

# City of Burlington Climate Action Plan and Cost-Carbon-Benefit Analysis

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## Our presentation will address:

- What is Climate Action Planning?
- Burlington's CAP Update Process
- GHG Inventory Results
- Reduction Target
- Strategies Development
- **Spring Hill's Analysis**
- Strategy Examples
- Next Steps
- Q & A

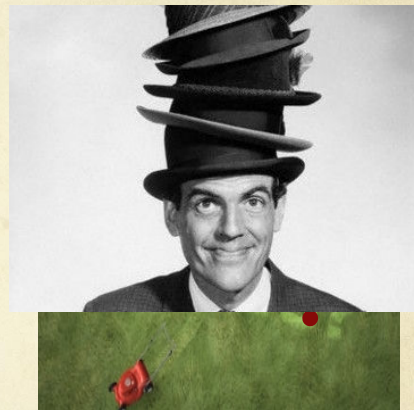
## Burlington, Vermont

- Vermont's largest city (~40,000)
- ~10 square miles with extensive shoreline on Lake Champlain
- Home to state's largest educational institution and ~13,000 students
- Regional center for government, commerce, education and healthcare
- Within 2 hours of Montreal, 4 hours of Boston and 5 hours of New York
- Wealth of historic structures dating back to ~1818.



## What is climate action planning?

- A process for **measuring, planning, reducing, and monitoring** GHG emissions and climatic impacts
- It creates a customized **roadmap and decision support tool** to understand where to get the largest and most cost-effective emissions reductions



<http://www.sustain.ucla.edu/news/article.asp?parentid=3002>

## Burlington's CAP Update Process

- GHG Emissions Inventory Development
- Reduction Target Establishment
- Reduction Strategies Development
- Reduction Strategies Analysis/Quantification
- Final Prioritization/Implementation/Drafting
- Adoption (as Chapter of the MDP)
- Monitoring/Updating

## 2007 GHG Emissions Inventory Results

City Government:

24,224 Equivalent Tons of CO<sup>2</sup>

Community:

432,423 Equivalent Tons of CO<sup>2</sup>



\*\*Prepared using 2009 ICLEI's Clean Air and Climate Protection (CACP) Software

## Burlington's Reduction Targets

### Short-term:

Reduction of 20% below 2007 levels by 2020

\*\*Equals 1.5% annual reduction until 2020

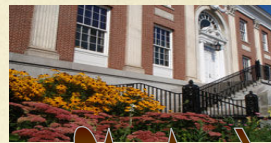
### Long-term:

Reduction of 80% below 2007 levels by 2050

\*\*Equals 2% annual reduction between 2020 and 2050

## Strategy Categories

- Energy Efficiency in Buildings
- Renewable Energy Resources
- City Government Transportation
- Community Transportation
- Waste Reduction and Recycling
- Local Farms, Gardens, and Food Production
- Urban Forestry and Carbon Offsets
- Policy and Education



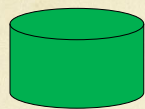
*Over 200 Mitigation Strategies*

## What was the project goal?

To provide a comprehensive set of actionable  
GHG reduction strategies that will:

- (1) form the foundation of Burlington's CAP
- (2) provide the City with a carbon mitigation strategy decision-making framework; and
- (3) better prepare the City to reach its GHG reduction targets.

