cities/](https://www.compactofmayors.org/resources/tools-for-cities/)
### Table 2. GHG Emission Sources

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Electricity</td>
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</tr>
<tr>
<td>Transmission Loses</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Natural Gas</td>
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<td></td>
<td>X</td>
</tr>
<tr>
<td>Natural Gas Leakage</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Oil Wells</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Stationary Diesel</td>
<td></td>
<td></td>
<td>X</td>
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<tr>
<td>Voluntary Renewable Energy Credits</td>
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<tr>
<td>Mobile Gasoline</td>
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<td>Mobile Diesel</td>
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<td>X</td>
</tr>
<tr>
<td>Mobile Electricity</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Railways</td>
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</tr>
<tr>
<td>Boulder County Airports</td>
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<td></td>
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<td>Denver International Airport</td>
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<td>X</td>
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<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Refrigerant</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Muni-Renewable Energy*</td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

*‘Muni-Renewable Energy’ refers to renewable energy assets owned by municipalities only.*

Per the GPC protocol, the sources listed above can be organized into the following scopes:

- **Scope 1**: GHG emissions from sources located within the county boundary, including:
  - energy and transportation fuel combustion;
  - fugitive emissions (includes active oil wells and leakage of natural gas);
  - solid waste (including compost) treated within the county;
  - wastewater treated within the county;
  - industrial processes and product use inside the county; and
  - agriculture, forestry, and land use inside the county.

- **Scope 2**: GHG emissions occurring as a consequence of the use of grid-supplied electricity, heat, steam and/or cooling within the county boundary.

- **Scope 3**: GHG emissions that occur outside the county boundary as a result of activities taking place within the county boundary, including:
  - transmission and distribution losses;
solid waste (including compost) treated outside the county; and
transportation activities for which fuel combustion occurs outside the county.

The GPC protocol does not recognize emissions avoided through the purchase of renewable energy credits (RECs), local installation of renewable energy systems (including solar and hydrogeneration), or recycling. However, communities frequently want to understand the potential impact of these activities. For Boulder County, these items are calculated as “information-only” and include:
- recycling;
- RECs; and
- local renewable energy production (solar and hydrogeneration).

Sources of Data
Lotus collected all data by reaching out to a variety of people and resources. The list of resources will need to be researched and updated every year. All data resources and contacts can be found in the Boulder County Inventory Management Report and in the 2016 Boulder County Greenhouse Gas Inventory spreadsheet.

The inventory considers the predominant greenhouse gases — carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O) — as well as refrigerants. For ease of reporting and comparing the absolute effects of different gases, all GHGs have different, defined global warming potentials (GWP). The GWP of a GHG defines its contribution to global warming (i.e. the ability of each gas to trap heat in the atmosphere), whereas a GWP of one is equal to the impacts of one unit of CO2. The effect of a non-CO2 GHG or the combination of different GHGs is expressed as carbon dioxide equivalents or CO2e.

In 2016, GWPs have been sourced from the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (see Table 3). Methane, nitrous oxide, HCFC 123, HFC-134A, and R-114 are converted to CO2e by multiplying their value by the 100-year GWP coefficient.

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Formula</th>
<th>GWP (2016)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Dioxide</td>
<td>CO2</td>
<td>1</td>
</tr>
<tr>
<td>Methane</td>
<td>CH4</td>
<td>28</td>
</tr>
<tr>
<td>Nitrous Oxide</td>
<td>N2O</td>
<td>265</td>
</tr>
<tr>
<td>2,2-Dichloro-1,1,1-trifluoroethane</td>
<td>HCFC 123</td>
<td>77</td>
</tr>
<tr>
<td>1,1,1,2-Tetrafluoroethane</td>
<td>HFC-134A</td>
<td>1,430</td>
</tr>
<tr>
<td>1,2-dichloro-1,1,2-trifluoroethane</td>
<td>R-114</td>
<td>10,000</td>
</tr>
</tbody>
</table>
Previous Inventory Methodologies

For the 2005 and 2011 inventories, Boulder County used the GHG Protocol Corporate Accounting and Reporting Standard, developed by the World Resources Institute and the World Business Council for Sustainable Development. Results from the 2005 inventory were published in a comprehensive report titled Boulder County, Colorado Greenhouse Gas Inventory Final Report, and results from the 2011 inventory were published in the GHG Inventory & SEP Analysis.

Boulder County’s geopolitical organizational boundary was used as the boundary for both previous emission inventories. Whenever possible, the 2011 inventory attempted to prioritize emissions estimates based on available activity data for Boulder County over modeled data; however, in some cases the data was estimated or modeled.

Overview of Boulder County’s 2016 GHG Emissions

GHG emissions are a product of emission factors and activity data. Emission factors represent the amount of GHGs emitted into the atmosphere by a specific activity (see Appendix B for more information on emission factors). Activity data refers to the data measured for the community GHG emission inventory calculations, such as fuel consumed, electricity consumed, tons of waste generated, and vehicle miles traveled. Activity data is influenced by community indicators (i.e. population, economic growth, etc.), energy consumption, and other generation behaviors. Changes in emissions result from the interplay of activity data and emission factors. Boulder County can influence positive changes in emissions through various programs, policies, and outreach efforts. A regular review of emission changes and the factors that influence those changes will inform how well Boulder County’s climate-change initiatives are working and may inform where the county should focus future efforts.

The following is an overview of 2016 GHG emissions and the drivers that affected the GHG emissions throughout the years. If applicable, comparisons are made between the 2011 and 2016 GHG inventories.

Community Indicator Trends

Community Indicators reflect how the countywide community is changing over time. Between 2011 and 2016, the population grew and the area experienced economic growth (see Table 4). During this time the county has seen an 8% increase in population and a 7% increase in the number of people employed.

---

Table 4. Changes in Community Indicators

<table>
<thead>
<tr>
<th>Community Indicators</th>
<th>2011</th>
<th>2016</th>
<th>Change since 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boulder County Population</td>
<td>297,814</td>
<td>322,226</td>
<td>8%</td>
</tr>
<tr>
<td>Number of Households</td>
<td>118,545</td>
<td>122,516</td>
<td>3%</td>
</tr>
<tr>
<td>Number of Housing Units</td>
<td>126,444</td>
<td>133,773</td>
<td>6%</td>
</tr>
<tr>
<td>Number of Jobs</td>
<td>238,388</td>
<td>254,340</td>
<td>7%</td>
</tr>
<tr>
<td>C&amp;I Building Floor Space (ft²)</td>
<td>73,386,167</td>
<td>90,608,049</td>
<td>23%</td>
</tr>
<tr>
<td>GDP (million dollars)</td>
<td>$18,832</td>
<td>$23,400</td>
<td>24%</td>
</tr>
<tr>
<td>Heating Degree Days&lt;sup&gt;8&lt;/sup&gt;</td>
<td>4,526</td>
<td>3,756</td>
<td>-17%</td>
</tr>
<tr>
<td>Cooling Degree Days</td>
<td>1,424</td>
<td>1,386</td>
<td>-3%</td>
</tr>
</tbody>
</table>

Boulder County has also seen a 48% increase in the amount of retail sales within the county, and a 24% increase in its Gross Domestic Product (GDP), which represents significant growth in economic activity for the community.

Although growth can benefit the community, it makes the task of achieving significant reductions in GHG emissions more challenging. Fortunately, Boulder County is reducing overall GHG emissions as it grows, and in some cases normalized metrics present drastic reductions.

Overall 2016 emissions have decreased by 0.4% since 2011. When normalized by community indicators (i.e. population, households, employees, GDP, etc.), we see a larger reduction in emissions: from a 6% reduction of emissions per job to a 33% reduction in commercial and industrial emissions per square foot (see Table 5). These numbers show that Boulder County is successfully reducing emissions as the county’s economy continues to grow.

---

<sup>8</sup> A Heating Degree Day (HDD) and Cooling Degree Day (CDD) are roughly proportional to the energy used for heating and cooling a building. They are calculated by taking the difference between the average daily temperature and the balance point temperature. The balance point temperature is the average daily outside temperature at which a building maintains a comfortable indoor temperature without heating or cooling. When the average daily temperature is above the balance point temperature, the result is cooling degree days (i.e., a building must be cooled to maintain the balance point temperature). When the average daily temperature is below the balance point temperature the result is heating degree days (i.e., the building must be heated to maintain the balance point temperature). HDD and CDD were taken from: [http://www.weatherdatadepot.com/](http://www.weatherdatadepot.com/) using at 60-degree Fahrenheit balance point.
Table 5. Normalized Emissions Data

<table>
<thead>
<tr>
<th>Normalized Emissions</th>
<th>Units</th>
<th>2011</th>
<th>2016</th>
<th>% Change Between 2016 and 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emissions per Resident</td>
<td>mtCO₂e/person</td>
<td>16.4</td>
<td>15.1</td>
<td>-8%</td>
</tr>
<tr>
<td>Residential Emissions per Household</td>
<td>mtCO₂e /HH</td>
<td>11.3</td>
<td>8.7</td>
<td>-23%</td>
</tr>
<tr>
<td>C&amp;I Emissions per Employee</td>
<td>mtCO₂e /FTE</td>
<td>8.6</td>
<td>7.2</td>
<td>-16%</td>
</tr>
<tr>
<td>C&amp;I Emissions per Square Foot (ft²)</td>
<td>mtCO₂e /ft²</td>
<td>0.03</td>
<td>0.02</td>
<td>-33%</td>
</tr>
<tr>
<td>Emission per Job</td>
<td>mtCO₂e /FTE</td>
<td>20.5</td>
<td>19.2</td>
<td>-6%</td>
</tr>
</tbody>
</table>

**Energy Source Emissions**

The energy sector accounted for 61% of Boulder County’s 2016 GHG emissions and included the following emission sources:

- electricity consumption (including transmission and distribution losses);
- natural gas consumption;
- stationary diesel consumption;
- fugitive emissions from natural gas consumption; and
- fugitive emissions from oil well extraction.

**Trends and Key Takeaways**

The following are the major takeaways and trends from the energy sources:

- Electricity consumption (including transmission and distribution losses) accounted for 41% of Boulder County’s 2016 GHG emissions.
- Between 2011 and 2016, electricity consumption has decreased by 1%; however, the GHG emissions from electricity has decreased by 25% due to significantly lower electricity emission factors (see Appendix B for more information).
- Electricity emission reductions (625,850 mtCO₂e) were the single largest source of GHG reductions overall between 2011 and 2016.
- Between 2011 and 2016, Boulder County’s per person and per household residential electricity consumption decreased by 15% and 11%, respectively, while the county’s population grew by 8% and the number of households increased by 3%.
- The commercial and industrial (C&I) electricity consumption per square foot decreased by 17%, while C&I square footage increased by 23%.
- Natural gas consumption accounted for 18% of Boulder County’s 2016 GHG emissions, and between 2011 and 2016, emissions from natural gas have increased by 0.8%.
- Fugitive emission from active oil wells and natural gas accounted for 2% of Boulder County’s GHG emissions.
As shown in Figure 1, the majority of emissions from energy came from electricity (64%) followed by natural gas at 29%. The remaining energy sources made up less than 7% of Boulder County’s 2016 GHG emissions.

