Town of Concord

Municipal Energy Use Reduction Plan

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Policy Statement

In 2010, the Board of Selectmen adopted a goal for the Town to reduce municipal energy consumption, for Town buildings/facilities and streetlights, by 20% over 2008 levels by July 1, 2015. Understanding that 2015 is not an immediate deadline, this Plan seeks to establish best practices that will help the Town realize incremental goals of 5% reduction in energy consumption per year. The guidelines herein are meant to be easy for Town employees to implement and follow in order to help the Town achieve both its incremental and overall goals. This Plan is intended to accompany Administrative Policy Procedure #59: Energy Management Policy, and should be reviewed and updated as needed each year.

Overall Goals

1. 20% Energy Use Reduction in buildings/facilities and streetlights over 2008 levels by 2015
2. Cost Savings
3. Wise Use of Resources
4. Town is Leader

Four Sustainability Objectives - American Planning Association (APA)

In addition to the goal mentioned above, the Town should consider adopting as policy objectives the four sustainability objectives described within the APA's *Policy Guide on Planning for Sustainability*. When implemented, the four sustainability objectives are designed to help communities take an integrated approach to managing change within their boundaries. They are:

(1) Reduce dependence upon fossil fuels, extracted underground metals and minerals;
[Reduce the use of non-renewable sources of energy in order to help protect ecosystems, wildlife, water supplies, soil, food and human health from toxins and greenhouse gases that are released into the atmosphere and that degrade natural systems.]

(2) Reduce dependence on chemicals and other manufactured substances that can accumulate in Nature;
[Reduce the use of fertilizers, pesticides, herbicides and supplies/materials made with synthetic compounds and chemicals in order to reduce the amount of toxic runoff, off-gasses and harmful byproducts that degrade natural and man-made environments.]

(3) Reduce dependence on activities that harm life-sustaining ecosystems; and
[Promote mixed-use development that reuses existing developed land, reduces auto-dependence and sprawl, minimizes water use and reduces encroachment on life-sustaining ecosystems such as wetlands, floodplains, groundwater supply areas and viable agricultural lands.]

(4) Meet the hierarchy of present and future human needs fairly and efficiently.
[Adhere to the first 3 objectives in a way that equitably protects public health, safety and welfare, incorporates the needs of the disenfranchised, and encourages citizen-based processes with participation by all residents regardless of income status, race, gender or ethnicity.]

Employee Eco-Team

The Town should consider establishing an Employee Eco-Team:

Per Facility: Eco Master (may be the Facility Manager in some cases)

Per Division (where practical): Eco Leader

The Eco Masters should consider meeting quarterly to discuss and coordinate initiatives among their buildings. Each Eco Master should consider meeting with their respective Eco Leaders once per month to disseminate ideas, review progress, discuss problems and gather feedback.

The main responsibility of the Eco Leaders will be to ensure that the employees within their Divisions are adhering to the best practices for Behavior Adaptation listed within each Focus Area below. They will be expected to report back to the Eco Masters each month and to help come up with solutions to any problems that arise. The Eco Masters will be expected to integrate and work closely with the Facility Managers Group. The Employee Eco Team as a whole will be tasked with the implementation of recommendations listed within this document as well as the drafting of any policies relating to energy efficiency, fuel economy and resource management.

Baseline Data & Tracking Software

It is important to understand the Town's current energy consumption before setting forth goals for reduction. In 2009, the Town became a member of ICLEI (Local Governments for Sustainability), an international organization that helps municipalities reduce emissions that cause global warming. Using ICLEI's 2009 Clean Air & Climate Protection (CACP) software, the Town was able to input all of the natural gas, oil, propane, diesel, gasoline and electricity usage data for each Town building & facility, streetlight & traffic signal, wastewater & water delivery facility, and vehicle in order to calculate the Town's carbon footprint for the selected baseline year 2008. In 2010, the Town signed up to use the Department of Energy Resources (DOER) sponsored Mass Energy Insight (MEI) tool, which is specifically geared to track energy use in municipal buildings via a monthly download from National Grid and the Concord Municipal Light Plant.

Though use of MEI may obviate the need for the Town to input municipal data into the CACP software, the strength of the CACP software is that it has a built-in algorithm that converts all of the greenhouse gas emissions from the energy usage inputs into an equivalent tonnage of C02 (CO2e), otherwise known as a carbon footprint. [Another advantage of the CACP software is that it can be used to calculate the carbon footprint for the community (i.e., residential, commercial, industrial sectors); the Town used the CACP software to calculate a community carbon footprint for the baseline year 2008.]

While an understanding of the Town's carbon footprint allows the Town to compare how it stacks up against other ICLEI member communities, it is hardly intuitive for people to speak in terms of equivalent metric tonnes of carbon dioxide (CO2e), especially when determining how to reduce consumption. Therefore the simplified charts within this report show municipal energy consumption in terms of kilowatt hours (kWh), British thermal units (Therms), gallons of oil and propane, *and* tonnes of CO2e.

Though the ICLEI CACP software is currently managed by the Department of Planning and Land Management, the tracking of data in MEI is being handled by the Town's Energy Conservation Coordinator at the Light Plant. The primary functionality of MEI is to track energy use in municipal facilities, and there are a number of ways to view and report the data, i.e. comparing flat energy use of

buildings of similar sizes or within departments, comparing relative efficiencies of buildings based on usage per square foot, etc.

The IT Department is also considering establishing a system of its own, rather than using MEI, for tracking Concord's municipal energy use. A proprietary system would eliminate data privacy issues, allow for real-time tracking by interfacing with the Smart Grid, and be managed and maintained on-site.

Data Indicators, Considerations & Reporting Methods

When making cross-year comparisons regarding energy consumption, it is important to understand and account for the various indicators at play that will almost inevitably affect the data. Indicators such as weather patterns, building occupancy, square footage, new buildings/additions, updated code requirements, and hours of operation all have a role in determining how much energy is used to heat and cool Town buildings and facilities. Another consideration is that there are two basic types of Town buildings: those that mainly serve staff and are not heavily used by the public (office buildings), and those that exist for public use (libraries, recreation facilities, etc.), and each drives the hours of operation of the building. Moreover, buildings with a lot of garage space or multiple staffing shifts will skew the data on occupancy and number of people per square foot.

The electricity consumed by streetlights is a factor of the number of miles of road in Town, the interval placement of the streetlights and the hours that they run. Energy used to operate water and wastewater pumps and infrastructure depends on the Town's water consumption and treatment methods. Electric power needs will probably rise as temperatures get hotter, more people own electric vehicles, and buildings switch to electric thermal storage heating systems. Gasoline and diesel fuel used by Town vehicles will increase as long as the Town continues to have more miles of public road to plow, salt/sand and repair, and more acres of Town-owned land to maintain. In sum, data comparisons become much more challenging as the data is scrutinized, and the need for a method of normalization becomes paramount.

At this time, the understanding is that both MEI and the ICLEI CACP 2009 software can account for, at a minimum, the hours of operation, occupancy and square footage of a facility; however, these indicators are simply used for reporting, not for data normalization. Furthermore, weather factors such as precipitation, degree days or humidity are not accounted for at all.

In light of the abovementioned indicators and considerations, the following reporting method is proposed:

Building Efficiency = Energy Use per Square Foot

Each Eco Master (or facility manager as the case may be) will be responsible for reducing the kWh and BTU use per square foot for his/her building 20% over 2008 levels by 2015. This will have the following advantages:

1. The focus will be on an efficiency rate, not on total kWh and BTU use, so the addition of conditioned space to a building will not negatively impact the Eco Master of the building.
2. This will help to level the playing field by allowing the Eco Masters to compete to reduce kWh and BTU use per square foot – again, a rate not a total.
3. Eco Masters will ultimately be competing against themselves and will be striving to reduce the rate of energy consumption in his/her own building.

Weather Normalization = Degree Days

A *degree day* is a measure of heating or cooling for which the daily difference between mean temperature and base temperature is calculated. The base temperature is typically set at 65 degrees; the daily differences are typically aggregated for a month or a year. The tables below show the degree days for both heating and cooling for the years 2008, 2009 and 2010. In sum, the degree days for heating/cooling for a particular year is the sum of the number of degrees of heating/cooling needed each day during the year to get to the base temperature.

As the carbon footprint baseline year is 2008, the degree day data for 2008 will be the normalizing control for which all other years will be relative. Aligning the degree day data with the quarterly reporting timeframe, described below, will further normalize the data.

Quarterly Reporting

The Employee Eco Team will be responsible for quarterly reporting, per the fiscal year quarters, of building energy efficiency and progress to the Town Manager, Board of Selectmen, Senior Management Team, Facility Managers and Comprehensive Sustainable Energy Committee. The Eco Masters and Eco Leaders will have access to MEI and will be able to view the kWh and BTU use per square foot for their individual buildings. As there is a 30-60 day lag in the gas and electric data upload to MEI, the reporting schedule will be shifted accordingly from the fiscal quarters. The Employee Eco Team will determine an appropriate format (i.e., charts, text, etc.) for the quarterly reports.

Municipal & School Carbon Footprint Calculations

The four tables below represent summaries of the municipal and school carbon footprint calculations for calendar years 2008, 2009 and 2010. For the full data, see Appendices A and B.