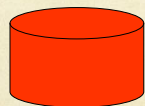
## Phase 1: Strategy Filtering



= suitable for immediate CAP cost  
and GHG analysis

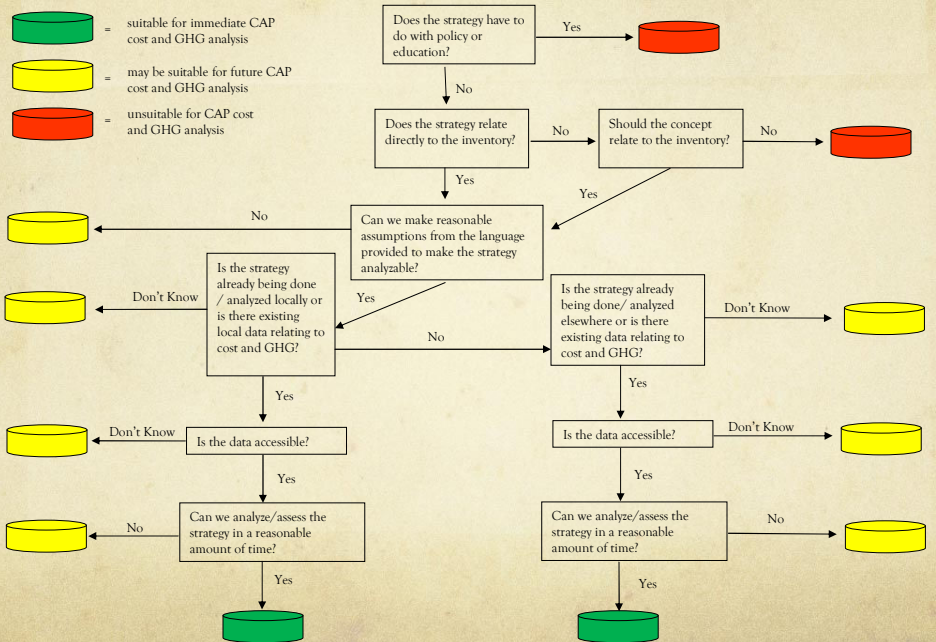


= may be suitable for future CAP  
cost and GHG analysis



= unsuitable for CAP cost and  
GHG analysis

# Burlington CAP Strategy Decision Tree



## Phase 2: Strategy Analysis

### Financial and environmental parameters:

- Initial capital investment (\$)
- Total capital investment (\$)
- Average annual cost/savings (\$)
- Internal rate of return (%)
- Net present value (\$)
- Average annual avoided emissions (tCO<sub>2</sub>e)
- Cost/savings per ton of avoided emissions (\$/tCO<sub>2</sub>e)

# Phase 2: Strategy Analysis

| Discount Rate 9% Timeframe 25 years  |                               |                                 |                               |                                    |                             |                        |   |   |
|--|-------------------------------|---------------------------------|-------------------------------|------------------------------------|-----------------------------|------------------------|---|---|
| Strategy   | Category                      | Initial Capital Investment (\$) | Total Capital Investment (\$) | Average Annual Cost / Savings (\$) | Internal Rate of Return (%) | Net Present Value (\$) | Average Annual Avoided Emissions (tCO <sub>2</sub> e) | Cost / Savings per Ton of Avoided Emissions (\$/tCO <sub>2</sub> e) |
| Implement McNeil district heating project.                                 | Renewable Energy              | (\$4,200,000)                   | (\$23,100,000)                | \$961,272                          | 5%                          | (\$6,873,688)          | 188   | 4,273   |
| Reduce government VMT.   | Government Transportation     | \$0                             | \$0                           | \$681,485                          | Infinite                    | \$5,652,451            | 167   | 4,086   |
| Require new residential construction to be VESH qualified.                 | Energy Efficiency             | (\$1,714)                       | (\$42,857)                    | \$36,924                           | 98%                         | \$207,574              | 30  | 1,223   |
| Implement BED AMI program.   | Energy Efficiency             | (\$3,471,966)                   | (\$3,471,966)                 | \$676,667                          | 15%                         | \$2,211,948            | 466   | 1,154   |
| Require new commercial construction to follow Core Performance guidelines. | Energy Efficiency             | (\$682,000)                     | (\$14,550,000)                | \$1,780,802                        | 22%                         | \$7,460,927            | 1,947   | 903   |
| Implement POWER program.   | Energy Efficiency             | (\$235,175)                     | (\$4,525,000)                 | \$5,173,195                        | 29%                         | \$21,832,538           | 6,161   | 838   |
| Implement "Solar on Schools."  | Renewable Energy              | (\$2,144,000)                   | (\$2,144,000)                 | \$365,427                          | 29%                         | \$2,199,821            | 533   | 525   |
| Implement residential PAYT program.  | Waste Reduction and Recycling | \$0                             | \$0                           | \$466,658                          | Infinite                    | \$4,583,789            | 943   | 495   |
| Reduce community VMT.  | Community Transportation      | \$0                             | \$0                           | \$7,200,583                        | Infinite                    | \$59,723,917           | 15,289  | 471   |
| Implement government vehicle retirement and replacement program.           | Government Transportation     | (\$125,000)                     | (\$625,000)                   | \$531,219                          | 93%                         | \$4,282,645            | 1,177   | 447   |
| Implement government alternative-commuting program.                        | Government Transportation     | \$0                             | \$0                           | \$139,346                          | Infinite                    | \$1,155,776            | 339   | 411   |
| Implement BED "Renewable Energy Resource Rider" program.                   | Renewable Energy              | (\$957,750)                     | (\$4,288,750)                 | \$124,524                          | 3%                          | (\$1,586,927)          | 462   | 195   |
| Replace existing streetlights with LEDs.                                   | Energy Efficiency             | (\$156,750)                     | (\$1,567,500)                 | \$42,475                           | 5%                          | (\$314,437)            | 293   | 124   |
| Implement deep energy efficiency program in government buildings.          | Energy Efficiency             | (\$2,027,221)                   | (\$20,272,208)                | \$78,690                           | 1%                          | (\$9,577,445)          | 513   | (5)   |
| Increase the UTC.  | Urban Forestry                | (\$132,300)                     | (\$3,424,500)                 | (\$284,568)                        | N/A                         | (\$2,466,775)          | 12,087  | (24)  |
| Implement a digester for organic waste.                                    | Renewable Energy              | (\$4,950,000)                   | (\$4,950,000)                 | (\$334,707)                        | N/A                         | (\$8,237,894)          | 5,017   | (106)   |
| Implement residential organics collection program.                         | Waste Reduction and Recycling | (\$855,000)                     | (\$855,000)                   | (\$218,313)                        | N/A                         | (\$3,126,170)          | 1,782   | (142)   |