**Figure 1. Energy Emissions Sources, 2016**

Electricity Usage

Electricity consumption accounted for 41% of Boulder County’s 2016 GHG emissions. As shown in Table 6, residential electricity consumption between 2011 and 2016 decreased by 8%, while commercial electricity use increased by 3%. Altogether electricity usage decreased by 1%. Although consumption was reduced by only 1%, the GHG emissions from electricity decreased by 25% due to significantly lower electricity emission factors (for more information on emission factors see Appendix B: Overview of Emission Factors). Electricity emission reductions were the single largest source of GHG reductions between 2011 and 2016.

**Table 6. Electricity Consumption and Emissions**

<table>
<thead>
<tr>
<th>Electricity Data</th>
<th>2011</th>
<th>2016</th>
<th>% Change since 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential Electricity Use (kWh)</td>
<td>1,080,416,815</td>
<td>992,059,503</td>
<td>-8%</td>
</tr>
<tr>
<td>C&amp;I Electricity Use (kWh)</td>
<td>1,982,026,066</td>
<td>2,040,232,459</td>
<td>3%</td>
</tr>
<tr>
<td><strong>Total Electricity Use (kWh)</strong></td>
<td><strong>3,062,442,881</strong></td>
<td><strong>3,032,291,962</strong></td>
<td><strong>-1%</strong></td>
</tr>
<tr>
<td>Residential Electricity Use Emission (mtCO₂e)</td>
<td>893,984</td>
<td>628,073</td>
<td>-30%</td>
</tr>
<tr>
<td>C&amp;I Electricity Use Emission (mtCO₂e)</td>
<td>1,640,014</td>
<td>1,280,074</td>
<td>-22%</td>
</tr>
<tr>
<td><strong>Total Electricity Emissions (mtCO₂e)</strong></td>
<td><strong>2,533,998</strong></td>
<td><strong>1,908,148</strong></td>
<td><strong>-25%</strong></td>
</tr>
</tbody>
</table>
If you normalize electricity consumption for growth factors, residential electricity usage decreased by 11% per household and 15% per person since 2011. At the same time, C&I electricity consumption decreased per square foot by 17%.

### Table 7. Normalized Electricity Data

<table>
<thead>
<tr>
<th>Normalized Energy Data</th>
<th>Units</th>
<th>2011</th>
<th>2016</th>
<th>% Change since 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential Electricity per Person</td>
<td>kWh/person</td>
<td>3,628</td>
<td>3,079</td>
<td>-15%</td>
</tr>
<tr>
<td>Residential Electricity per Household</td>
<td>kWh/HH</td>
<td>9,114</td>
<td>8,097</td>
<td>-11%</td>
</tr>
<tr>
<td>C&amp;I Electricity per Square Foot</td>
<td>kWh/ft²</td>
<td>27</td>
<td>22.5</td>
<td>-17%</td>
</tr>
</tbody>
</table>

Between 2011 and 2016, Boulder County’s per person and per household residential electricity consumption decreased while the county’s population grew by 8% and the number of households increased by 3%.

As the community grows, its normalized electricity consumption continues to trend downwards; this indicates a higher level of efficiency in both the residential and the C&I building sectors for electricity consumption. The people living in and employed within Boulder County are using less electricity to perform the same tasks. The reduction in normalized electricity usage can likely be attributed to growing end-user awareness as well as demand side management programs from the utilities and Boulder County (i.e. EnergySmart, Weatherization Assistance Program, and Partners for a Clean Environment (PACE)).

When electricity is transmitted from large power plants to consumers, a portion of the electricity is inherently lost due to resistance. The GPC BASIC+ protocol requires calculating transmission and distribution losses. The loss factor of 4.67% was determined using data from the U.S. Energy Information Administration. This factor showed that 89,077 mtCO₂e were created due to the loss of electricity via utility transmission and distribution and represented 1% of Boulder County’s total 2016 GHG emissions.

As Boulder County continues to grow, policies and programs that increase end-user awareness and demand side management will play a key role in ensuring that the share of emissions from stationary electricity continues to track downwards.

**Natural Gas Usage**

Natural gas consumption accounted for 18% of Boulder County’s 2016 GHG emissions. Since 2011, total natural gas consumption increased by 0.5%, while natural gas usage decreased by 14% per household and decreased 8% per square foot in the commercial sector over the same time period (see Table 8 and Table 9 for more information).
Table 8. Natural Gas Consumption

<table>
<thead>
<tr>
<th>Natural Gas Data</th>
<th>2011</th>
<th>2016</th>
<th>% Change since 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential Natural Gas Use (therms)</td>
<td>83,797,986</td>
<td>74,077,642</td>
<td>-12%</td>
</tr>
<tr>
<td>C&amp;I Natural Gas Use (therms)</td>
<td>77,278,544</td>
<td>87,832,319</td>
<td>14%</td>
</tr>
<tr>
<td><strong>Total Natural Gas Use (therms)</strong></td>
<td><strong>161,076,530</strong></td>
<td><strong>161,909,961</strong></td>
<td><strong>0.5%</strong></td>
</tr>
<tr>
<td>Residential Natural Gas Use Emission (mtCO$_2$e)</td>
<td>444,297</td>
<td>393,877</td>
<td>-11%</td>
</tr>
<tr>
<td>C&amp;I Natural Gas Use Emission (mtCO$_2$e)</td>
<td>409,731</td>
<td>467,012</td>
<td>14%</td>
</tr>
<tr>
<td><strong>Total Natural Gas Emissions (mtCO$_2$e)</strong></td>
<td><strong>854,028</strong></td>
<td><strong>860,889</strong></td>
<td><strong>0.8%</strong></td>
</tr>
</tbody>
</table>

Table 9. Normalized Natural Gas Data

<table>
<thead>
<tr>
<th>Normalized Natural Gas Data</th>
<th>Units</th>
<th>2011</th>
<th>2016</th>
<th>Change since 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential Natural Gas per Person</td>
<td>th/person</td>
<td>281.4</td>
<td>229.9</td>
<td>-18%</td>
</tr>
<tr>
<td>Residential Natural Gas per Household</td>
<td>th/HH</td>
<td>706.9</td>
<td>604.6</td>
<td>-14%</td>
</tr>
<tr>
<td>C&amp;I Natural Gas per Square Foot</td>
<td>th/ft$^2$</td>
<td>1.1</td>
<td>0.9</td>
<td>-8%</td>
</tr>
</tbody>
</table>

Natural gas consumption can track closely with cold weather since natural gas is the most common fuel used for heating in Boulder County. Since HDD (i.e. number of days when heating was required) decreased between 2011 and 2016 by 17%, it would be expected that natural gas usage would also decrease; however, natural gas consumption increased slightly.

These numbers highlight the need for Boulder County to focus on natural gas consumption since it may result in increasing emissions moving forward.

**Stationary Diesel Usage**
Stationary diesel usage accounted for 0.1% of Boulder County’s GHG emissions. Between 2011 to 2016, stationary diesel consumption and emissions both decreased by 96% (134,000 mtCO$_2$e). The reduction was almost entirely driven by one location in Louisville no longer consuming any stationary diesel for their emergency diesel generator.

**Fugitive Emissions**
Active oil wells and natural gas distribution systems cause methane leakage and fugitive emissions, which must be accounted for in the GPC protocol. Fugitive emission accounted for more than 2% of Boulder County’s GHG emissions.

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9 Fugitive emissions and natural gas leakage rates were not calculated in the 2011 inventory; therefore, there are no comparable emissions between 2011 and 2016.
Boulder County had nearly 300 active oil wells within county limits in 2016. During the natural gas extraction process, these wells emit small amounts of methane that add up over time to comprise a significant amount of emissions. Fugitive emissions from active wells accounted for 2% of Boulder County’s GHG emissions.

Further, natural gas distribution systems have methane leaks which accounted for 0.6% of Boulder County’s total GHG emissions.

**Information-Only Renewable Energy Generation**

Per the GPC protocol, renewable energy generation is calculated as an information-only item. While no emission reductions can be included from renewable energy and Renewable Energy Credits (RECs) in a GPC inventory, many cities and counties track this data to monitor the success of their renewable energy programs and policies.

In 2016, businesses and residents installed and consumed over 11 megawatts of power generated by solar photovoltaic panels and community solar gardens. RECs allow electricity users to purchase the environmental benefits of renewable energy that is generated somewhere else. In 2016, businesses and residents in Boulder County purchased over 115 megawatts of RECs (approximately 4% of total Boulder County’s electricity) from Renewable Choice Energy and various utility REC programs.

**Transportation Source Emissions**

The transportation sector accounted for 31% of all Boulder County’s 2016 GHG emissions and included the following emission sources:

- mobile gasoline;
- mobile diesel;
- mobile electricity;
- railways; and
- aviation fuel.

**Trends and Key Takeaways**

The following are the major takeaways and trends from the transportation sources:

- On-road transportation emissions from gasoline, ethanol, and diesel usage accounted for 21% of Boulder County’s total 2016 GHG emissions.
- Emissions from on-road transportation decreased by 5% between 2011 and 2016.
- Aviation fuel consumption from the three airports that serve Boulder County residents accounted for 10% of Boulder County’s total 2016 GHG emissions. These airports include: Denver International Airport (DIA) (located in the City and County of Denver), Boulder Municipal Airport (located in the City of Boulder), and Vance Brand Municipal Airport (located in the City of Longmont).
As shown in Figure 2, the majority of transportation emissions came from mobile gasoline (57%) followed by aviation fuel at 32% and mobile diesel at 11%. The remaining transportation sources made up less than 0.03% of Boulder County’s transportation emissions.

Figure 2. Emissions from Transportation Sector, 2016

Gasoline, Ethanol, and Diesel Usage

On-road transportation emissions from gasoline, ethanol, and diesel usage accounted for 21% of Boulder County's total 2016 GHG emissions. As shown in Table 10, emissions from on-road transportation decreased by 5% between 2011 and 2016. On-road emission data is based on several factors: emission factors, fuel efficiencies, vehicle miles traveled (VMT), and vehicle type distribution by vehicle fuel (diesel and gasoline).