Municipal Energy Use (CY2008)						
Sector	Elec (kWh)	Nat Gas (Therms)	Oil (Gals)	Propane (Gals)	Total Cost ($)	CO2e (tonnes)
Buildings & Facilities	3,224,487	138,014	3,201	602	$554,616	1,990
Streetlights & Traffic Signals	718,105	0	0	0	$68,268	272
Water Delivery Facilities	1,502,905	3,772	0	2,140	$166,271	601
Wastewater Facilities	981,580	700	8,311	0	$142,554	460
Electric Power	220,886	0	0	0	$33,133	84
Vehicle Fleet	See Below				$325,974	877
Solid Waste - Fitchburg Landfill	landfill methane capture reduces tonnes CO2e per tons trash					-25
Totals	6,647,963	142,486	11,512	2,742	$1,290,816	4,259
Heating Degree Days (base 65): 6,277 / Cooling Degree Days (base 65): 552						

Municipal Energy Use (CY2009)						
Sector	Elec (kWh)	Nat Gas (Therms)	Oil (Gals)	Propane (Gals)	Total Cost ($)	CO2e (tonnes)
Buildings & Facilities	3,065,713	132,227	1,853	628	no data	1,886
Streetlights & Traffic Signals	658,468	0	0	0	no data	249
Water Delivery Facilities	1,521,182	5,156	0	2,176	no data	616
Wastewater Facilities	1,006,091	815	8,250	0	no data	469
Electric Power	234,515	0	0	0	no data	89
Vehicle Fleet	See Below				no data	944
Solid Waste - Fitchburg Landfill	landfill methane capture reduces tonnes CO2e per tons trash					-25
Totals	6,485,969	138,198	10,103	2,804	no data	4,228
Heating Degree Days (base 65): 6,456 / Cooling Degree Days (base 65): 445						

Municipal Energy Use (CY2010)						
Sector	Elec (kWh)	Nat Gas (Therms)	Oil (Gals)	Propane (Gals)	Total Cost ($)	CO2e (tonnes)
Buildings & Facilities	3,129,737	119,122	1,181	240	no data	1,833
Streetlights & Traffic Signals	518,413	0	0	0	no data	196
Water Delivery Facilities	1,705,904	5,699	0	2,822	no data	692
Wastewater Facilities	1,054,876	539	4,500	0	no data	448
Electric Power	219,180	0	0	0	no data	83
Vehicle Fleet	See Below				no data	976
Solid Waste - Fitchburg Landfill	landfill methane capture reduces tonnes CO2e per tons trash					-25
Totals	6,628,110	125,360	5,681	3,062	no data	4,203
Heating Degree Days (base 65): 5,884 / Cooling Degree Days (base 65): 856						

The School data are included for informational purposes only; all prescriptive policies and guidelines set forth within this Plan are intended solely for municipal government operations.

School Energy Use						
Sector	Elec (kWh)	Nat Gas (Therms)	Oil (Gals)	Propane (Gals)	Total Cost ($)	CO2e (tonnes)
2008						
Buildings & Facilities	5,699,969	414,273	0	0	$856,780	4,361
Water Delivery Facilities	2,744	0	0	0	$666	1
Vehicle Fleet					$66,639	170
Solid Waste - Fitchburg Landfill	landfill methane capture reduces tonnes CO2e per tons trash					-42
Totals	5,702,713	414,273	0	0	$924,085	4,490
2009						
Buildings & Facilities	5,962,083	450,776	0	0	no data	4,654
Water Delivery Facilities	3,064	0	0	0	no data	1
Vehicle Fleet					no data	177
Solid Waste - Fitchburg Landfill	landfill methane capture reduces tonnes CO2e per tons trash					-43
Totals	5,965,147	450,776	0	0	no data	4,789
2010						
Buildings & Facilities	6,071,791	410,095	0	0	no data	4,477
Water Delivery Facilities	6,254	0	0	0	no data	3
Vehicle Fleet					no data	179
Solid Waste - Fitchburg Landfill	landfill methane capture reduces tonnes CO2e per tons trash					-43
Totals	6,078,045	410,095	0	0	no data	4,616

Data Disclaimers:

1. *No data for School diesel use was provided for 2009 or 2010, so the diesel data from 2008 was used for 2009 and 2010.*
2. *No cost data was provided for 2009 or 2010. MEI does not include it.*
3. *The CACP calculation for tonnes of CO2e for solid waste seems counterintuitive. Basically, if the landfill you send your trash to captures methane, then the more trash you send there the more tonnes of CO2e you can subtract from your total carbon footprint. However, it would probably be better to reduce the amount of trash going to the landfill altogether.*

The Municipal Energy Goal – Buildings/Facilities & Streetlights

Goal: 20% Energy Use Reduction in buildings/facilities and streetlights over 2008 levels by 2015

This goal includes the following buildings/facilities: CMLP HQ, 141 Keyes, 133 Keyes offices, 133 Keyes salt shed, 135 Keyes offices, 135 Keyes garage, Harvey Wheeler Community Center, Town House, Town House chillers, 24 Court Lane, Information Center, Gun House, The Knoll, Compost Facility, Police/Fire HQ, Police/Fire HQ garage, West Concord Fire, Hunt Recreation, 105 Everett, Beede Center, Main Library, Fowler Branch Library, Thoreau Street Tennis Courts, Hunt Playground & Rideout Playground.

The Emerson Umbrella and FOPAC buildings are not included; they are Town-owned but leased and managed by other entities.

The four tables below represent summaries of the municipal building/facility and streetlight carbon footprint calculations for calendar years 2008, 2009 and 2010. For the full data, see Appendices A and B.

Municipal Building/Facility & Streetlight Energy Use (CY2008)						
Sector	Elec (kWh)	Nat Gas (Therms)	Oil (Gals)	Propane (Gals)	Total Cost ($)	CO2e (tonnes)
Buildings & Facilities	3,224,487	138,014	3,201	602	$554,616	1,990
Streetlights	657,598	0	0	0	$58,384	249
Totals	3,882,085	138,014	3,201	602	$613,000	2,239
Heating Degree Days (base 65): 6,277 / Cooling Degree Days (base 65): 552						

Municipal Building/Facility & Streetlight Energy Use (CY2009)						
Sector	Elec (kWh)	Nat Gas (Therms)	Oil (Gals)	Propane (Gals)	Total Cost ($)	CO2e (tonnes)
Buildings & Facilities	3,065,713	132,227	1,853	628	no data	1,886
Streetlights	601,644	0	0	0	no data	228
Totals	3,667,357	132,227	1,853	628	no data	2,114
Heating Degree Days (base 65): 6,456 / Cooling Degree Days (base 65): 445						

Municipal Building/Facility & Streetlight Energy Use (CY2010)						
Sector	Elec (kWh)	Nat Gas (Therms)	Oil (Gals)	Propane (Gals)	Total Cost ($)	CO2e (tonnes)
Buildings & Facilities	3,129,737	119,122	1,181	240	no data	1,833
Streetlights	467,146	0	0	0	no data	177
Totals	3,596,883	119,122	1,181	240	no data	2,010
Heating Degree Days (base 65): 5,884 / Cooling Degree Days (base 65): 856						

Incremental Goals

The following table is based strictly on a 5% reduction in 2008 levels per year until July 1, 2015 when the overall goal of 20% reduction in 2008 levels is achieved for Town buildings/facilities and streetlights. This table is meant as a guide; it is unlikely that each factor of the municipal carbon footprint will be reduced by an even 5% per year.

[Please note: The CACP software requires that the carbon baseline be derived from Calendar Year data. Therefore, the 2008 Calendar Year was used to establish our baseline carbon footprint. However, as Town operations and budgets are based on the Fiscal Year (July 1 through June 30), the incremental goals set forth in this Plan are based on a Fiscal Year schedule.]

Municipal Energy Use Reduction Goals (By Fiscal Year)						
Year	Elec (kWh)	Nat Gas (Therms)	Oil (Gals)	Propane (Gals)	Total Cost ($)	CO2e (tonnes)
Baseline: 2008	*3,882,085*	*138,014*	*3,201*	*602*	*$613,000*	*2,239*
CY2009 Actual	*3,667,357*	*132,227*	*1,853*	*628*	*no data*	*2,114*
CY2010 Actual	*3,596,883*	*119,122*	*1,181*	*240*	*no data*	*2,010*
Incremental Goals:						
Reduction Increment:	~194,104/yr	~6,901/yr	160/yr	30/yr	$30,650/yr	112/yr
2011-2012 (5% < 2008)	3,687,981	131,113	3,041	572	$582,350	2,127
2012-2013 (10% < 2008)	3,493,877	124,212	2,881	542	$551,700	2,015
2013-2014 (15% < 2008)	3,299,773	117,311	2,721	512	$521,050	1,903
2014-2015 (20% < 2008)	3,105,668	110,411	2,561	482	$490,400	1,791
Overall Goal (20% < 2008)	*3,105,668*	*110,411*	*2,561*	*482*	*$490,400*	*1,791*

How Are We Doing?

As shown in the table above, the *CY2010 Actual* CO2e of 2,010 tonnes positions the Town ahead of the incremental goal of 2,015 tonnes CO2e for the 2012-2013 time period (FY2013). However, as expected, not every energy source is being reduced at the same pace. While the gallons of oil and propane used have already met (exceeded) the reduction target for July 1, 2015, natural gas and electric use are only at the July 1, 2013 and July 1, 2012 targets, respectively. Still, it is important to note that the Town is on pace to meet, and perhaps surpass, its goal for buildings/facilities and streetlights.