Annual Savings

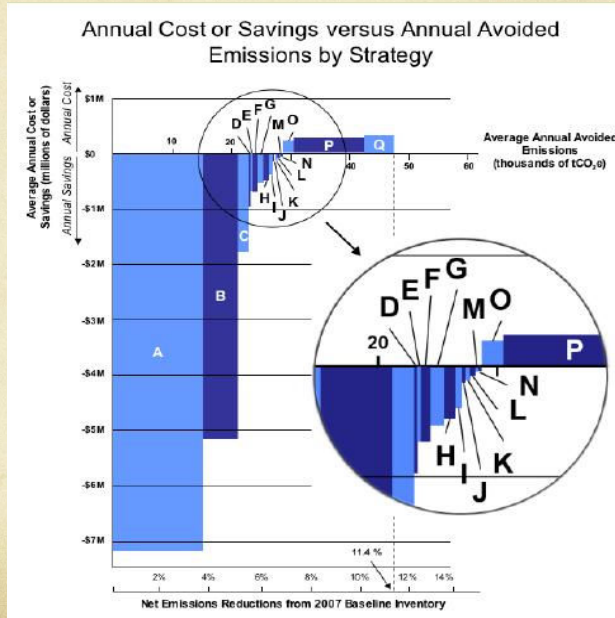
Annual Cost

## Co-Benefits

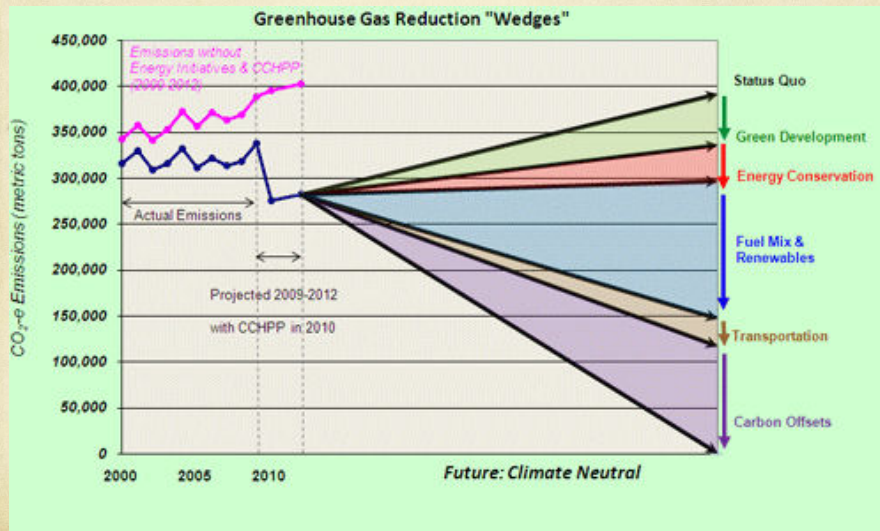
- Improved human health and safety
- Increased local economic activity
- Enhanced public visibility and marketability
- Increased educational opportunities
- Decreased urban heat island effect
- Improved soil retention and water quality