Table 10. On-road Transportation Trends

<table>
<thead>
<tr>
<th>Transportation Data</th>
<th>Units</th>
<th>2011</th>
<th>2016</th>
<th>% Change since 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>On-road transportation total emissions</td>
<td>mtCO₂e</td>
<td>1,097,941</td>
<td>1,039,423</td>
<td>-5%</td>
</tr>
<tr>
<td>On-road transportation</td>
<td>gallons fuel</td>
<td>121,826,342</td>
<td>124,542,743</td>
<td>2%</td>
</tr>
<tr>
<td>VMT</td>
<td>miles</td>
<td>2,390,243,903</td>
<td>2,208,590,205</td>
<td>-8%</td>
</tr>
</tbody>
</table>

While the gallons of fuel used increased slightly (2%), the emission decreased by 5% due to the inclusion of ethanol in the gasoline mixture. If you normalize transportation consumption for growth factors, emissions per person decreased by 14%, gallons per person decreased by 5% per person, and VMTs decreased by 15% per person.
Table 11. Normalized Transportation Data

<table>
<thead>
<tr>
<th>Normalized Transportation Data</th>
<th>Units</th>
<th>2011</th>
<th>2016</th>
<th>% Change since 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>On-road transportation emissions per person</td>
<td>mtCO₂e/person</td>
<td>3.7</td>
<td>3.2</td>
<td>-14%</td>
</tr>
<tr>
<td>Gallons per person</td>
<td>gallons/person</td>
<td>409</td>
<td>387</td>
<td>-5%</td>
</tr>
<tr>
<td>VMT per person</td>
<td>VMT/person</td>
<td>8,026</td>
<td>6,854</td>
<td>-15%</td>
</tr>
</tbody>
</table>

As the community grows, its normalized fuel consumption continues to trend downwards; this could indicate a higher level of efficiency in vehicles, less people driving single-occupied vehicles, and an increase in alternative transportation such as biking, walking, and mobility options. In addition, it could indicate an increase in end-user awareness on the impact of transportation on the environment.

As Boulder County continues to grow, policies and programs that increase end-user awareness and reduce vehicle miles traveled will play a key role in ensuring that the share of emissions from on-road emission continue to track downwards.

**Railways Diesel Usage**

Railways accounted for 0.004% of Boulder County’s total 2016 GHG emissions. Burlington Northern Santa Fe operates a diesel freight train that travels approximately 30 miles through unincorporated Boulder County and the Cities of Boulder, Longmont, and Louisville.

**Aviation Fuel Usage**

In 2016, emissions from aviation fuel accounted for 10% of Boulder County’s total 2016 GHG emissions and 32% of the emissions from transportation. There are three airports that serve Boulder County residents: DIA (located in the City and County of Denver), Boulder Municipal Airport (located in the City of Boulder), and Vance Brand Municipal Airport (located in the City of Longmont). Emissions from DIA accounted for almost 100% of the total GHG emissions from aviation.

The 2011 GHG inventory included the Boulder Municipal Airport and Vance Brand Municipal Airports, but not the Denver International Airport. This lead to a large increase in the reported aviation emissions between 2011 and 2016.

**Waste Source Emissions**

The waste sector accounted for just over 1% of all Boulder County’s 2016 GHG emissions and included the following emission sources:

- landfill gas;
- compost; and
- wastewater.
Trends and Key Takeaways
The following are the major takeaways and trends from waste sources:

- Landfill gas accounts for 1% of Boulder County’s total GHG emissions and composted waste accounts for 0.1% of Boulder County’s total GHG emissions.
- In 2016, 36% of countywide waste was diverted through recycling and composting.
- Between 2011 and 2016, the amount of landfilled waste per person increased by 18%.
- Wastewater emissions accounted for 0.05% of Boulder County’s total GHG emissions.

As shown in Figure 3, the majority of waste emissions came from landfill gas (91%) followed by compost at 5% and wastewater at 4%.

Figure 3. Emissions from Waste Sector, 2016

Landfilled, Recycled, and Composted Waste
Emissions from landfilled waste accounted for approximately 1% of Boulder County’s total GHG emissions. Between 2011 and 2016, the amount of landfilled waste increased by 27% and the amount of landfilled waste per person increased by 18% (see Table 12).
### Table 12. Landfilled, Composted and Recycling Tonnage

<table>
<thead>
<tr>
<th>Waste Data</th>
<th>Units</th>
<th>2011</th>
<th>2016</th>
<th>% Change since 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landfilled waste</td>
<td>Tons</td>
<td>223,361</td>
<td>284,093</td>
<td>27%</td>
</tr>
<tr>
<td>Composted waste*</td>
<td>Tons</td>
<td>-</td>
<td>46,351</td>
<td>-</td>
</tr>
<tr>
<td>Recycled waste*</td>
<td>Tons</td>
<td>-</td>
<td>112,475</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total Waste Created</strong></td>
<td>Tons</td>
<td>223,361</td>
<td>442,919</td>
<td>-</td>
</tr>
<tr>
<td>Diversion Waste</td>
<td>% Waste Diverted</td>
<td>-</td>
<td>36%</td>
<td></td>
</tr>
<tr>
<td>Landfill tons per person</td>
<td>Tons/Person</td>
<td>0.8</td>
<td>0.9</td>
<td>17%</td>
</tr>
<tr>
<td>Composted tons per person*</td>
<td>Tons/Person</td>
<td>-</td>
<td>0.1</td>
<td>-</td>
</tr>
<tr>
<td>Recycled tons per person*</td>
<td>Tons/Person</td>
<td>-</td>
<td>0.4</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total Waste Created Per Person</strong></td>
<td>Tons/Person</td>
<td>0.8</td>
<td>1.4</td>
<td>-</td>
</tr>
</tbody>
</table>

* Sources that were reported in 2016 but not reported in 2011. Still recycling and composting climate impacts are reported as information-only as the GPC protocol doesn’t include them in the inventory.

In 2016, 36% of waste was diverted from the landfill. In 2016, on average, 0.1 tons of compost and 0.4 of recycling was created per person per year. Per GPC protocol, emission reductions resulting from materials being recycled is not counted and the amount of recycled waste is reported as information-only in Boulder County’s inventory. However, Boulder County has identified recycling as a top GHG reduction strategy due to the life-cycle GHG emission savings achieved through recycling a material instead of landfilling the material. Utilizing the life-cycle emission factors from ICLEI’s Recycling and Composting protocol, it is estimated that Boulder County avoided 153,289 mtCO₂e.

**Wastewater Treatment**

In 2016, wastewater treatment plant (WWTP) emissions accounted for 0.05% of Boulder County’s 2016 GHG inventory. Each municipality has its own WWTP. In addition, some residents residing in Nederland and unincorporated Boulder County are served by septic systems. The 2016 inventory calculated WWTP emissions from process nitrous oxide and from fugitive emissions from nitrification and denitrification.

**Industrial Processes and Product Use Source Emissions**

The IPPU sector accounted for 5% of all Boulder County’s 2016 GHG emissions and included the following emission sources:

- industrial processes (cement manufacturing); and
- industrial product use (refrigerants).

---

10 Wastewater emissions were not calculated in the 2011 inventory; therefore, there are no comparable emissions from 2011 to 2016.
Trends and Key Takeaways
Emissions from industrial processes in Boulder County are primarily generated by cement manufacturing activities and, to a much smaller degree, refrigerant use in buildings. As shown in Figure 4, the majority of IPPU emissions came from cement manufacturing (96%) followed by refrigerants at 4%.

Industrial Processes
Industrial processes accounted for 5% of Boulder County’s total GHG emissions. The main emission sources from industrial processes are releases that chemically or physically transform materials (e.g. the blast furnace in the iron and steel industry, cement, etc.). During these processes different GHGs can be produced. The only industrial process noted within Boulder County is the cement plant located in unincorporated Boulder County.

Industrial Product Use
Industrial product use of refrigerants accounted for 0.2% of Boulder County’s total GHG emissions. Products such as refrigerants, foams or aerosol cans can release potent GHG emissions. Earlier generations of refrigerants—chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs)—contributed significantly to the depletion of stratospheric ozone and are being phased out due to the Kyoto Protocol. CFCs and HCFCs largely have been replaced with hydrofluorocarbons (HFCs) but many of these HFCs have high global warming potentials and are starting to be restricted or phased out.

Agriculture, Forestry, and Other Land Use Source Emissions
The Agriculture, Forestry, and Other Land Use (AFOLU) sector accounted for 0.6% of Boulder County’s 2016 GHG emissions and included the following emission sources:
• emissions from enteric fermentation;
• emissions from manure management;
• emissions from forest fires; and
• emissions from soil management.

Trends and Key Takeaways
The following are the major takeaways and trends from Agriculture, Forestry, and Other Land Use (AFOLU) sources:

• Emissions from livestock, which include those created by both enteric fermentation and manure management, comprise nearly 57% of AFOLU emissions for Boulder County and 0.4% of total emissions for Boulder County.
• Activities related to managed soils account for approximately 42% of AFOLU emissions and 0.3% of Boulder County’s total emissions.

As shown in Figure 5, the majority of AFOLU emissions came from enteric fermentation (55%) followed by soil management (42%), manure management (2%), and forest fires (2%).

![Figure 5. Emissions from AFOLU Sector, 2016](image)

Emissions from Livestock
Total agricultural emissions from livestock comprise 0.4% of 2016 emissions for Boulder County and nearly 57% of AFOLU emissions. Emissions from livestock are created through enteric fermentation and manure management. Enteric fermentation is the process of microbial fermentation through which methane is produced during animal digestion. Enteric fermentation is one of the largest sources of methane in the United States but only makes up a very small percentage of the total Boulder County 2016 GHG emissions.
Between 2011 and 2016, emissions from enteric fermentation and manure management increased by 26% due to the increased number of reported livestock (see Table 13).

**Table 13. Livestock Data (Number of Animals in Boulder County)**

<table>
<thead>
<tr>
<th>Livestock Category</th>
<th>2011</th>
<th>2016</th>
<th>% Change since 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy Cattle</td>
<td>0</td>
<td>59</td>
<td>100%</td>
</tr>
<tr>
<td>Beef Cattle</td>
<td>10,771</td>
<td>9,887</td>
<td>-9%</td>
</tr>
<tr>
<td>Sheep</td>
<td>1,343</td>
<td>922</td>
<td>-46%</td>
</tr>
<tr>
<td>Goat</td>
<td>206</td>
<td>694</td>
<td>70%</td>
</tr>
<tr>
<td>Pig</td>
<td>235</td>
<td>286</td>
<td>18%</td>
</tr>
<tr>
<td>Horse</td>
<td>3,915</td>
<td>3,796</td>
<td>-3%</td>
</tr>
<tr>
<td>Poultry*</td>
<td>-</td>
<td>35,100</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>16,470</td>
<td>50,744</td>
<td>68%</td>
</tr>
</tbody>
</table>

* Data was not provided for poultry in 2011

**Emissions from Land**

As data was not available over the required 20-year time period, and land use changes were minimal, emissions associated with land use changes were not included in the 2016 inventory.