Getting a Greener Focus

Though there are many ways that the Town can begin to reduce its energy use consumption, starting too many new initiatives in the first year may be overwhelming and counterproductive. As the incremental goals outlined above for buildings/facilities and streetlights appear to be within reach, the Town may also want to work on improving energy efficiency in other areas in the upcoming years. Energy savings will be more easily achieved if a particular area of focus is chosen for each year. The following areas of focus are recommended:

Focus 2011 – 2012: Municipal Building/Facility Energy Use Reduction

Focus 2012 – 2013: Outdoor Lighting & Municipal Solid Waste Reduction

→Assess progress, evaluate latest trends in energy reduction, and adjust goals where appropriate.

Focus 2013 – 2014: Municipal Vehicle Energy Use Reduction

Focus 2014 – 2015: Renewables – Landfill Gas, Hydropower, Wind, Solar, Thermal Energy Storage, Biomass, Cogeneration & Geothermal

[It should be noted that these Focus Areas are simply a guideline to outline how the Town will reduce its overall energy use; many of the initiatives and recommendations in each Focus Area are already underway, and certainly are not meant to be put on hold until the designated year in this Policy. Likewise, initiatives and recommendations in the 1st year are meant to be continued into the 2nd year and so forth, whenever practical and sensible.]

Focus 2011 – 2012: Municipal Building/Facility Energy Use Reduction

Goal: Help to reduce municipal energy use by 20% over 2008 levels.

A. Weatherization

In 2010 the Town began a phased Weatherization Design/Construction review of its buildings, funded through the Sawyer Trust. The purpose of the initiative is to analyze the deficiencies of and evaluate strategies for improving the performance of Town building envelopes. Infrared analyses and design reports have been prepared for the Town House, West Concord Fire Station, 133, 135 and 141 Keyes Road and the Hunt Recreation Center. Construction was completed in spring 2011 at the Town House and West Concord Fire Station, and is slated to begin in the early fall 2011 at 141 Keyes Road and Hunt.

Prior to this phased effort, the Sawyer Trust funded insulation and air sealing work at the Emerson Umbrella, FOPAC and the new Assessor's office at 24 Court Lane.

In addition, a number of windows and doors have been added at the following facilities:
Town House – storm windows / insulated fiberglass door & insulated window (1st Floor)
FOPAC – Marvin double-hung windows
24 Court Lane – Marvin double-hung windows
Public Safety Building – Marvin double-hung windows
141 Keyes Road – energy-efficient door

B. Lighting Upgrades

In 2010 the Town began phased lighting upgrades at its buildings, funded through the Sawyer Trust. The purpose of this initiative is to identify opportunities for upgrades (lighting fixtures, lights, controls, etc.) and to obtain quotes from manufacturers for the material and from contractors for the labor. To date, interior lighting has been upgraded at the Town House and West Concord Fire Station. Exterior lighting has been upgraded at the Public Safety Building and 133 and 135 Keyes Road. Proposals for lighting upgrades at the Beede Center (interior) and Harvey Wheeler Community Center (exterior) are in process. The lighting upgrades mainly entail moving from metal halide fixtures to high-output T8 or LED fixtures.

In addition to this phased effort, the Sawyer Trust has also funded lighting upgrades in the Hunt Gymnasium and Emerson Umbrella, and LED lights at 24 Court Lane.

C. HVAC Systems

Based on recommendations within the 2009 Town Energy Audit report and with funding from the Sawyer Trust, the Town has begun to evaluate and replace components of the HVAC systems in many of its buildings. To date, complete new HVAC systems have been installed at 135 Keyes Road and 24 Court Lane and a proposal for the design and commissioning of a new HVAC System at the Hunt Recreation facility is underway. In addition, high-efficiency boilers have been installed at the West Concord Fire Station, Public Safety, and FOPAC buildings. In addition, the Town is currently looking into the possibility of replacing the hot water and boiler pumps at the Beede Center with new energy efficient models.

D. Behavioral Adaptation – *Lights, Equipment, Supplies, Season (LESS)*

L*ights*

a) Turn off whenever leaving a room (any room)
b) Check all spaces before leaving at night
c) Adjust according to amount of natural light available

E*quipment*

a) Power down equipment
b) Turn off power strips and/or unplug devices at night
c) Allow remote turn-on/turn-off for system upgrades at night (work with IT department on this)
d) Device Reduction – assess devices versus staff needs (we may have too many)

S*upplies*

a) Set printer default to duplex
b) Send documents electronically whenever possible
c) Reuse envelopes, scrap paper, etc.
d) Recycle all paper, cardboard, cans, bottles, containers, plastics, toner/printer cartridges, batteries/cell phones, etc.

S*eason*

a) Limit use of heat/ac in "shoulder" seasons
b) Close/open blinds and/or windows
c) In summer months, set AC between 74-76 degrees
d) In summer months, indoor humidity should be tolerated up to 60%
e) In winter months, set thermostats between 65-68 degrees when the building is occupied. Set thermostats between 55-58 degrees when the building is not occupied.
f) In all months, set thermostats at lower temperatures for evenings/weekends
g) Dress appropriately (i.e., keep sweater in office)
h) Do not use space heaters in the summer

E. Purchasing Policies – Eco Purchasing Policy, Energy Star Purchasing Policy

Eco Purchasing Policy – the Town should continue to purchase green cleaning and office products whenever possible. The Employee Energy Team should consider drafting an Eco Purchasing Policy to guide the purchasing of environmentally preferable products in all Town buildings. Such a policy would include office supplies, cleaning supplies and kitchen supplies at a minimum. Coordinating this effort may also help the Town achieve economies of scale and bulk shipping cost savings. [This effort has already been started in some Town buildings.]

Energy Star Purchasing Policy – the Employee Energy Team should consider drafting an Energy Star Purchasing Policy that mandates that all new equipment purchased meet federal Energy Star or equivalent standards. Such a policy would also provide a list of reputable and/or state contracted companies to help employees select suppliers. As the Town replaces old equipment, the purchase of replacement Energy Star equipment will help reduce the electrical load in Town buildings. [Example Policy: The City of Cambridge, 2005]

F. Other Initiatives – Stretch Code, Smart Grid, Peak Demand Reduction, Smart Power Strips

Stretch Code – In 2010 the Town adopted the Board of Building Regulations & Standards Stretch Energy Code, which increases the building energy performance by 20% over the State Building Code for all new construction and requires performance testing for all new home construction.

Smart Grid – In 2009 the Town voted to build a Smart Grid System to provide the technology to manage electric power resources. The Smart Grid provides two key benefits: (1) A feedback mechanism to users on their power consumption, and (2) A controlled approach to reducing peak loads, allowing the Town to better anticipate and manage demand and to avoid additional charges for peak power. [Town buildings will be hooked up to the Smart Grid in the first phase and will be a leader as the Smart Grid network is rolled out.]

Peak Demand Reduction – since the summer of 2008/2009, the CMLP has targeted peak demand reduction by notifying ratepayers in advance of when the predicted peak load will occur. In New England, the peak typically occurs during the summer months (due to air conditioning) and is used as a reflection of the maximum power consumption level for the year. In order to avoid partial shutdowns or blackouts, New England must have sufficient capacity to support the peak, regardless of the demand levels throughout the rest of the year. To help reduce the peak load demand, Town employees are asked to turn lights off, turn AC up, and hold off on resource-hog activities during certain hours of the peak days.

Smart Power Strips – Smart Strips are power strips with advanced circuitry that allows them to sense when devices are not in use and shut them off. For example, if a user shuts off a computer, the Smart Strip will automatically shut off the computer's peripheral devices (printer, scanner, fax machine, etc.). Deploying Smart Strips in key locations throughout Town could help reduce overall energy consumption as well as idle current (which flows to peripheral devices even when they are not in use) and electrical costs. The Smart Strip itself uses less than one watt of energy to operate.

Focus 2012 – 2013: Outdoor Lighting & Municipal Solid Waste Reduction

Goal: Help to reduce municipal energy use by 20% over 2008 levels.

A. Outdoor Lighting, Streetlights & Traffic Signals

Outdoor Lighting – the Town adopted a Municipal Outdoor Lighting Policy and Guidelines (APP #38) document in 1983 and revised it in 1995 and 2001. The policy currently states:

> *"The Town of Concord provides municipal outdoor illumination for public safety and convenience, security of buildings, and to display the beauty of town buildings and public spaces at night. The Town of Concord's general policy is to provide the minimum amount of light necessary to accomplish these purposes in a uniform and equitable manner across town, consistent with the goals of energy efficiency, cost effectiveness, and aesthetic appropriateness."*

This policy highlights the Town's continued efforts to balance electrical consumption and safety.

In addition, the Concord Zoning Bylaw has a section on lighting:

> 7.7.3.10 Lighting: *Exterior lighting shall be designed for safety and for personal security. Glare and light spillover, as defined below, shall be controlled to protect inhabitants from the consequences of stray light shining into inhabitant's eyes or onto adjoining properties. Light pollution, as defined below, control shall be required to minimize the negative effect of misdirected upward light. All exterior lighting shall be aimed, located, designed, fitted and maintained so that it illuminates the task intended and does not shine directly onto neighboring properties, roadways or distribute excessive light skyward.*
>
> (a) Glare *shall mean the sensation produced by luminance within the visual field that is sufficiently greater than the luminance to which the eyes are adapted so as to cause annoyance, discomfort or loss in visual performance and visibility. The magnitude of the sensation of glare depends upon factors such as the size, position and luminance of the source, the number of sources, and the luminance to which the eyes are adapted.*
>
> (b) Light spillover *shall mean illumination produced by a light fixture, which extends beyond the boundaries of the lot or parcel upon which the light fixture is located.*
>
> (c) Light pollution *shall mean illumination which extends beyond an object, structure or area, which the light fixture is designed to serve, so as to produce glare, or otherwise interfere with viewing of natural vistas such as the night sky.*

All exterior lighting in Concord is required to be full cut-off and dark-sky friendly.