# Phase 3: Strategy Prioritization



# Strategy Planning



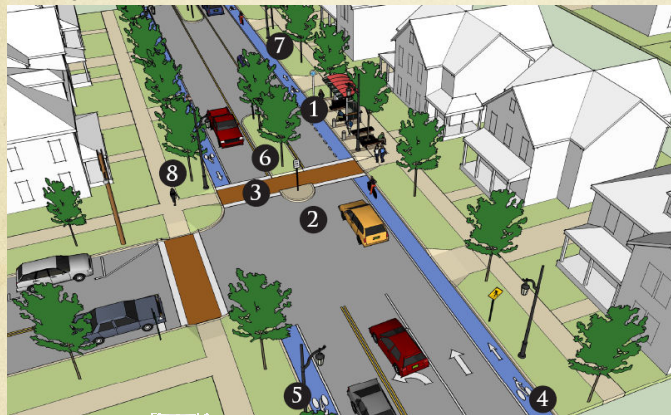
## Reduce Vehicle Miles Traveled

- The City of Burlington's community VMT was over 250 million in 2007 including a variety of private vehicles and fuel types
- Proposed to reduce community VMT by 10% through a combination of non-prescriptive travel substitutions
- Assumed to have no investment costs because most VMT reduction strategies are free or nominal costs and will be offset by the savings from avoided operations and maintenance
- Savings generated are a function of avoided fuel consumption

| Category                 | Initial Capital Investment (\$) | Total Capital Investment (\$) | Average Annual Cost / Savings (\$) | Internal Rate of Return (%) | Net Present Value (\$) | Average Annual Avoided Emissions (tCO <sub>2e</sub> ) | Cost / Savings per Ton of Avoided Emissions (\$/tCO <sub>2e</sub> ) |
|--------------------------|---------------------------------|-------------------------------|------------------------------------|-----------------------------|------------------------|---|---|
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## Reduce Vehicle Miles Traveled

Burlington 2010 Transportation Plan – The Complete Street



## Implement POWER Program

- Property Owners Win with Efficiency and Renewables (POWER) – also know as PACE or CEAD
- Allows property owners to access long-term municipal financing for eligible improvements to their buildings
- Enables property owners to pay for improvements via property taxes over a period up to twenty years; remains with property
- Planned to do 400 projects over ten years, but program is in jeopardy due to FHA and FM/FM objections

| Category          | Initial Capital Investment (\$) | Total Capital Investment (\$) | Average Annual Cost / Savings (\$) | Internal Rate of Return (%) | Net Present Value (\$) | Average Annual Avoided Emissions (tCO <sub>2</sub> e) | Cost / Savings per Ton of Avoided Emissions (\$/tCO <sub>2</sub> e) |
|-------------------|---------------------------------|-------------------------------|------------------------------------|-----------------------------|------------------------|---|---|
| Energy Efficiency | (\$235,175)                     | (\$4,525,000)                 | \$5,173,195                        | 29%                         | \$21,832,538           | 6,161   | 838   |

## Increase the Urban Tree Canopy

- 43% of the City of Burlington's land area, or 2,648 acres, is currently covered by tree canopy
- Proposed to increase the UTC to 50% by planting a total of 588 trees per year and by maintaining the existing UTC; this would be achieved on public and private property
- Avoided emissions would occur as a result of sequestration and net carbon storage; analysis did not consider reductions in energy usage and emissions due to shading or reduced urban heat island effect

| Category       | Initial Capital Investment (\$) | Total Capital Investment (\$) | Average Annual Cost / Savings (\$) | Internal Rate of Return (%) | Net Present Value (\$) | Average Annual Avoided Emissions (tCO <sub>2</sub> e) | Cost / Savings per Ton of Avoided Emissions (\$/tCO <sub>2</sub> e) |
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| Urban Forestry | (\$132,300)                     | (\$3,424,500)                 | (\$284,568)                        | N/A                         | (\$2,468,775)          | 12,087  | (24)  |

## Next Steps

- CAP “Overview” Document
- CAP Website:

[www.burlingtonclimateaction.com](http://www.burlingtonclimateaction.com)

- CAP Implementation
- Monitoring and Update
  - 2010 GHG Emissions Inventory (every 3 years)
- Carbon War Room
- Lockheed Martin



## Thank you and Q & A

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