**Emissions from Aggregate Sources and Non-CO2 Emission Sources**

Emissions from managed soils and forest fires represent 0.3% of Boulder County’s 2016 GHG emissions. GPC recognizes several types of emissions resulting from aggregate sources and non-CO₂ emissions sources in the BASIC+ inventory. While several of these aggregate sources are not occurring (i.e. rice cultivation) in Boulder County, there are both direct and indirect emissions resulting from managed soils and forest fires in the county. Between 2011 to 2016, emissions from managed soils in Boulder County decreased by 63%—this is in large part due to the county’s aggressive pursuit of organic land management practices.

Based on the Boulder County Parks and Open Space 2015 Agricultural Resources Division Annual Report¹¹, 15% of open space and grassland owned by Boulder County is organically managed. As Boulder County continues to increase organic management practices and reduce the use of synthetic fertilizers, the emissions from managed soils in Boulder County will continue to trend downwards.

In 2016, Boulder County experienced the Cold Springs fire which burned 528 acres. Emissions resulted from the fire accounted for 0.01% of Boulder County’s GHG emission in 2016.

¹¹ Boulder County Parks and Open Space 2015 Agricultural Resources Division Annual Report can be found at: https://assets.bouldercounty.org/wp-content/uploads/2017/03/agriculture-annual-report.pdf
Boulder County’s Potential to Reduce Greenhouse Gas Emissions

GHG Emission Reduction Strategies

Lotus researched sustainability reports, plans, and policies and worked with local energy, transportation, waste, carbon sequestration and oil and gas experts and staff to identify an initial list of GHG emission reduction strategies that have the greatest potential to reduce GHG emissions. Only those strategies with a high potential to reduce GHG emissions were considered; additional benefits such as air quality improvements were not considered during this analysis. For more information refer to Appendix C: Detailed Descriptions of GHG Emission Reduction Strategies.

The initial list of recommendations was reviewed with Boulder County staff, who provided guidance on a final list of recommended strategies. The list of GHG reduction strategies is presented in Table 14. These strategies fall under six sectors: building energy, renewable energy, transportation, oil and gas, waste, and other. Strategy definitions are based off industry best practices and are tailored based on existing actions underway by the county. In some cases, strategies may overlap or may be dependent on one another.
<table>
<thead>
<tr>
<th>Sector</th>
<th>Objective</th>
<th>Specific Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Energy</td>
<td>Implement deep carbon reductions in buildings to reduce energy consumption</td>
<td>Adhere to and Enforce Current Building Code&lt;br&gt;Implement Beyond Code Requirements&lt;br&gt;Accelerate Fuel Switching&lt;br&gt;Impose Mandatory Benchmarking&lt;br&gt;Increase the State’s Energy Efficiency Resource Standard&lt;br&gt;Continue Boulder County’s Suite of Energy Efficiency Programs</td>
</tr>
<tr>
<td>Renewable Energy</td>
<td>Accelerate solar energy adoption: all-of-the-above strategy</td>
<td>Continue Boulder County’s Suite of Renewable Energy Programs&lt;br&gt;Expand Rooftop Solar&lt;br&gt;Expand Community Solar&lt;br&gt;Additional Efforts</td>
</tr>
<tr>
<td>Transportation</td>
<td>Increase the adoption of electric vehicles</td>
<td>Accelerate Electric Vehicles: All-of-the-Above Strategy&lt;br&gt;Support Federal and/or State Clean Car Policies</td>
</tr>
<tr>
<td></td>
<td>Reduce carbon intensity of vehicle travel</td>
<td>Support Federal and/or State Clean Car Policies</td>
</tr>
<tr>
<td></td>
<td>Reduce single-occupancy vehicle travel</td>
<td>Expand Public Transit</td>
</tr>
<tr>
<td>Oil and Gas</td>
<td>Support regional and state efforts to control methane leaks</td>
<td>Adopt and Enforce Leak Detection and Repair</td>
</tr>
<tr>
<td>Waste</td>
<td>Strive for zero waste</td>
<td>Reduce Food Waste&lt;br&gt;C&amp;D and Composting Waste to Local Transfer Facility&lt;br&gt;Promote Zero Waste Education&lt;br&gt;Strive for Municipal Zero Waste&lt;br&gt;Conduct Other Efforts as Needed</td>
</tr>
<tr>
<td>Other Carbon Reduction Strategies</td>
<td>Implement community-wide comprehensive carbon reduction programs</td>
<td>Pursue Carbon Sequestration&lt;br&gt;Implement Carbon Tax&lt;br&gt;Carbon Intensive Industries Carbon Impact Offset Fund</td>
</tr>
</tbody>
</table>
It should be noted that there is a direct relationship between increasing renewable energy and all strategies that effect electricity use (through either increases or decreases in use), particularly stationary fuel switching and the addition of electric vehicles.

These strategies will help set Boulder County on a path to achieve the Paris Climate Agreement Goal which will help prevent a global temperature increase of 1.5 to 2°C.

**Community-Wide GHG Reduction Goals**

From 2016 to 2050, it is expected that emissions will increase by 7% or 345,387 mtCO2e in a business-as-usual scenario where no aggressive actions are taken by Boulder County and the community. Boulder County is committed to addressing climate change by GHG emissions in accordance with levels specified by the Paris Climate Agreement Goal, which will help prevent a global temperature increase of 1.5 to 2°C. In 2018, the county committed to the follow GHG reduction goals based on a 2005 baseline:

1. reduce GHG emissions by 45% by 2030; and
2. reduce GHG emissions by 90% by 2050.

If all strategies were to be implemented, Boulder County is estimated to achieve the GHG emission reductions listed in Table 15.

<table>
<thead>
<tr>
<th>Year</th>
<th>Boulder County’s GHG Emission Reduction Goal</th>
<th>Model Predictions</th>
<th>Additional Reductions Needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>2030</td>
<td>45%</td>
<td>49%</td>
<td>0%</td>
</tr>
<tr>
<td>2050</td>
<td>90%</td>
<td>61%</td>
<td>29%</td>
</tr>
</tbody>
</table>

Figure 6 and Figure 7 show the relative contribution from each sector towards the overall GHG emission reduction goal.
Figure 6. 2030 GHG Emission Reduction Potential Projections

Figure 7. 2050 GHG Emission Reduction Potential Projections

The contributions to lower emissions from the GHG reduction strategies, grouped by category, varies each goal year. The largest contribution in GHG emission reductions comes from
renewable energy, which must provide electricity not only for current demand, but any additional electricity demanded due to stationary fuel switching and electric vehicles.

In 2050, after renewable energy, the next largest contribution comes from building efficiency, followed by transportation, other carbon reduction strategies, expected reductions from the City of Boulder, waste, and oil and gas.

From 2030 to 2050, it becomes more challenging to achieve the GHG emission reduction goal. There are a few reasons as described:

1. The business-as-usual (BAU) projection in GHG emissions continues to grow each year due to expected increases in population. The GHG reductions from the proposed strategies need to exceed the increase in BAU projections.
2. The GHG emission reduction strategies affect key emission sources in these sectors: electricity, on-ground transportation, waste, and oil and gas. Boulder County’s GHG emissions include additional sources that are not as easily influenced by Boulder County programs and policies, such as airline travel from the Denver International Airport. The GHG emission reduction savings that result from the key emission sources need to be large enough to overcome sources that are not directly impacted by the list of recommended strategies.

It should be noted that the contributions from each sector (and therefore strategy) are highly dependent on data inputs and data assumptions. Refer to the spreadsheet titled Boulder County GHG Modeling Spreadsheet_060618.

Because the inputs used in this model are specific to Boulder County and further assumptions were derived during multiple conversations and through research, comparing the results of this model to other communities should be approached with care. Likewise, the assumptions used in the model predict the potential reductions in GHG emissions and the successful implementation of the strategies depends on the level of resources provided to each initiative. If assumed inputs, such as participation or savings values, do not occur, then the potential for GHG emission reductions will change accordingly. Data inputs and assumptions can be referenced in the spreadsheet titled Boulder County GHG Modeling Spreadsheet_060618.
GHG Savings Over Time

The impact of GHG emission reduction potential over time is shown in Figure 8. If Boulder County does not pursue more aggressive GHG reduction strategies, it is expected that GHG emissions will increase over time and will be affected by changes in population, emission factors, and other exogenous factors. This is shown as the BAU projection. Each colored “wedge” represents the amount of savings predicted by a specific sector, with GHG emission savings from renewable energy dominating the potential for savings. The difference between the BAU and the cumulative GHG savings from all strategies is shown as “Remaining Emissions”. Boulder County’s GHG emission reduction goals for 2030 and 2050 are included in the “GHG Emission Goal” line.

The GHG emission reductions shown in Figure 8 represent the potential if all recommended GHG reduction strategies were pursued.

Figure 8. Impacts from GHG Emission Reduction Strategy Savings Over Time
Many of the strategies are expected to reach their full potential of participation and/or savings in the year 2030; therefore, there is a steep incline of potential savings from 2018 until 2030 and the savings begin to incline at a more gradual rate following the year 2030 until 2050.

The BAU captures the already-committed-to increases in renewable energy by the utilities, while the renewable energy wedge captures the additional reduction in GHG emission resulting from additional renewable energy commitments.

**Contributions from Different Strategies**

Contributions from each strategy in 2030 and 2050 are shown in Figure 9.
The reduction potential of each individual strategy is presented in Table 16. It should be noted that both stationary and mobile fuel switching are only effective if the additional electricity that they generate is supplied by renewable energy (assuming that renewable energy has an emission factor of 0 lbs. CO₂e/MWh).