Streetlights & Traffic Signals – As of the 2008 baseline, streetlights and traffic signals accounted for 11% of the Town's electrical usage, 5% of the Town's energy costs, and 6% of the municipal carbon footprint. In 2010 the Town decided to remove 521 of its 1,350 street lights in order to reduce the Town's operating expenses, promote energy conservation and implement a more equitable distribution of street lights throughout the community. The vast majority of the streetlights that were removed were mercury vapor, which is a very old and energy consumptive style. [The CSEC estimated that the removal of these streetlights will account for almost 20% (one fifth) of the Town's entire 20% municipal energy use reduction goal.]

In early 2011 the Town Manager drafted an *Interim Street Lighting Policy*, based on the lower allocation of funding for street lighting noted above. It states that Town policy is to provide street lighting only at the intersections of public streets, in the commercial centers (Concord Center, Thoreau Depot, and West Concord Center) at 150-foot intervals, in the Village Districts within

Concord Center and West Concord Center at 200 to 400-foot intervals, at frequently-used pedestrian crosswalks, at significant curves in the roadway, at railroad crossings, and at areas deemed necessary by the Police Department. This interim policy is to remain effective until such time that the Board of Selectmen adopts a new policy.

In April 2011, Town Meeting voted to restore 500 of the 521 lights that were removed. While this has potential to be a step backward in terms of the Town's energy reduction goals, the Concord Municipal Light Plant (CMLP) is considering installing timing modules with automatic on/off settings on each of the 500 streetlights, which could result in an overall reduction in net energy use.

B. Municipal Solid Waste Reduction, Recycling & Composting

Municipal Solid Waste Reduction – Though about 50% of the Town, including residents and small businesses, subscribes to the Municipal Solid Waste Program, the recommendations in this Policy are meant to pertain, at least for now, only to Town government operations and employees.

According to FY 2008 records, there were 26 municipal buildings including the public schools; 17 used dumpsters and the others put barrels on the curb. All but 3 buildings (Deaconess, Wastewater Treatment Plant, and Compost Site) had 96-gallon recycling toters – some for paper, some for commingled glass, metal and plastic. There were 11 cardboard-only containers throughout Town. Trash and recycling were picked up on average once per week for each building; an average of 2.58 recycling toters were picked up per week at each building.

In FY 2008, municipal facilities produced 214.24 tons of trash and the public schools produced 363.7 tons of trash, for a total of 577.94 tons. In FY 2009, municipal facilities produced 214.24 tons of trash and the public schools produced 364.6 tons of trash, for a total of 578.84 tons. Each year, Concord sent 75% of its trash to the Fitchburg Landfill in Westminster (433.46 tons in FY 2008, 434.13 tons in FY 2009), and 25% of its trash to the Wheelabrator Incinerator in Millbury (144.48 tons in FY 2008, 144.71 tons in FY 2009).

While these municipal numbers only represent about 5% of the Town's overall yearly trash tonnage, Town employees should consider continuing to reduce their waste as much as possible in order to divert a larger percentage of trash from the Fitchburg Landfill and the Millbury Incinerator.

[As a side note, most employees probably do not know where their trash goes and what happens to it. Waste Management Renewable Energy (WMRE) has been operating a landfill methane gas facility at the Fitchburg Landfill since 2007. WMRE has exclusive rights to the landfill gas, which they anticipate will equate to more than 20 years of fuel. Here is how it works: a series of wells connected by a piping system are drilled into the landfill for the collection and transport of methane gas to a nearby compression facility. The gas is then de-watered, filtered and pressurized, and transported to the Fitchburg Power Station where it is used to power engines to generate renewable electricity for sale and delivery to Unitil (formerly the Fitchburg Gas & Electric Company). The Millbury Incinerator also operates a waste-to-gas program, though they recently were cited by the DEP for improper reporting of hazardous materials and for dumping wastewater into wetlands.]

Recycling – As implied above, there may not be many ways to improve upon the Municipal Solid Waste Program from a government operation and employee waste reduction standpoint (as all municipal facilities participate in the program and every employee has a recycle bin); however, it is likely that Town staff can continue to do better in terms of recycling. In order to divert as much

employee-generated trash as possible from the solid waste stream, it is important that employees fully understand and take advantage of the Town's trash and recycling programs.

Composting – Composting poses a challenge of its own. Though the Town has a composting facility for yard waste, there is currently no facility or program for food waste. The EPA estimates that almost 13% of total municipal solid waste generation by material comes from food scraps; when trapped in a landfill, decomposing food scraps release methane gas, which is 20 times worse than carbon dioxide, into the atmosphere. While residents can purchase composters or build them in their backyards, these options are not available at most Town buildings for employee use at this time. Moreover, a Town-sponsored composting facility for food waste would likely attract animals and require additional staffing. However, some trash companies, including Waste Management, offer contracts for curbside pickup of food compost that the Town could pursue.

Focus 2013 – 2014: Municipal Vehicle Energy Use Reduction

Goal: Increase average unleaded fleet fuel efficiency from 17.7* mpg to 22 mpg by July 1, 2015

*[The average fleet fuel efficiency for all Town-owned unleaded vehicles was calculated from the Auto Fleet Schedule for the Town of Concord dated May 2009, with the following conservative assumptions about the vehicles: (1) all vehicles have 6 or 8 cylinders, (2) all vehicles are automatic, (3) all vehicles have 4 wheel drive, and (4) all vehicles were bought new.]

The table below shows the municipal vehicle inventory for 2008, the baseline year. In 2008, the Town owned, operated and maintained a total of 247 vehicles, 208 with engines using either unleaded or diesel fuel. Though the Town only owned 4 hybrid vehicles at that time, the Town has purchased many more since and has made it a priority, though not yet a policy, to purchase fuel efficient vehicles whenever practicable.

Municipal Vehicle Inventory
(vehicle list: May 2009 / fuel use data: CY2008)

Department	Light Trucks	Buses / Heavy Trucks	Off-Road (Unleaded)	Off-Road (Diesel)	Passenger Cars	Hybrids	Motor-cycles	Trailers (No Engine)	Unleaded (gals)	Unleaded Cost ($)	Diesel (gals)	Diesel Cost ($)
Building	2								455	$1,422		
Concord Public Works												
Administration	17	15	3	8	1			7	4,885	$13,897	6,254	$23,604
Highway & Snow	2	2		4	1			2	4,888	$15,883	10,475	$45,482
Grounds / Park & Tree		2	1					2	4,342	$17,428	2,518	$8,071
Water & Sewer	10	2	3		1	1		5	8,902	$27,747	218	$8,825
CMLP	10	9	2	1		3		10	6,194	$19,414	5,166	$20,575
COA / Veterans	3								2,743	$8,430		
Fire	5	8			2			8	2,560	$7,972	7,280	$29,888
Health					2				193	$552		
Library	1								152	$472		
NRC	4								653	$1,858		
Police	4	1			10	1	2	3	23,009	$71,675	20	$70
Town	1								894	$2,709		
Totals	59	39	9	13	17	5	2	37	59,870	$189,459	31,931	$136,515
							CO2e (tonnes):			*532*		*345*
Schools	22	38		2	2			2	7,237	$21,847	10,465	$44,792
							CO2e (tonnes):			*64*		*106*

(The Town anticipates adding electric vehicles to its fleet in 2011)

A. Fuel Efficient Vehicle Policy

While in recent years the Town has made an effort to purchase fuel efficient vehicles whenever possible, the Town should consider adopting a Fuel Efficient Vehicle Policy for all new additions to the Town fleet. Adoption of a Fuel Efficient Vehicle Policy is not only in line with the criteria of the Green Communities Program, but it may also help the Town increase its average fleet fuel efficiency, reduce overall greenhouse gas emissions, acquire the most appropriate vehicles and equipment, improve driver satisfaction and reduce operating costs.

[A model policy is available through the Green Communities Program website.]

A Fuel Efficient Vehicle Policy shall consider the following:

a) 2009 EPA data - combined city & highway MPG shall be no less than:
    a. 2 wheel drive car: 29 MPG
    b. 4 wheel drive car: 24 MPG
    c. 2 wheel drive small pick-up truck: 20 MPG
    d. 4 wheel drive small pick-up truck: 18 MPG
    e. 2 wheel drive standard pick-up truck: 17 MPG
    f. 4 wheel drive standard pick-up truck: 16 MPG
b) Elimination of older, less efficient or unnecessary vehicles from the fleet
c) Reduction in vehicle size when possible - will increase fuel economy
d) Reduction in vehicle miles traveled (VMT) to the extent operationally feasible
e) Reduction in greenhouse gas emissions and other forms of air pollution
f) Incorporation of alternative fuel vehicles into the fleet or retrofitting of heavy diesel equipment to use biofuels whenever possible
g) Incorporation of 2-passenger vehicles and Segways into the fleet
h) Incorporation of Plug-In Electric vehicles into the fleet (they can be integrated into the Town's Smart Grid and energy storage systems and have a range of 60 miles per day)
i) Assessment of Police Department needs and the potential to reduce the number of vehicles capable of housing detainees and increase the number of 2-passenger vehicles
j) Limitation on purchasing single-use vehicles
k) Reduction in overall number of vehicles, if possible
l) Reduction in operational and maintenance costs of the fleet
m) Driver awareness and training

B. Behavioral Adaptation – *Reduce, Alternatives, Carpool, Engine (RACE)*

R*educe*

a) Vehicle Miles Traveled – map out your route to reduce VMT
b) Make sure you know how to get where you are going before you get in the car!
c) Coordinate and combine trips with coworkers whenever possible
d) Ask yourself - Is the trip necessary and is driving the best way to get there?