### Table 16. GHG Reductions by Strategy

<table>
<thead>
<tr>
<th>Strategy</th>
<th>GHG Emission Reduction Potential (mtCO₂e) in 2030</th>
<th>GHG Emission Reduction Potential (mtCO₂e) in 2050</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BUILDING EFFICIENCY</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Adhere to and Enforce Current Building Code</td>
<td>33,013</td>
<td>42,907</td>
</tr>
<tr>
<td>2. Implement Beyond Code Requirements</td>
<td>103,746</td>
<td>255,412</td>
</tr>
<tr>
<td>3a. Accelerate Fuel Switching (savings from natural gas)</td>
<td>196,063</td>
<td>232,839</td>
</tr>
<tr>
<td>3b. Accelerate Fuel Switching (increased electricity emissions)</td>
<td>(389,461)</td>
<td>(318,031)</td>
</tr>
<tr>
<td>4. Impose MandatoryBenchmarking</td>
<td>54,271</td>
<td>43,994</td>
</tr>
<tr>
<td>5. Increase the State’s Energy Efficiency Resource Standard</td>
<td>92,858</td>
<td>108,597</td>
</tr>
<tr>
<td>6. Continue Boulder County’s Suite of Energy Efficiency Programs</td>
<td>15,657</td>
<td>34,323</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>106,147</td>
<td>400,042</td>
</tr>
<tr>
<td><strong>RENEWABLE ENERGY</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Continue Boulder County’s Suite of Renewable Energy Programs</td>
<td>5,936</td>
<td>10,362</td>
</tr>
<tr>
<td>2. Expand rooftop solar</td>
<td>311,733</td>
<td>267,940</td>
</tr>
<tr>
<td>3. Expand community solar</td>
<td>31,389</td>
<td>26,979</td>
</tr>
<tr>
<td>4. Additional efforts</td>
<td>544,415</td>
<td>1,218,617</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>893,473</td>
<td>1,523,899</td>
</tr>
<tr>
<td><strong>TRANSPORTATION</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1a. Accelerate Electric Vehicles: All-of-the-Above Strategy (savings from using less fossil fuel)</td>
<td>240,480</td>
<td>589,464</td>
</tr>
<tr>
<td>1b. Accelerate Electric Vehicles: All-of-the-Above Strategy (increased electricity emissions)</td>
<td>(109,407)</td>
<td>(238,252)</td>
</tr>
<tr>
<td>2. Support Clean Car Policies</td>
<td>42,467</td>
<td>82,166</td>
</tr>
<tr>
<td>3. Expand Public Transit</td>
<td>15,540</td>
<td>10,413</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>189,081</td>
<td>443,791</td>
</tr>
<tr>
<td><strong>OIL AND GAS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Support Regional and State Efforts to Control Methane Leaks</td>
<td>6,252</td>
<td>6,252</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>6,252</td>
<td>6,252</td>
</tr>
<tr>
<td><strong>WASTE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Reduce Food Waste</td>
<td>23,054</td>
<td>27,378</td>
</tr>
<tr>
<td>2. C&amp;D and Composting Waste to Local Transfer Facility</td>
<td>257</td>
<td>305</td>
</tr>
<tr>
<td>3. Zero Waste Education</td>
<td>21,170</td>
<td>25,141</td>
</tr>
<tr>
<td>4. Municipal Zero Waste</td>
<td>86</td>
<td>109</td>
</tr>
<tr>
<td>5. Other Efforts Needed</td>
<td>26,466</td>
<td>31,424</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>71,033</td>
<td>84,356</td>
</tr>
<tr>
<td><strong>OTHER</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Pursue Carbon Sequestration</td>
<td>29,861</td>
<td>75,800</td>
</tr>
<tr>
<td>2. Implement Carbon Tax</td>
<td>350,571</td>
<td>361,145</td>
</tr>
<tr>
<td>3. Carbon Intensive Industries Carbon Impact Offset Fund</td>
<td>24,798</td>
<td>24,798</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>405,230</td>
<td>461,743</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>1,671,216</td>
<td>2,920,083</td>
</tr>
</tbody>
</table>

---

12 Further detail on each strategy, data inputs and assumptions, and the source of each assumption can be referenced in the corresponding tab in the spreadsheet titled Boulder County GHG Modeling Spreadsheet_060618.
Appendix A: Municipality Overviews

Overview of Municipalities GHG Emissions

The following is an overview of each municipality’s 2016 GHG emissions. See each municipality’s subsection for more detailed information on their 2016 GHG emissions. The methodology used by Boulder County to calculate emissions for each municipality may differ from how individual municipalities may have calculated their respective GHG inventories.

Figure 10. GHG Emissions by Municipality, 2016

Unincorporated 30%
City of Boulder 32%
Superior 2%
Nederland 0.3%
Lyons 0.4%
Louisville 5%
Longmont 22%
Lafayette 6%

Figure 11. Emissions by Sector by Municipality, 2016

13 All GHG emissions occurring from industrial processes, product use, and non-energy uses of fossil fuel, are reported under Industrial Processes and Product Uses (IPPU). Energy use from industrial companies is reported under energy emissions.
The following table provides an overview of each municipality’s 2016 population, total emissions percent of total Boulder County emissions, and emissions per capita.

### Table 17. Overview of Emissions per Municipality

<table>
<thead>
<tr>
<th>Municipality</th>
<th>2016 Population</th>
<th>Total mtCO₂e</th>
<th>% of Total Emissions</th>
<th>Emissions per Capita</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Boulder</td>
<td>108,020</td>
<td>1,581,618</td>
<td>32%</td>
<td>14.6</td>
</tr>
<tr>
<td>Lafayette</td>
<td>28,278</td>
<td>315,818</td>
<td>6%</td>
<td>11.2</td>
</tr>
<tr>
<td>Longmont</td>
<td>92,858</td>
<td>1,091,533</td>
<td>22%</td>
<td>11.8</td>
</tr>
<tr>
<td>Louisville</td>
<td>20,801</td>
<td>260,795</td>
<td>5%</td>
<td>12.5</td>
</tr>
<tr>
<td>Lyons</td>
<td>2,148</td>
<td>21,008</td>
<td>0.4%</td>
<td>9.8</td>
</tr>
<tr>
<td>Nederland</td>
<td>1,534</td>
<td>16,644</td>
<td>0.3%</td>
<td>10.9</td>
</tr>
<tr>
<td>Superior</td>
<td>13,155</td>
<td>109,834</td>
<td>2%</td>
<td>8.3</td>
</tr>
<tr>
<td>Unincorporated</td>
<td>55,432</td>
<td>1,475,786</td>
<td>30%</td>
<td>26.6</td>
</tr>
<tr>
<td><strong>Boulder County Total</strong></td>
<td><strong>322,226</strong></td>
<td><strong>4,873,034</strong></td>
<td><strong>100%</strong></td>
<td><strong>15.1</strong></td>
</tr>
</tbody>
</table>
City of Boulder
In 2016, the City of Boulder experienced the following GHG and economic trends:

- The City of Boulder was the most populous municipality in Boulder County with 108,020 residents.
- The total GHG emissions in 2016 for the City of Boulder was 1,581,618 mtCO$_2$e, which accounts for 32% of Boulder County’s total GHG emissions.
- The average per capita emissions for the City of Boulder was 14.6 mtCO$_2$e per resident, which is the second highest emissions per capita for a municipality in Boulder County.
- As shown in Figure 13, the commercial and industrial sector was the largest emitter of GHG emissions at 57%, followed by transportation at 24%, and the residential sector at 16%. The remaining sectors made up less than 3% of total emissions.
- As shown in Figure 14, electricity was the largest source of emissions at 53%, followed by natural gas at 20%, mobile gasoline at 11% and aviation fuel at 10%. The remaining sources accounted for less than 5% of total emissions.

Note: The methodology used by Boulder County to calculate emissions for each municipality may differ from how individual municipalities may have calculated their respective GHG inventories.

Figure 13. GHG Emissions by Sector for the City of Boulder, 2016
Figure 14. GHG Emissions by Source for the City of Boulder, 2016

- **Electricity**: 53%
- **Natural Gas**: 20%
- **Mobile Gasoline**: 12%
- **Stationary Diesel**: 0.2%
- **Mobile Diesel**: 2%
- **Aviation Fuel**: 10%
- **Landfill Gas**: 2%
- **Compost**: 0.2%
- **Refrigerants**: 1%
City of Lafayette
In 2016, the City of Lafayette experienced the following emissions trends:

- The City of Lafayette had a population of 28,278 residents.
- The total GHG emissions in 2016 for the City of Lafayette was 315,818 mtCO$_2$e, which accounts for 6% of Boulder County’s total GHG emissions.
- The average per capita emissions for the City of Lafayette was 11.2 mtCO$_2$e per resident.
- As shown in Figure 15, the transportation sector was the largest emitter of GHG emissions at 40%, followed by the commercial and industrial sector at 28%, and the residential sector at 28%. The remaining sectors made up approximately 3% of total emissions.
- As shown in Figure 16, electricity was the largest source of emissions at 39%, followed by mobile gasoline at 22%, natural gas at 18% and aviation fuel at 14%. The remaining sources accounted for 8% of total emissions.

Note: The methodology used by Boulder County to calculate emissions for each municipality may differ from how individual municipalities may have calculated their respective GHG inventories.

Figure 15. GHG Emissions by Sector for the City of Lafayette, 2016
Figure 16. GHG Emissions by Source for the City of Lafayette, 2016

- **Electricity**: 39%
- **Natural Gas**: 18%
- **Mobile Gasoline**: 22%
- **Mobile Diesel**: 4%
- **Aviation Fuel**: 14%
- **Landfill Gas**: 2%
- **Refrigerants**: 0.1%
- **Oil Wells**: 1%
City of Longmont

In 2016, the City of Longmont experienced the following emissions trends:

- The City of Longmont had a population of 92,858 residents, making it the second most populous municipality in Boulder County.
- The total GHG emissions in 2016 for the City of Longmont was 1,091,533 mtCO\textsubscript{2}e, which accounts for 22% of Boulder County’s total GHG emissions.
- The average per capita emissions for the City of Longmont was 11.8 mtCO\textsubscript{2}e per resident.
- As shown in Figure 17, the commercial and industrial sector was the largest emitter of GHG emissions at 37%, followed by the residential sector at 30%, and the transportation sector at 30%. The remaining sectors made up less than 3% of total emissions.
- As shown in Figure 18, electricity was the largest source of emissions at 50%, followed by natural gas at 18%, mobile gasoline at 14%, and aviation fuel at 13%. The remaining sources accounted for approximately 5% of total emissions.

Note: The methodology used by Boulder County to calculate emissions for each municipality may differ from how individual municipalities may have calculated their respective GHG inventories.

![Figure 17. GHG Emissions by Sector for the City of Longmont, 2016](image-url)
Figure 18. GHG Emissions by Source for the City of Longmont, 2016

- Electricity: 50%
- Natural Gas: 18%
- Mobile Gasoline: 14%
- Mobile Diesel: 3%
- Aviation Fuel: 13%
- Landfill Gas: 2%
City of Louisville

In 2016, the City of Louisville experienced the following emissions trends:

- The City of Louisville had a population of 20,801 residents.
- The total GHG emissions in 2016 for the City of Louisville was 260,795 mtCO$_2$e, which accounts for 5% of Boulder County’s total GHG emissions.
- The average per capita emissions for the City of Louisville was 12.5 mtCO$_2$e per resident.
- As shown in Figure 19, the commercial and industrial sector was the largest emitter of GHG emissions at 45%, followed by the transportation sector at 31%, and the residential sector at 22%. The remaining sectors made up less than 2% of total emissions.
- As shown in Figure 20, electricity was the largest source of emissions at 50%, followed by natural gas at 17%, mobile gasoline at 16%, and aviation fuel at 12%. The remaining sources accounted for less than 5% of total emissions.

Note: The methodology used by Boulder County to calculate emissions for each municipality may differ from how individual municipalities may have calculated their respective GHG inventories.

Figure 19. GHG Emissions by Sector for the City of Louisville, 2016
Figure 20. GHG Emissions by Source for the City of Louisville, 2016

- Electricity: 50%
- Natural Gas: 17%
- Mobile Gasoline: 16%
- Mobile Diesel: 3%
- Aviation Fuel: 12%
- Landfill Gas: 1%
- Compost: 0.1%
- Refrigerant: 0.2%
- Compost: 0.1%
- Refrigerant: 0.2%
Town of Lyons

In 2016, the Town of Lyons experienced the following emissions trends:

- The Town of Lyons had a population of 2,148 residents.
- The total GHG emissions in 2016 for the Town of Lyons was 21,008 mtCO$_2$e, which accounts for 0.4% of Boulder County’s total GHG emissions.
- The average per capita emissions for the Town of Lyons was 9.8 mtCO$_2$e per resident.
- As shown in Figure 21, the residential sector was the largest emitter of GHG emissions at 44%, followed by the transportation sector at 29%, and the commercial and industrial sector at 26%. The remaining sectors made up less than 3% of total emissions.
- As shown in Figure 22, electricity was the largest source of emissions at 49%, followed by natural gas at 20%, aviation fuel at 16%, and mobile gasoline at 11%. The remaining sources accounted for less than 5%.
Figure 22. GHG Emissions by Source for the Town of Lyons, 2016

Electricity, 49%
Natural Gas, 20%
Mobile Gasoline, 11%
Mobile Diesel, 2%
Aviation Fuel, 16%
Landfill Gas, 2%
**Town of Nederland**

In 2016, the Town of Nederland experienced the following emissions trends:

- The Town of Nederland had a population of 1,534 residents.
- The total GHG emissions in 2016 for the Town of Nederland was 16,644 mtCO₂e, which accounts for 0.3% of Boulder County’s total GHG emissions.
- The average per capita emissions for the Town of Nederland was 10.9 mtCO₂e per resident.
- As shown in Figure 23, the residential sector was the largest emitter of GHG emissions at 46%, followed by the commercial and industrial sector at 27%, and the transportation sector at 24%. The remaining sectors made up less than 3% of total emissions.
- As shown in Figure 24, electricity was the largest source of emissions at 50.5%, followed by natural gas at 23%, aviation fuel at 14%, and mobile gasoline at 8%. The remaining sources accounted for less than 5% of total emissions.

*Figure 23. GHG Emissions by Sector for the Town of Nederland, 2016*
Figure 24. GHG Emissions by Source for the Town of Nederland, 2016

- **Electricity**, 50%
- **Natural Gas**, 23%
- **Mobile Gasoline**, 8%
- **Mobile Diesel**, 2%
- **Aviation Fuel**, 14%
- **Landfill Gas**, 2%
- **Refrigerant**, 0.3%
- **Wastewater**, 0.1%
- **Refrigerant**, 0.3%
**Town of Superior**

In 2016, the Town of Superior experienced the following emissions trends:

- The Town of Superior had a population of 13,155 residents.
- The total GHG emissions in 2016 for the Town of Superior was 109,834 mtCO$_2$e, which accounts for 2% of Boulder County’s total GHG emissions.
- The average per capita emissions for the Town of Superior was 8.3 mtCO$_2$e per resident, the lowest for all municipalities in Boulder County.
- As shown in Figure 25, the residential sector was the largest emitter of GHG emissions at 41%, followed by the transportation sector at 39%, and the commercial and industrial sector at 19%. The remaining sectors made up approximately 1% of emissions of total emissions.
- As shown in Figure 26, electricity was the largest source of emissions at 39.4%, followed by natural gas at 20%, aviation fuel at 18%, and mobile gasoline at 17%. The remaining sources accounted for less than 5% of total emissions.

![Figure 25. GHG Emissions by Sector for the Town of Superior, 2016](image)
Figure 26. GHG Emissions by Source for the Town of Superior, 2016

- **Electricity, 39%**
- **Natural Gas, 20%**
- **Mobile Gasoline, 17%**
- **Mobile Diesel, 3%**
- **Aviation Fuel, 18%**
- **Landfill Gas, 1%**
- **Refrigerant, 0.1%**
Unincorporated Boulder County

In 2016, the areas of unincorporated Boulder County experienced the following emissions trends:

- The unincorporated areas had a population of 55,432 residents.
- The total GHG emissions in 2016 for the unincorporated areas was 1,475,786 mtCO$_2$e, which accounts for 30% of Boulder County’s total GHG emissions.
- The average per capita emissions for unincorporated Boulder County was 26.6 mtCO$_2$e per resident, the highest for all disaggregated areas of Boulder County.
- As shown in Figure 27, the transportation sector was the largest emitter of GHG emissions at 38%, followed by the commercial and industrial sector at 19%, the residential sector at 18%, and the IPPU sector at 17%. The remaining sectors made up approximately 8% of emissions.
- As shown in Figure 28, mobile gasoline was the largest source of emissions at 27%, followed by electricity at 20%, cement manufacturing at 17%, and natural gas at 17%. The remaining sources accounted approximately 14% of total emissions.

**Figure 27. GHG Emissions by Sector for Unincorporated Boulder County, 2016**
Figure 28. GHG Emissions by Source for Unincorporated Boulder County, 2016

- Electrici: 20%
- Natural Gas: 17%
- Oil Wells: 6%
- Mobile Gasoline: 27%
- Cement Manufacture: 17%
- Mobile Diesel: 5%
- Aviation Fuel: 6%
- Enteric Fermentation: 1%
- Soil Management: 1%
- Landfill Gas: 0.3%
Appendix B: Overview of Emission Factors

Boulder County is served by six utilities: Xcel Energy, Estes Park Light and Power, Longmont Power and Communications, Poudre Valley Rural Electric Association, Lyons, and United Power. Each electric utility has a different resource mix (i.e. renewable energy, natural gas, coal, nuclear) and therefore a different emission factor. Emission factors are represented in units of carbon dioxide equivalent (CO$_2$e), which combines the respective global warming potentials (GWP) of the various GHGs.

Colorado’s Renewable Energy Standard$^{14}$ and the state’s Clean Air Clean Jobs Act$^{15}$ require all Colorado utilities to increase their efficiency in their own operations and procure increasing amounts of energy from low- to zero-carbon sources (i.e. renewable energy, recycled energy, etc.) through 2020. As a result, the mix of energy sources that utilities supply the electric grid changes every year, and the resulting electricity emission factor decreases every year.

The 2011 emission inventory used Environmental Protection Agency’s Emissions & Generation Resource Integrated Database (eGRID) emission factors for electricity. These factors are based off the Rocky Mountain Power Authority sub-region called WECC Rockies.$^{16}$ The 2016 inventory electricity emission factors (mtCO$_2$e/MWh) were based on emission factor or resource mix data from the six utilities providing service in Boulder County. As shown in Table 18, five of the utilities electricity emission factors used in the 2011 and 2016 GHG inventories decreased between 2% and 31% between 2011 and 2016. The Town of Lyons utilities emission factor increased by 0.6% during the same time period.

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$^{14}$ For more information, see: https://www.xcelenergy.com/staticfiles/xe/Corporate/CRR2013/environment/renewable-energy.html.

$^{15}$ For more information, see: https://www.xcelenergy.com/environment/system_improvements/colorado_clean_air_clean_jobs.

$^{16}$ For more information see: https://www.epa.gov/energy/emissions-generation-resource-integrated-database-egrid
Table 18. Changes in Electricity Emission Factors

<table>
<thead>
<tr>
<th>Utility</th>
<th>Locations Served</th>
<th>2011</th>
<th>2016</th>
<th>Change since 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Xcel Energy</td>
<td>Boulder, Louisville, Lafayette, Longmont, Nederland, Superior, Unincorporated/other</td>
<td>0.8278</td>
<td>0.6044</td>
<td>-26.9%</td>
</tr>
<tr>
<td>Longmont Power and Communications and Estes Park Light and Power</td>
<td>Longmont</td>
<td>0.8278</td>
<td>0.7452</td>
<td>-9.9%</td>
</tr>
<tr>
<td>Poudre Valley REA</td>
<td>Unincorporated/other, Lyons</td>
<td>0.8278</td>
<td>0.7404</td>
<td>-10.6%</td>
</tr>
<tr>
<td>Lyons</td>
<td>Lyons</td>
<td>0.8278</td>
<td>0.8330</td>
<td>0.6%</td>
</tr>
<tr>
<td>United Power</td>
<td>Unincorporated/other</td>
<td>0.8278</td>
<td>0.5700</td>
<td>-31.1%</td>
</tr>
</tbody>
</table>

Emission factors for other emission sources (natural gas, gasoline, etc.) were minor or stayed consistent between 2011 and 2016.

The reduction in the electricity emission factors for five of the six utilities serving Boulder County is the largest cause of reduced emissions from electricity use in the residential and C&I sectors.
Appendix C: Detailed Descriptions of GHG Emission Reduction Strategies

The following is an overview of top strategies and policies identified by Lotus that have the potential to considerably reduce GHG emissions. The analysis was completed by looking only through the lens of GHG reductions. Secondary benefits or risks were not considered during this analysis. The strategies will help set the County on a path to achieve the Paris Climate Agreement Goal which will help prevent a global temperature increase of 1.5-2 degrees C. This review was completed by performing the following tasks:

- Reviewing numerous reports and studies completed on behalf of Boulder County regarding potential GHG reduction strategies, policies, and regulations including:
  - Boulder County’s Sustainable Energy Plan (SEP) developed by Boulder County in partnership with many other cities/towns in 2008
  - Boulder County’s Environmental Sustainability Plan adopted in 2013
  - Boulder County’s 2012 GHG Inventory developed by WSP
  - Boulder County’s 2015 Sustainability Impact Analysis Report by Natural Capitalism Solutions

- Reviewing the current policy efforts being considered by Boulder County including:
  - The Colorado Community for Climate Action (CC4CA) Policy Agenda
  - An updated House Bill 07-1146 which requires all local governments to adopt and enforce an International Energy Conservation Code (IECC) Code that meets or exceeds a minimum version (i.e. the original bill states that they will enforce or exceed the IECC 2003 standard).

- Reviewing comparable city’s and county’s sustainability goals, including: Boulder, Denver, Fort Collins, Broomfield, Longmont, Marin County, CA, Sonoma County, CA, King County, WA, Miami-Dade, FL and Summit County, UT.

- Identifying GHG reduction strategies based off Lotus’s deep expertise working with dozens of municipalities on their climate action plans.