A*lternatives*

a) Walk to meetings, appointments, lunch, etc.
b) Bike – a number of Town facilities have bike racks on-site or nearby (Town House, CPW/DPLM, CMLP, Public Safety Building, West Concord Fire Station, Beede, Hunt Recreation, all Schools including Ripley]
c) Technology - take advantage of phone/video conferencing, emailing, Skype, device-to-device conferencing and other new technologies that allow for remote participation [The Town will need to establish policies regarding use of some of the above-mentioned technologies.]

C*arpool*

a) Carpool to meetings, appointments, lunch – even to/from work if possible
b) Coordinate and combine trips with coworkers whenever possible

E*ngine*

a) Turn off the engine upon stopping at a destination – idling wastes fuel and money, can cause respiratory illness and damage the engine, and is against the law.
b) Do we need so many engines? Can Divisions/Departments share vehicles?

C. Green Fleet Team

The Town should consider designating 3-4 department heads as the Green Fleet Team, the primary responsibility for which will be developing a format (in tandem with the Fuel Efficient Vehicle Policy) for department heads to use when purchasing a new vehicle. The Green Fleet Team shall ensure that performance standards are met and shall aid in selecting the greenest option based on fuel efficiency, greenhouse gas emissions, cost, operational ability and safety, in accordance with the aforementioned Fuel Efficient Vehicle Policy.

D. Other Initiatives –Engine Idling Policy, Bike Share Program, Fuel Management System

Engine Idling Policy – In response to a July 2006 state law that restricted idling of any vehicle to no more than 5 minutes unless engaged in an operation for which the engine power is necessary (MGL Ch.90, s.16A and 310 CMR 7.11), the Town and Concord Public Works prepared an Idle Reduction Campaign that included a *Limitation on Engine Idling Policy* in 2007. The Town policy "applies to the operation of all Public Works vehicles regardless of gross vehicle weight rating, all heavy-duty vehicles regardless of fuel being used, all off-road diesel-powered equipment regardless of horsepower rating and all off-road equipment regardless of fuel being used." Drivers must turn off engines upon stopping and must not allow a vehicle to idle for more than 30 seconds.

Bike Share Program – While this area of Massachusetts has long been attractive to serious bikers, the Town of Concord could reduce the number of cars on its local streets by establishing a Bike Share Program to serve more casual bikers such as tourists and commuters, residents and employees of MCI, Emerson, Baker Avenue, the Town, etc. Over the past couple of years, the Town has been working to enhance the number and quality of bike racks throughout Concord to provide the infrastructure necessary to support an increasing community of bikers. To jumpstart a Bike Share Program, the Town could use unclaimed bikes gathered by the Police Department, paint them a Concord green, and park them in strategic locations around Town (i.e., near the MBTA Commuter Rail stations and municipal parking lots). Details pertaining to marketing and outreach, membership, fees, access, security, storage, maintenance, etc. would be worked out by the Town prior to rolling out the Program.

Fuel Management System – the Town and the CMLP are currently implementing a Fuel Management System to measure and manage the use of fuel by Town-owned vehicles. Such a system will provide the Town with data regarding the miles driven and fuel use per vehicle, from which the Town can calculate the actual MPG for each vehicle as compared to the rated MPG. Having this data will allow the Town to more easily set a target MPG for its vehicle fleet, and will help frequent drivers identify when there are problems with the operation and efficiency of the vehicles.

Focus 2014 – 2015: Renewables –Landfill Gas, Hydropower, Wind, Solar, Thermal Energy Storage, Biomass, Cogeneration & Geothermal

Goal: Help to reduce municipal energy use by 20% over 2008 levels.
Goal: Increase the CMLP Renewable Energy Portfolio to 20% renewables by 2015.

Renewable energy is energy that comes from resources that are naturally replenished such as sunlight, wind, water flow, waves, landfill gas, biomass and ground heat, and that do not emit carbon dioxide and other greenhouse gases into the atmosphere. Taking advantage of renewable sources of energy from outside Town through Power Purchase Agreements with the Concord Municipal Light Plant (CMLP), or as installations within the Town (which will power Town facilities and/or sell excess power generated to the CMLP), will help reduce the Town's dependency on fossil fuels and lessen the Town's carbon footprint.

The Plan herein will take a two-pronged approach to renewable sources of energy:

(1) Sources of renewable energy that the CMLP can contract for to increase its Renewable Energy Portfolio; and
(2) Sources of renewable energy that are or can be established within Town.

(1) CMLP Renewable Energy Portfolio

The Massachusetts Renewable Portfolio Standard for investor-owned utilities was 5% in 2010, increasing 1% per year to 15% in 2020. The Concord Municipal Light Plant (CMLP), though not required to adhere to this standard, states a commitment within its Renewable Energy Strategy dated January 2011 to increase its Renewable Energy Portfolio from 10% in 2010 to 20% by 2015 and 30% by 2020. Also noted within the Strategy is that "Each 10% increase in renewable energy will reduce C02 emissions by 15 million pounds (7,500 tons) annually."

The current portfolio is comprised of 10% renewable energy from the following sources: 4% landfill gas from the Granby Landfill, 3% hydropower from Maine, and 3% hydropower from the New York Power Authority. The CMLP hopes to enter into a 15-year contract for 5 million kWhs per year of wind power from Spruce Mountain Power of Maine in fall 2011, and to complete a utility-scale solar installation for 800,000 kWhs per year at the Concord Wastewater Treatment Plant at some point during 2011. The realization of both of these would increase the Renewable Energy Portfolio to 13%.

A. Landfill Gas

As noted above, landfill gas is derived from the capture of methane gas through wells and pipes drilled into a landfill. It is considered a renewable source of energy because it prevents the methane from entering the atmosphere and because there is no end in sight to the disposing of trash into landfills. The CMLP contracts for 7.5 million kWhs per year of landfill gas from the Granby Landfill.

B. Hydropower

Hydropower, otherwise known as hydraulic power, is derived from the force or energy of moving water, and most commonly comes from flowing rivers, wave action and ocean tides. The amount of hydropower generated, especially at small facilities, is directly related to natural events such as floods, heavy downpours and droughts. It is presumed that the 3 major rivers in Concord – the Assabet, Sudbury and Concord Rivers – are not considered viable for hydropower, as the CMLP Strategy notes that "It is generally regarded in the power industry that all river-based hydropower opportunities in New England have been exploited." The CMLP contracts for 5.5 million kWhs per

year of hydropower from Maine and 6 million kWhs per year of hydropower from the New York Power Authority.

C. Wind

The MassGIS wind map for Massachusetts indicates that Concord, like most of the central areas of the state, does not have the consistent, sustained wind speeds necessary to render wind power an economically viable or feasible source of renewable energy. Moreover, the high cost of energy transmission and potential long-distance energy losses associated with wind energy restrict the sources of wind power for Concord to New England and eastern-Canada. Fortunately, there are areas of Maine and Massachusetts that do have the wind speeds necessary: Spruce Mountain in Bethel Maine, the coastal areas and off-shore areas of eastern Massachusetts, the Wachusett Mountain region of central Massachusetts, and the Berkshires in western Massachusetts. As noted above, the CMLP is working on a 15-year contract with Spruce Mountain Power for 5 million kWhs per year of wind power. In addition, the CMLP may pursue the installation of a modest-sized CMLP-owned wind turbine near Wachusett Mountain in Princeton, MA.

(2) Renewable Energy Sources Within Town

Establishing renewable sources of energy within the Town's boundaries will not only help power municipal facilities which will reduce the municipal carbon footprint, but will also significantly reduce transmission and forward capacity costs, will help educate residents and students, and will demonstrate to tourists and people passing through that Concord is on the leading edge of sustainable practices.

A. Solar

Solar energy is derived from the sun's radiant light and heat and is therefore one of the most renewable sources of energy available. It is also the most viable source of renewable energy within Concord, as Concord's latitude and climate make solar economically feasible. The use of solar power is generally categorized as either active or passive depending on how it is harnessed, converted and distributed. Passive solar usually takes the form of Daylighting, Passive Solar Heating and Passive Solar Cooling. Active solar usually takes the form of Solar Hot Water, Solar Thermal and Photovoltaic (PV) Electricity.

Daylighting – buildings are designed so that windows, openings and reflective surfaces are strategically placed to allow sunlight to illuminate interior spaces.

Passive Solar Heating & Passive Solar Cooling – buildings are designed to collect, store and distribute solar heat in the winter and reject it in the summer.

Solar Hot Water – hot water tanks are mounted directly above solar collectors; hot water naturally rises into the tank. In some cases, where tanks are ground-mounted, pumps are necessary to facilitate the heat exchange.

Solar Thermal – low and medium-temperature solar thermal collectors absorb/store sunlight and use it to heat air, water and small spaces. High-temperature collectors concentrate sunlight and use it for electric power production.