This work was reviewed and supplemented by the following experts:

- Taryn Finnesey with the Colorado Department of Public Health and Environment
- Tom Plant with the Center for the New Energy Economy
- Will Toor with the Southwest Energy Efficiency Project
- Amelia Myers with Conservation Colorado
- Stacy Tellinghuisen with Western Resource Advocates (WRA)
Overview of GHG Emissions

To understand which GHG emission reduction policies and strategies to select, it is important to have a strong understanding of which sectors and sources are attributing the highest GHG emissions. Emissions by sector are especially important to look at since many programs and policies specifically target sectors. For example, Boulder County’s EnergySmart program focuses solely on the commercial and residential sectors. In 2016, the commercial, transportation, and residential sectors made up almost 92% of Boulder County’s total GHG emissions. Industrial process and oil wells together made up 5% with the remaining sectors representing approximately 2%. In addition, it is important to note which sector’s emissions are increasing. Of the top four emitters, commercial and residential energy building use is decreasing (mostly due to decreased emission factors for electricity), while transportation and industrial process emission are increasing.

It is also important to understand GHG emissions by source. For example, Boulder County’s renewable energy policies focus only on electricity; while the county’s sustainable agricultural practices program focus on manure management. In 2016, electricity, natural gas, gasoline, and aviation fuel made up 89% of the total GHG emissions. Of the top four emitters, electricity emissions and mobile gasoline emissions are decreasing, while natural gas and aviation fuel emissions are increasing.

Though it is important for Boulder County to address all GHG emissions, Lotus recommends focusing the majority of Boulder County’s staff time, money, and political capital on top GHG emitters where they have significant or moderate control. As such, our recommendations focus on the commercial, transportation, and residential sectors and electricity, natural gas, and gasoline sources. Note that some sectors and sources will be affected indirectly due to these policies.

Note: Aviation/jet fuel accounts for 10% of the counties GHG emissions. Air traffic management practices, new aircraft technology, and developing sustainable alternative fuels are helping reduce GHG emissions per flight; however, each of those strategies are unlikely to be achieved through a county’s policies or programs. Therefore, we have not provided any strategies for aviation fuel.

Summary of Strategies, Programs, and Policies

Many of the current programs and policies that are occurring in Boulder County that help reduce GHG reductions are not listed below; however, it does not mean that they are not valuable in reducing GHG emissions or providing secondary benefits such as reduced costs or improved air quality. Instead the following are meant to highlight the most impactful GHG strategies. Also, it should be noted that some of the strategies might be better accomplished on a state, regional, or city level. However, we believe it is possible for
Boulder County to play a role in starting, leading, bolstering, or lobbying for these strategies. Table 19 shows the recommended strategies for Boulder County.

**Table 19. GHG Reduction Strategies by Sector**

<table>
<thead>
<tr>
<th>Sector</th>
<th>Objective</th>
<th>Specific Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Building Energy</strong></td>
<td>Implement deep carbon reductions in buildings to reduce energy consumption</td>
<td>Adhere to and Enforce Current Building Code</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Implement Beyond Code Requirements</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Accelerate Fuel Switching</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Impose Mandatory Benchmarking</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increase the State’s Energy Efficiency Resource Standard</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Continue Boulder County’s Suite of Energy Efficiency Programs</td>
</tr>
<tr>
<td><strong>Renewable Energy</strong></td>
<td>Accelerate Solar Energy Adoption: All-of-the-Above Strategy</td>
<td>Continue Boulder County’s Suite of Renewable Energy Programs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Expand Rooftop Solar</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Expand Community Solar</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Additional Efforts</td>
</tr>
<tr>
<td><strong>Transportation</strong></td>
<td>Increase the adoption of electric vehicles</td>
<td>Accelerate Electric Vehicles: All-of-the-Above Strategy</td>
</tr>
<tr>
<td></td>
<td>Reduce carbon intensity of vehicle travel</td>
<td>Support Federal and/or State Clean Car Policies</td>
</tr>
<tr>
<td></td>
<td>Reduce single-occupancy vehicle travel</td>
<td>Expand Public Transit</td>
</tr>
<tr>
<td><strong>Oil and Gas</strong></td>
<td>Support regional and state efforts to control methane leaks</td>
<td>Adopt and Enforce Leak Detection and Repair</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reduce Food Waste</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C&amp;D and Composting Waste to Local Transfer Facility</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Promote Zero Waste Education</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Strive for Municipal Zero Waste</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Conduct Other Efforts as Needed</td>
</tr>
<tr>
<td><strong>Waste</strong></td>
<td>Strive for zero waste</td>
<td>Pursue Carbon Sequestration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Implement Carbon Tax</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Carbon Intensive Industries Carbon Impact Offset Fund</td>
</tr>
<tr>
<td><strong>Other Carbon Reduction Strategies</strong></td>
<td>Implement community-wide comprehensive carbon reduction programs</td>
<td></td>
</tr>
</tbody>
</table>
Building Energy

Electricity is currently the top GHG emitter for Boulder County (41%) and is expected to continue to be top emitter for the near future. Although GHG emissions from electricity have reduced by 25% since 2011, usage has decreased by only 1%. The large emission reductions are due to the increase in renewable energy on the grid. Due to competitive renewable energy prices and growing consumer demand, it is expected that demand for renewable energy will rapidly increase; however, there is inconsistency between Boulder County’s five utilities on how quickly they are moving towards renewable energy.

In addition, it is also expected that the demand for electricity will increase or stay flat over time due to the increase in population, square footage, electric vehicles, and fuel switching (switching from natural gas to electricity). Together these trends show that electricity should be a top priority for Boulder County’s GHG reduction strategy.

Natural gas is currently the second largest GHG emitter for Boulder County (18%) and could potentially be the top emitter in the near future, surpassing electricity. GHG emissions from natural gas have increased by 0.8% between 2005 and 2016. Unlike electricity, the emission factor is likely to stay flat (i.e. natural gas is not becoming cleaner). Boulder County has the potential to reduce GHG emissions from natural gas through demand for natural gas at the site (where it is being used (i.e. buildings)) and stricter regulations on natural gas wells.

Strategies 1 and 2: Adhere to and Enforce Current Code and Implement Beyond Code Requirements

Between 2011 and 2016, commercial square footage increased in Boulder County by over 23%, population rose by 8%, and the number of housing units rose by 6%. All of these trends lead to an increased amount of new and remodeled square footage. The following would drastically reduce GHG emissions:

- Encourage or require (if possible) all Boulder County communities to have codes that match the most recent IECC codes
- Continually improve codes (ideally on a three-year basis each time a new IECC code is released) by creating new policies or ordinances
- Enforce energy codes
- Continue to increase building codes to require net-zero energy consumption for new buildings and to be significantly more stringent for existing buildings, through policy or ordinance
Note that Boulder County would need to figure out the best way for them to influence this strategy since cities are the primary enforcers of building codes.

- **Plans That Agree**: SEP Plan, NREL City Policies report, Boulder County’s Environmental Sustainability Plan, WSP GHG Inventory, House Bill 07-1146
- **Other Cities/Counties with Similar Goals**: Denver, King County, WA, Sonoma County, CA, Cleveland, OH, Summit County, UT, and Miami-Dade County, FL

**Strategy 3: Fuel Switching**

As the grid continues to become cleaner, Boulder County should start to convert commercial and residential buildings from natural gas heating to electric heating. This will significantly reduce natural gas emissions, by providing electric heat from a no- to low-carbon source.

Specific policies and programs could include: building code requirements and targeted rebates.

- **Plans That Agree**: N/A
- **Other Cities/Counties with Similar Goals**: Denver, Fort Collins, City of Boulder, Sonoma County, CA, Cleveland, OH, and Vancouver, BC

**Strategy 4: Impose Mandatory Benchmarking**

According to research completed for the Energize Denver project, benchmarking and transparency requirements have resulted in a 2-3% energy savings each year. Some cities have seen even higher reductions ranging from 5-11%.17

Boulder County could require all commercial buildings in Boulder County over a certain size to publicly benchmark and report energy consumption.

- **Plans That Agree**: NREL City Policies
- **Other Cities/Counties with Similar Goals**: Denver, State of California

Strategy 5: Increase the State’s Energy Efficiency Resource Standard

House Bill 1227, signed in June 2017, extends electric efficiency programs to 2028 and requires the Public Utilities Commission to set goals of at least 5% peak demand reduction and 5% energy savings by 2028 for demand-side management programs implemented during 2019 through 2028 when compared to 2018. However, many experts believe this bill was not stringent enough.

Boulder County could lobby for the Energy Efficiency Resource Standard to increase and potentially be expanded to co-operative and municipal utilities.

- **Plans That Agree:** CC4CA
- **Other Cities/Counties with Similar Goals:** Denver and Sonoma County, CA

Strategy 6: Continue Boulder County’s Suite of Energy Efficiency Programs

Boulder County currently offers numerous residential and commercial programs and policies. Since 2011, GHG emissions from residential sector buildings have decreased, while GHG emissions from the commercial sector have increased. While both residential and commercial sectors must be addressed in energy efficiency programs and policies, commercial programs might need to be prioritized in the short run to start reversing the trend of increased GHG emissions. We recommend continuing to be aggressive in energy efficiency programs and policies but focus in on carbon reductions.

Boulder County could continue to support their energy efficiency and renewable energy programs (e.g. Partners for a Clean Environment, EnergySmart, BuildSmart, Weatherization, etc.) with additional funding and emphasis on GHG reductions.

- **Plans That Agree:** NREL City Policies, NCS Analysis, Boulder County’s Environmental Sustainability Plan, and SEP Plan
- **Other Cities/Counties with Similar Goals:** All cities and counties reviewed

Renewable Energy

Many of Boulder County’s utilities have increased their renewable energy due to Colorado’s Renewable Portfolio Standard (RPS). The RPS requires Investor-Owned Utilities to acquire 30% of their energy mix from renewable energy sources by 2020, co-operative utilities over 100,000 meters to acquire 20% of their energy mix from renewable energy sources by 2020, and co-operative utilities under 100,000 meters and municipal utilities serving more than 40,000 meters to acquire 10% of their energy mix from renewable energy sources by 2020.
sources by 2020. This policy will sunset in 2020; a utility would not have to increase their renewable energy allocation over their mandated percentage past 2020.

**Strategy 7: Continue Boulder County’s Suite of Renewable Energy Programs**

Boulder County currently offers numerous residential and commercial programs and policies. We recommend continuing to be aggressive in renewable energy programs and policies.

Boulder County could continue to support their renewable energy programs (e.g. Partners for a Clean Environment, EnergySmart, BuildSmart, Weatherization, etc.) with additional funding and emphasis on GHG reductions.

- **Plans That Agree:** NREL City Policies, NCS Analysis, Boulder County’s Environmental Sustainability Plan, and SEP Plan
- **Other Cities/Counties with Similar Goals:** All cities and counties reviewed

**Strategies 8-10: Expand Rooftop Solar, Community Solar, and Additional Renewable Energy Efforts**

Three specific strategies were added to the analysis after conversation with the experts had concluded:

- Expand rooftop solar on viable rooftops.
- Expand community solar to viable land areas.
- Pursue additional renewable energy strategies to help achieve 100% renewable energy by 2030.

These efforts were highlighted by Boulder County as options to help drastically reduce GHG emissions.

**Transportation**

Generally, emissions from gasoline are on a downward trajectory due to more efficient vehicles. As more businesses and people move to Boulder County, it is expected that gasoline emissions will remain constant or potentially increase due to the growth in number of vehicles and vehicle miles traveled from longer commutes. It is very possible that the ground transportation sector will become the largest emitter in the near future surpassing residential and commercial buildings; however, if transportation policy, programs, and strategies are pursued correctly it is possible that ground transportation emissions will drastically reduce in the near and mid-term.

Note that each of the recommended policies below will most likely reduce mobile diesel as well.
Also, a note about biodiesel and compressed natural gas: historically many cities have recommended the usage of biodiesel and compressed natural gas due to potential GHG reductions; however, in recent years many cities are no longer considering these strategies due to costs, availability, and minimal GHG reduction potential (over the long run compared to electric vehicles). Therefore, we did not consider biofuels or CNG in our analysis. Note that Will agreed with this statement that alternative fuels are good for niche vehicles but are not scalable.

**Strategy 11: Electric Vehicles (EV): All-of-the-above Strategy**

The Colorado Energy Office’s 2015 *Colorado Electric Vehicle Market Implementation Study* estimated that each individual electric light duty vehicle accounts for an average annual reduction in GHG emissions of approximately 37%, compared to the typical gasoline-powered light duty vehicle in 2015.\(^{18}\) As the energy mix becomes increasingly cleaner, the emissions reductions will continue to improve (potentially to a 100% reduction in emissions if 100% renewable energy is supplied to grid). However, according to the report even in a high electric vehicle growth scenario, by 2030 EVs will only account for 15.5% of all light duty vehicles on the road in Colorado (assumes a 44.2% year-over-year growth in electric vehicle sales). To reach significant GHG reductions in the transportation sector, electric vehicle penetration must increase rapidly.

Potential options for Boulder County to pursue: Bulk Buying Programs, Tax Free Purchasing, Feebates (one-time fee on buyers who purchase higher emission vehicles), and regulations.

- **Plans That Agree:** SEP Plan, NCS Analysis, Boulder County’s Environmental Sustainability Plan, CC4CA, and NREL City Policies
- **Other Cities/Counties with Similar Goals:** All cities and counties reviewed

**Strategy 12: Support Clean Car Policies**

The Corporate Average Fuel Economy, or CAFE standard, is a federal regulation that requires vehicle manufacturers to improve gas mileage and decrease emissions. As the vehicle fleet turns over, more efficient vehicles will replace less efficient ones, and as a result, the carbon intensity of the miles traveled by vehicles will continue to drop. This represents an enormous opportunity for Boulder County to capitalize on these federal regulations. Clean car standards can help ease the per-capita emissions of all drivers. CAFE standards are currently being debated at the national level and could potentially be eliminated. If so, Colorado will need to help with the reductions.

\(^{18}\) For more information see: [https://www.colorado.gov/pacific/energyoffice/atom/14086](https://www.colorado.gov/pacific/energyoffice/atom/14086)
Boulder County could encourage clean car standards for Colorado or the region.

- **Plans That Agree:** SEP Plan, Boulder County’s Environmental Sustainability Plan, Western Resource Advocates
- **Other Cities/Counties with Similar Goals:** City and County of Denver, Sonoma County, CA, Cleveland, OH

**Strategy 13: Expand Public Transit**

A top priority to reduce GHG emissions must include decreasing single-occupant vehicles (SOVs). Developing a countywide rapid public transit network that includes buses, light rail, and first- and last-mile connections will help reduce GHG emissions while increasing quality of life.

Boulder County could include numerous strategies and policies including expanded rapid transit and free/reduced cost eco-passes.

- **Plans That Agree:** SEP Plan, NCS Analysis, Boulder County’s Environmental Sustainability Plan CC4CA, and NREL City Policies
- **Other Cities/Counties with Similar Goals:** All cities and counties reviewed

**Oil and Gas**

Currently natural gas wells currently account for only 1.8% of Boulder County’s emissions but that could quickly rise with the recent end of the moratorium on oil and gas development in Boulder County. For example, in March 2017, Crestone Peak Resources proposed opening up to 216 new wells in Boulder County. This application alone, if permitted, would increase the number of active wells in Boulder County by 73% (in 2016 there were 298). In addition, oil and gas extraction is a large GHG and volatile organic compound (VOC) emitter for the State of Colorado and is expected to increase annually with the increase in drilling and pipelines.

**Strategy 14: Support regional and state efforts to control methane leaks**

In Colorado, the amount of methane leaked from oil and gas sector is expected to rise as more wells are drilled and infrastructure for oil and gas is increased. Oil and gas accounts for less than 2% of Boulder County’s GHG emissions but that number is expected to rise.

Boulder County should support an additional round of methane regulations through PUC or legislator.

- **Plans That Agree:** Western Resource Advocates
- **Other Cities/Counties with Similar Goals:** Longmont
Waste

Strategies 15-19: Waste Reduction and Diversion Rates

Five specific strategies were added to the analysis after conversation with the experts had concluded including:

- Reduce Food Waste: Reduce all food waste through source reduction campaign.
- C&D and Composting Waste to Local Transfer Facility: Develop a construction and demolition (C&D) local processing facility. Divert all C&D waste produced in the county to the facility.
- Promote Zero Waste Education: Educate the residential and commercial sectors on ways to reduce waste using existing infrastructure.
- Strive for Municipal Zero Waste: Reduce waste produced in all municipal buildings.
- Conduct Other Efforts as Needed: Represents remaining emissions that must be reduced through existing efforts that may be hard to quantify and/or new efforts.

These efforts were highlighted by Boulder County as options to help drastically reduce GHG emissions.

Other Carbon Reduction Strategies

Carbon sequestration through forestry, land management, and agricultural practices can play a large role in helping reduce GHG emissions. It should be noted that the GHG protocol currently used by Boulder County (i.e. GPC) does not count carbon sequestration towards overall GHG emissions. However, this may change. In addition, even though carbon sequestration is not counted, it does not mean that is not reducing GHG emissions.

Strategy 20: Pursue Carbon Sequestration

Boulder County could create a carbon sequestration program that encourages or requires carbon sequestration strategies.

- Plans That Agree: NCS Analysis, Boulder County’s Environmental Sustainability Plan, Western Resource Advocates
- Other Cities/Counties with Similar Goals: City and County of Denver, Marin County, CA, Sonoma County, CA, and Miami-Dade County, FL
Strategy 21: Implement Carbon Tax

A carbon tax is a fee imposed on the burning of carbon-based fuels (e.g. coal, oil, and gas). A carbon tax can act as the core policy for reducing GHG emissions, while helping account for the externalities of fossil fuels.

Boulder County could impose a carbon tax to help incentivize a reduction in fossil fuels to help provide funding for the aforementioned strategies.

- Plans That Agree: N/A
- Other Cities/Counties with Similar Goals: Denver, all municipalities in California already effected by cap-and-trade.

Strategy 22: Carbon Intensive Industries Carbon Impact Offset Fund

The creation of an Carbon Intensive Industries Carbon Impact Offset Fund was added to the analysis after conversations with the experts had concluded. The strategy would impose a carbon tax on energy intensive industries including marijuana and oil and gas industries. For example, marijuana growers could be required to offset 100% of electricity consumed by a no-carbon source. Oil and gas industries would be required to achieve a certain level of efficiency and would be taxed on methane released that exceeds the pre-determined level of efficiency.

Note that this effort was highlighted by Boulder County as an option to help drastically reduce GHG emissions after conversations with experts were concluded.
Proposed 2020 Ballot Measures

June 16, 2020

SINGLE USE BAG TAX
Discussion/Direction

• Which retailers should the tax apply to? Options include:
  • All retailers in Louisville
  • Only food stores/other retail
  • Other combination

• What should be the amount charged for the tax? Options include:
  • $0.10 per bag with $0.04 retained by retailer for cost of compliance and $0.06 remitted to the City (similar to Boulder’s fee)
  • $0.20 per bag with $0.10 retained by retailer for cost of compliance and $0.10 remitted to the City
  • Other amount

*Staff recommends that retailers retain their portion of the tax for compliance as a vendor fee rather than remitting the entire tax to the City and receive a refund.

• Should revenue from the tax be used for program administration and other sustainability-related initiatives or be left as unrestricted? Options include:
  • Tax revenue should only be used for program administration and other sustainability-related initiatives
  • Tax revenue should remain unrestricted

• When should the City start collecting the tax? Options include:
  • January 1, 2021
  • January 1, 2022
  • January 1, 2025

CIGARETTES/TOBACCO/VAPING TAX
Discussion/Direction

• **Which tax structure option would the City Council like to pursue?**
  - Option 1 - Local sales tax on tobacco (per pack/per cigarette) + OTP (on all other tobacco products)
  - Option 2 - Local sales tax on tobacco (per pack/per cigarette) + OTP with exemptions
    - If this option is selected, what exemptions are desired?
  - Option 3 - Local sales tax on e-cigarettes/vaping (electronic smoking devices) products only

• **What tax rate would City Council like to apply?**
  - If Option 1 or 2 - $4 and 40%, $3 and 30% or other?
  - If Option 3 – 40%, 30%, other?

• **Would Council like to include a signage requirement for retailers?**
• **Is City Council satisfied with the proposed estimate for the tax revenues?**
• **Does City Council wish to earmark use of tax revenues?**
• **Is City Council satisfied with the proposed use of the revenues?**
• **When should the sales tax go into effect?**

COMMUNITY RENEWABLE ENERGY
Discussion/Direction

- Which type of tax should the City pursue? Options include:
  - None – use existing revenue
  - Sales tax
  - Property tax
  - Climate tax

- Should there be different pricing for residential/commercial/industrial users? Options include:
  - Yes – similar to Boulder's CAP tax, there should be different tax rates for each sector
  - No – all sectors should have the same tax rate

- What should be the maximum amount to be collected by the tax? Options include:
  - $629,600 – the annual amount estimated by Xcel
  - Higher amount – could allow for floating tax based on use by kilowatt hour

- When should the City start collecting the tax? Options include:
  - January 1, 2021
  - January 1, 2022
  - January 1, 2025

- Should there be a sunset date for the new tax? Options include:
  - Yes – January 1, 2030
  - No