Photovoltaic Electricity – photovoltaic panels (typically made of silicon cells) convert the sun's rays into direct current (DC) electricity through semiconductors that create voltage when

exposed to light. Photovoltaic panels may be ground-mounted, roof-mounted or wall-mounted and may either track the position of the sun or remain in a fixed position.

Current Initiatives

In 2010, the Concord Municipal Light Board drafted a *Utility Scale Solar Strategy* that outlines a long-term program for installing ground-mounted, utility-scale (megawatt size) photovoltaic arrays within the Town's borders. The goal stated in the strategy is "to develop approximately 25 megawatts of solar generating capacity in Concord in units of approximately 5 megawatts deployed incrementally at intervals of about 5 years."

Also in 2010, the Town Manager created a Solar Committee to prepare an RFP for the parcels voted at Town Meeting 2010 for a long-term lease for solar. That process resulted in the CMLP entering into a contract for an 800,000 kWh per year solar installation at the Wastewater Treatment Plant site on Bedford Street. That process also revealed the need for a more comprehensive study of Town-owned properties.

In 2011, the Board of Selectmen created a Solar Siting Committee to review all Town-owned, non-conservation lands in terms of viability for solar. The Committee has prepared a matrix of criteria for which to rank each site, and at the time of this document is conducting site visits, researching existing development restrictions and soliciting stakeholder feedback for the first cut list. The Committee is expected to prepare a report to the Board of Selectmen in the summer 2011.

A structural analysis is currently underway to determine the feasibility of a rooftop solar installation at the Beede Center. Due to lighter solar technologies, it may be possible.

Existing Solar Installations on Town Property

Willard School – a 48 kW system was installed on the roof of the Willard School in 2010 funded through an Energy Efficiency & Conservation Block Grant (EECBG) awarded by the State, the CMLP and the Sawyer Trust Fund. It is expected to offset about 9% of the School's annual electricity needs.

B. Thermal Energy Storage – Electric Thermal Storage, Ice Storage

Electric Thermal Storage (ETS) – Electric Thermal Storage (ETS) systems convert low-cost, off-peak electricity into heat and store the heat in ceramic bricks that are within the unit. A thermostat monitors outside air temperature and regulates heat delivery, and alerts the system to release heat from the bricks when necessary. ETS systems can be sized for residences, businesses and municipal buildings, and can work with room heaters, forced hot air or forced hot water heating systems. The advantages to ETS systems are that they are relatively low cost (the conversion of electricity to heat occurs when electric rates are the lowest), especially when coupled with the rebates available from the CMLP, and that they operate at a 100% rate of efficiency. [When combined with an air source heat pump, the efficiency rate can be as high as 200%.] In addition, they are clean, do not require routine maintenance, can interface easily with the Smart Grid, and produce fewer greenhouse gas emissions than standard heating oil and fuels. The CMLP is currently the only Town building that utilizes the ETS technology.

Ice Storage – Ice Storage is an HVAC design option whereby a traditional chiller produces ice during the night when electricity rates are low; the ice is stored in modular tanks and then used to cool the building the next day. Ice storage tanks can be located in a basement, on a roof, inside or outside, or buried underground; tanks that provide about 1/3 of a building's total cooling usually take up about

0.25% of the conditioned space. Though an ice storage system uses about the same amount of power as a traditional HVAC system, it shifts the load to off-peak hours thus resulting in cost savings and reduced emissions. Ice storage systems typically have a good payback in terms of consumption reduction as the smaller sized motor runs continuously for a determined period of time and the compressor does not cycle on and off as with a typical AC system. While the best candidate buildings for an ice storage system include buildings over 100 tons, buildings with chilled water cooling systems, and buildings that are not typically operated at night (which leaves time for the ice to be made), chillers and ancillary components can be right-sized for smaller buildings. The Town is looking into replacing the 16-year old failing HVAC system at 141 Keyes Road with an ice storage system. [A study prepared by BLW Engineering in summer 2011 revealed that an ice storage component to the new HVAC system at Hunt was cost prohibitive.]

C. Biomass

Biomass energy is derived from the burning of the following renewable resources: garbage (municipal solid waste & manufacturing trash), wood (harvested wood & wood waste), waste (agricultural waste & human waste), landfill gases, alcohol fuels (from sugarcane & corn) and living or dead plant matter (trees, stumps, branches, yard clippings, wood chips, etc.). The existing biomass power generating industry provides about 1.4% of the U.S. electrical supply. As the industry grows, depending on certain Massachusetts regulations around biomass, it may or may not be a viable power source for Concord.

D. Cogeneration (Combined Heat & Power)

Cogeneration, or Combined Heat & Power, is the process by which excess or waste heat from the generation of electricity is captured and used for heating purposes (i.e., hot water, space heating). Rather than rejecting or emitting the byproduct thermal energy into the atmosphere, cogeneration harnesses it and puts it to an efficient use. The cogeneration process typically requires that the whole system is located near the site where the excess heat is used. As electricity is typically generated by the combustion of fossil fuels, it may be possible to substitute biomass in place of fossil fuels to create an even more renewable cogeneration system. Concord currently does not operate any cogeneration facilities, and more research is needed to determine if cogeneration (or biomass cogeneration) is really a viable option for the Town.
[Biomass cogeneration systems operate at both Mt. Wachusett Community College in Massachusetts and Middlebury College in Vermont]

E. Geothermal – Electricity & Ground Source Heat Pumps

The term *geothermal* is used to mean both geothermal power and geothermal heat pumps. Geothermal power is electricity produced by heat engines running on the circulation of high temperature geothermal fluids such as magma conduits, hot springs and oil wells. Currently, there are 77 geothermal power plants in the U.S., 22 of which are concentrated at The Geysers in California.

Geothermal Heat Pumps, or Ground Source Heat Pumps, provide fairly stabilized central heating and cooling through a system that pumps heat to and from the ground. Ground source heat pumps take advantage of the relatively consistent 50-60 degree temperatures, down to about 10 feet below the surface, to use the earth as a heat source in the winter and a heat sink in the summer. As of 2004, there were over a million ground source heat pump systems installed worldwide.

Funding Sources

Sawyer Trust Fund

In May 2008, the Town of Concord was gifted an amount close to $1.7 million from the Alfred A. Sawyer Trust for the purposes of energy conservation, water conservation and materials recycling projects in Town-owned buildings. Since that time, the Comprehensive Sustainable Energy Committee (CSEC) has reviewed and recommended favorable action on a number of Town energy projects, many of which are noted within this Policy. The Town should and will continue to pursue energy projects in Town buildings until this Fund is fully expended. The Finance Division maintains the official Fund records; at the time this Plan was written there was an estimated $1.2 million left in the Fund.

National Grid Rebates

The Town is currently pursuing a number of rebates from National Grid for the design and installation of insulation and high-efficiency boilers in Town buildings. The rebates vary in amount. The Town anticipates eligibility for rebates for the following projects:

24 Court Lane: Insulation, Boilers, Design
FOPAC: Insulation, Boilers
Public Safety Building: Insulation, Boilers, Design
Town House: Insulation, Design
West Concord Fire Station: Insulation, Boilers, Design
CPW/DPLM: Insulation, Design
Hunt: Insulation, Boilers
141 Keyes: Insulation

The Town may explore ways to make this rebate money available for future energy projects. It may be possible to appropriate the sum of the rebates from the budget into a separate energy fund.

Energy Conservation Budget

The Town may want to consider appropriating or allocating rebates and savings from and/or building an energy line item into the budget each year for energy conservation.

[It is interesting to note that as with Jevon's Paradox (where increased energy efficiency leads to increased consumption) one of the rebound effects of reducing consumption is the related increase in price, which thus decreases the overall cost savings incurred from using less energy. Therefore, unit consumption and price need to be evaluated contemporaneously for each year to determine a real cost savings.]

Additional Sources

Green Communities Program – if at some time the Town decides to become a Green Community, the Town will be eligible for many different state grants relating to energy conservation and efficiency.

The Town will continue to explore federal and state grant opportunities for energy initiatives.

Recommendations

Baseline Data, Tracking & Reporting

The Town should consider establishing quarterly reporting of municipal data to the Town Manager, Board of Selectmen, Senior Management Team, Facility Managers, and Comprehensive Sustainable Energy Committee, to inform on the progress of the Town toward the incremental yearly goals and the overall goal of 20% reduction in Town building/facility and streetlight energy use over 2008 levels by 2015.

Employee Eco Team

The Town should consider the following:

1. Overall Eco Manager – designating/hiring 1 person to manage Town-wide control systems from a master panel, coordinate all the energy efforts among buildings and provide guidance to the Employee Eco Team. [Example: Andover, MA]
2. Surveys – the Employee Eco Team could prepare a survey for Town employees to gather more information about the likely outcomes of many of the recommendations within this Plan. [In addition, questions about composting, commuting distances and methods, and other sustainable practices could be incorporated into the next Citizen Survey.]
3. Empowerment – once MEI is up and running, the Eco Masters and Eco Leaders would benefit from receiving access to view the data for their buildings.
4. Competitions – the Employee Eco Team could establish monthly or quarterly competitions (with prizes) between the Eco Leaders to incentivize energy use reduction.
5. Publicity – creating a Sustainability Webpage that highlights achievements, successes and initiatives related to energy and resource conservation and management would increase publicity. The Town could design the webpage to be interactive in order to gather feedback and suggestions. [Example: City of Portsmouth, NH]
6. Staff Education – the Eco Team should consider increasing energy awareness for all employees and informing new hires of Administrative Policy & Procedure #59.

Focus 2011 – 2012: Municipal Building/Facility Energy Use Reduction

Weatherization

The Town should consider the following:

1. Continuing the phased Weatherization Design/Construction review until all Town buildings have been evaluated. [If Needed: Beede, Public Safety, Harvey Wheeler]
2. Notifying the Facilities Maintenance Manager of any found leaks, cracks or drafts as soon as possible to allow corrections or repairs to take place.

Lighting Upgrades

The Town should consider the following:

1. Continuing interior and exterior lighting upgrades at each facility. [If Needed: Interior – Public Safety Building, 133, 135, 141 Keyes, Harvey Wheeler, Hunt / Exterior – 141 Keyes, Beede, Hunt, Town House, West Concord Fire]
2. LEDs - continuing to install LEDs whenever possible. LEDs use a lot less power than incandescent and compact fluorescent bulbs, generate very little heat, and can last up to 50,000 hours in the right conditions. The Town can expect to save between 50% - 90% of its lighting electricity costs by replacing existing bulbs with LEDs.

3. Sensors - installing sensors for automatic shutoff wherever possible in each facility. [The DPLM installed motion sensors in the bathroom and 2nd floor meeting room and estimates a 40-50% energy savings in lighting for these areas.]
4. Bulbs - each Division/Department could assess the lighting in their space and remove bulbs wherever practical. [The DPLM removed 1/2 to 2/3 of the bulbs in many rooms and estimates a corresponding 50% - 66% savings in energy costs.] In cases where there are multiple switches per space, staff could determine how many sets of lights need to be on.
5. Drafting standards for building control systems so that they interface with the Smart Grid – this will save money, time and training. [Example: Andover, MA]

HVAC Systems

The Town should consider the following:

1. Continuing to review the HVAC systems in all Town buildings and whenever possible moving from outdated ~80% efficient boilers to new ~95% efficient boilers.
2. Establishing HVAC specifications (with help from the Comprehensive Sustainable Energy Committee) for high-efficiency, properly sized HVAC equipment and system commissioning. Here are some things to consider:
    a. Condensing hot water modulating boilers with indoor/outdoor reset
    b. High-efficiency just-in-time hot water systems
    c. Single and dual compressor AC systems
    d. Energy Management System (EMS) for remote management of thermostats that can interface with Concord's Smart Grid system
    e. Bidder familiarity with utility incentive programs, high-efficiency equipment and installation procedures, operation and preventative maintenance practices
3. Preparing specifications (with help from the Comprehensive Sustainable Energy Committee) for other mechanical, electrical and control systems relating to energy efficiency and/or conservation in Town buildings.
4. Drafting standards for building control systems so that they interface with the Smart Grid – this will save money, time and training. [Example: Andover, MA]
5. Implementing an Integrated Design Team approach (including an up-front design consultation) for all energy or water-related improvements to existing buildings. Continuing to allow the Sawyer Trust Fund to pay for design studies as well as project/construction work.
6. Continuing to pursue an ice storage demonstration project. [Details provided in *Focus 2014-2015*]

Other Initiatives

The Town should consider the following:

1. Stretch Code – designing new Town buildings to exceed or "stretch" the stretch code and to meet or exceed LEED/CHPS requirements.
2. Smart Grid/MEI – continuing to work to integrate the Smart Grid user interface with MEI or similar system designed by Town.
3. Beyond Peak Demand – extending the energy saving techniques practiced during peak demand beyond peak demand times if sensible.
4. Smart Power Strips – the CMLP is underwriting the cost of a Smart Strip Pilot. The Town may want to determine whether additional Smart Power Strips could be paid for by the Sawyer Trust Fund if the pilot project proves beneficial.
5. Four day work week during the summer! ☺

Focus 2012 – 2013: Outdoor Lighting & Municipal Solid Waste Reduction

Outdoor Lighting

The Town should consider the following:

1. Streetlights – continuing the practices outlined in the *Interim Street Lighting Policy* while working toward a permanent Street Lighting Policy. Supporting the CMLP in their efforts to conserve energy while restoring the 500+ streetlights.
2. LED Conversion – exploring the possibility of converting some of the existing streetlights, traffic lights and parking lot lights to LEDs. [The CMLP parking lot has LEDs; Harvey Wheeler is next.]
3. Sensors – determining whether sensors may be appropriate in certain municipal parking lots so that lights are not on unless cars or people are present.
4. Timing – assessing whether the timing of the lighting on buildings and in parking lots is aligned with the actual occupancy and use of these spaces. Safety lighting aside, there may be instances in which lights are needlessly left on all night.

Municipal Solid Waste Reduction

The Town should consider the following:

1. Landfill-Gas-to-Energy – exploring the possibility of closing the loop by contracting for gas from the Fitchburg Landfill or renewable electricity from Unitil. [The CMLP already has a gas contract with the Granby Landfill – it expires in 2013.]
2. Concord's Capped Landfill – exploring the possibility of drilling wells into our own landfill for gas capture to either fuel Town buildings or fuel renewable electricity generation. [The City of Northampton sells landfill gas to a private vendor to power a landfill-gas-to-energy facility. Noted in the Northampton Municipal Energy Reduction Plan, May 2010]
3. Education – the Eco Tem should consider informing employees about the recycling program and about its importance to the Town, both upon hire and at periodic intervals. The Eco Team should also consider informing employees about the environmental benefits and do's/don'ts of composting.
4. Detached Trash & Recycle Bins – continuing the practice and promotion of recycling by switching the locations of bins so that the recycle bin is the most convenient receptacle to the employee. Recycling will become a habit.
5. Attached Trash &Recycle Bins – continuing the practice and promotion of recycling by providing recycling receptacles that are larger than the trash receptacles. Perception will become reality.
6. Positive Reinforcement / Awareness – at some frequency, maintenance/janitorial staff could put smiley stickers (or the like) on each trash bin that is completely free of recyclables.
7. Composting – at a minimum, researching the costs, resident requirements (compost bins probably cannot be left outside overnight for morning pick-up) and additional trash trucks on Town streets associated with entering into a contract for curbside pick-up of food scraps.
8. Compost Guru – designating a Compost Guru (a member of the Employee Eco Team) to explore the possibility of placing composters outside of each Town building for employees or of collecting employee food scraps and delivering them to a local compost pile and/or gardener [Gaining Ground?] or other location.

Focus 2013 – 2014: Municipal Vehicle Energy Use Reduction

The Town should consider the following:

1. Data Tracking – tracking fuel use and mpg data by vehicle in order to monitor vehicle efficiency and calculate average fleet fuel efficiency more specifically.
2. Engine Idling Policy – revising the policy to include all Town-owned vehicles (not just Public Works) and all Town employees, throughout Town and especially on Town property.
3. Bike Share Program – collaborating with local employment centers, MBTA, ATA Cycles, etc., research other small town bike share programs, and roll out Concord's program in 2012.
4. Grants – researching whether grants are still available from the Clean Cities Program (federal) or Department of Energy Resources (DOER) for fuel efficient vehicles.

Focus 2014 – 2015: Renewables –Landfill Gas, Hydropower, Wind, Solar, Thermal Energy Storage, Biomass, Cogeneration & Geothermal

Please note: the recommendations herein are meant to complement the recommendations outlined in the CMLP Renewable Energy Strategy of January 2011. For more detailed and thoughtful information regarding the following, please refer to the aforementioned CMLP Strategy.

Landfill Gas

The Town should consider the following:

1. Landfill Gas – exploring the possibility of contracting for a greater number of kWhs per year from the Granby Landfill.
2. New Contract – exploring the possibility of entering into a new contract for landfill gas from the Fitchburg Landfill (where Concord trash is dumped).
3. Concord's Capped Landfill - exploring the possibility of drilling wells into our own landfill for gas capture to either fuel Town buildings or fuel renewable electricity generation. [The City of Northampton sells landfill gas to a private vendor to power a landfill-gas-to-energy facility. Noted in the Northampton Municipal Energy Reduction Plan, May 2010]

Hydropower

The Town should consider the following:

1. Hydropower – exploring the possibility of contracting for a greater number of kWhs per year from Maine and New York.
2. New Contracts – exploring the possibility of entering into new contracts for hydropower with Acton, MA and Hydro Quebec.
3. Marine Power – examining the opportunities to purchase marine power from Maine (tide-based) and Cape Cod (wave-based) when available.

Wind

The Town should consider the following:

1. Spruce Mountain – following through with the contract for wind power.
2. Princeton, MA – continuing to explore the possibility of approaching Princeton, MA about installation of a CMLP-owned wind turbine.
3. Small/Medium-Scale Wind Facilities – pursuing other opportunities to partner with other towns to develop small or medium-scale wind facilities that would provide access to 7-12 MW of capacity.

Solar

The Town should consider the following:

1. Solar Siting – reviewing the report and advancing the efforts of the Solar Siting Committee where possible. In the near future, identifying non Town-owned lands that could be purchased for solar.
2. Utility-scale Solar – preparing a detailed plan for a multi-year investment in utility-scale solar based on potential sites and financial feasibility. Weighing the pros and cons of a PPA versus outright ownership of a solar facility.
3. Rooftop Solar – conducting a structural analysis and solar feasibility study for the roofs of all appropriate Town buildings.
4. Solar @ Beede – whether a solar installation of both PV's and solar thermal collectors could provide the Beede Center with both the electricity and hot water heating that it requires
5. As-of-Right Siting Bylaw – drafting an As-of-Right Siting Bylaw for solar installations within Town. This is a requirement of the Green Communities Program and could help the Town further its goals by codifying provisions for solar installations. [Example Bylaw available on DOER website]

Thermal Energy Storage, Biomass, Cogeneration & Geothermal

The Town should consider the following:

1. Electric Thermal Storage – exploring the possibility of converting the remaining Town buildings that heat with oil (105 Everett, Wastewater Treatment Plant, Cemetery Building) to ETS.
2. Ice Storage – pursuing an ice storage demonstration project at 141 Keyes Road.
3. Biomass Cogeneration @ CCHS – exploring whether a biomass cogeneration system could be incorporated into the design for the new High School as a demonstration project and whether it could provide electricity for the High School and heat for the Beede Center.
4. Cogeneration Contract – exploring whether the CMLP can contract for electricity from a cogeneration facility.
5. Ground Source Heat Pumps – exploring the possibility of incorporating them into designs and/or renovations of Town buildings.
6. Opportunities – continuing to monitor and pursue trends in and opportunities for solar, energy storage, geothermal, biomass and cogeneration whenever possible.

Concord

Government Greenhouse Gas Emissions in 2008

Summary Report

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	(%)	Energy (MMBtu)	Cost ($)
Buildings and Facilities	6,318	67	593	6,351	72.6	86,186	1,487,063
Streetlights & Traffic Signals	270	5	25	272	3.1	2,451	68,268
Water Delivery Facilities	598	11	57	602	6.9	5,711	166,935
Wastewater Facilities	457	7	47	460	5.3	4,573	142,554
Solid Waste Facilities	0	0	-3,215	-68	-0.8	0	0
Vehicle Fleet	1,040	22	28	1,048	12.0	14,479	392,634
Electric Power	83	2	8	84	1.0	754	33,132
Total	8,765	114	-2,457	8,749	100.0	114,153	2,290,586

Government Greenhouse Gas Emissions in 2008
Detailed Report

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	(%)	Energy (MMBtu)	Cost ($)
Buildings and Facilities							
Concord, Massachusetts							
105 Everett - Scope 1							
Fuel Oil (#1 2 4)	18	0	3	18	0.2	241	5,255
Natural Gas	2	0	0	2	0.0	44	903
Subtotal 105 Everett - Scope 1	20	0	3	20	0.2	284	6,158
105 Everett - Scope 2							
Electricity	2	0	0	2	0.0	17	808
Subtotal 105 Everett - Scope 2	2	0	0	2	0.0	17	808
133 Keyes (OFF/B) - Scope 2							
Electricity	60	1	6	60	0.7	543	19,955
Subtotal 133 Keyes (OFF/B) -	60	1	6	60	0.7	543	19,955
133 Keyes (Office & Garage) - Scope 1							
Natural Gas	54	0	5	54	0.6	1,024	16,702
Subtotal 133 Keyes (Office & (	54	0	5	54	0.6	1,024	16,702
133 Keyes (Park & Tree) - Scope 1							
Natural Gas	25	0	2	25	0.3	472	8,245
Subtotal 133 Keyes (Park & Tr	25	0	2	25	0.3	472	8,245
133 Keyes (Salt Shed) - Scope 2							
Electricity	0	0	0	0	0.0	1	162
Subtotal 133 Keyes (Salt Shec	0	0	0	0	0.0	1	162
135 Keyes (MN/HT) - Scope 2							
Electricity	34	1	3	34	0.4	306	14,178
Subtotal 135 Keyes (MN/HT) -	34	1	3	34	0.4	306	14,178
135 Keyes - Scope 1							
Natural Gas	10	0	1	10	0.1	187	3,475
Subtotal 135 Keyes - Scope 1	10	0	1	10	0.1	187	3,475

Government Greenhouse Gas Emissions in 2008
Detailed Report

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
135 Keyes Garage - Scope 2							
Electricity	4	0	0	4	0.0	39	1,704
Subtotal 135 Keyes Garage - S	4	0	0	4	0.0	39	1,704
141 Keyes - Scope 1							
Natural Gas	21	0	2	21	0.2	400	6,887
Subtotal 141 Keyes - Scope 1	21	0	2	21	0.2	400	6,887
141 Keyes - Scope 2							
Electricity	37	1	3	37	0.4	333	12,358
Subtotal 141 Keyes - Scope 2	37	1	3	37	0.4	333	12,358
Beede Center - Scope 1							
Natural Gas	242	0	23	243	2.8	4,563	11,655
Subtotal Beede Center - Scope	242	0	23	243	2.8	4,563	11,655
Beede Center - Scope 2							
Electricity	469	9	44	472	5.4	4,259	115,281
Subtotal Beede Center - Scope	469	9	44	472	5.4	4,259	115,281
CMLP Headquarters							
Electricity	162	3	15	163	1.9	1,469	64,584
Subtotal CMLP Headquarters	162	3	15	163	1.9	1,469	64,584
Compost Site - Scope 2							
Electricity	0	0	0	0	0.0	1	147
Subtotal Compost Site - Scope	0	0	0	0	0.0	1	147
Gun House - Scope 2							
Electricity	0	0	0	0	0.0	2	196
Subtotal Gun House - Scope 2	0	0	0	0	0.0	2	196
Harvey Wheeler CC - Scope 1							
Natural Gas	70	0	7	70	0.8	1,315	18,447
Subtotal Harvey Wheeler CC -	70	0	7	70	0.8	1,315	18,447

Government Greenhouse Gas Emissions in 2008
Detailed Report

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	(%)	Energy (MMBtu)	Cost ($)
Harvey Wheeler CC - Scope 2							
Electricity	43	1	4	43	0.5	389	16,211
Subtotal Harvey Wheeler CC -	43	1	4	43	0.5	389	16,211
Hunt Gym - Scope 1							
Natural Gas	43	0	4	44	0.5	819	15,007
Subtotal Hunt Gym - Scope 1	43	0	4	44	0.5	819	15,007
Hunt Gym - Scope 2							
Electricity	35	1	3	35	0.4	319	11,698
Subtotal Hunt Gym - Scope 2	35	1	3	35	0.4	319	11,698
Hunt Playground - Scope 2							
Electricity	1	0	0	1	0.0	12	618
Subtotal Hunt Playground - Sc	1	0	0	1	0.0	12	618
Library, Fowler - Scope 2							
Electricity	17	0	2	17	0.2	151	7,587
Subtotal Library, Fowler - Sco	17	0	2	17	0.2	151	7,587
Library, Fowler - Scope 1							
Natural Gas	20	0	2	20	0.2	380	6,296
Subtotal Library, Fowler - Scop	20	0	2	20	0.2	380	6,296
Library, Main - Scope 1							
Natural Gas	84	0	8	85	1.0	1,589	25,187
Subtotal Library, Main - Scope	84	0	8	85	1.0	1,589	25,187
Library, Main - Scope 2							
Electricity	176	3	16	178	2.0	1,603	55,992
Subtotal Library, Main - Scope	176	3	16	178	2.0	1,603	55,992
Police/Fire (Emergency Heater) - Scope 1							
Natural Gas	0	0	0	0	0.0	0	266
Subtotal Police/Fire (Emergen	0	0	0	0	0.0	0	266

Government Greenhouse Gas Emissions in 2008
Detailed Report

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	(%)	Energy (MMBtu)	Cost ($)
Police/Fire (P/F Boiler) - Scope 1							
Natural Gas	78	0	7	78	0.9	1,461	24,449
Subtotal Police/Fire (P/F Boile	78	0	7	78	0.9	1,461	24,449
Police/Fire - Scope 2							
Electricity	112	2	10	113	1.3	1,021	34,747
Subtotal Police/Fire - Scope 2	112	2	10	113	1.3	1,021	34,747
Police/Fire Garage - Scope 2							
Electricity	0	0	0	0	0.0	4	277
Subtotal Police/Fire Garage - S	0	0	0	0	0.0	4	277
Rideout Playground - Scope 2							
Electricity	2	0	0	2	0.0	17	802
Subtotal Rideout Playground -	2	0	0	2	0.0	17	802
School, Alcott - Scope 1							
Natural Gas	205	0	19	206	2.4	3,868	11,256
Subtotal School, Alcott - Scope	205	0	19	206	2.4	3,868	11,256
School, Alcott - Scope 2							
Electricity	261	5	24	263	3.0	2,373	83,283
Subtotal School, Alcott - Scope	261	5	24	263	3.0	2,373	83,283
School, CCHS - Scope 2							
Electricity	965	18	90	973	11.1	8,774	254,737
Subtotal School, CCHS - Scop	965	18	90	973	11.1	8,774	254,737
School, CCHS 1 - Scope 1							
Natural Gas	659	1	62	661	7.6	12,423	32,129
Subtotal School, CCHS 1 - Sc	659	1	62	661	7.6	12,423	32,129
School, CCHS 2 - Scope 1							
Natural Gas	103	0	10	104	1.2	1,946	11,683
Subtotal School, CCHS 2 - Sc	103	0	10	104	1.2	1,946	11,683

Government Greenhouse Gas Emissions in 2008
Detailed Report

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	(%)	Energy (MMBtu)	Cost ($)
School, CCHS 3 - Scope 1							
Natural Gas	18	0	2	18	0.2	336	1,614
Subtotal School, CCHS 3 - Sc	18	0	2	18	0.2	336	1,614
School, CCHS 4 - Scope 1							
Natural Gas	12	0	1	12	0.1	229	4,030
Subtotal School, CCHS 4 - Sc	12	0	1	12	0.1	229	4,030
School, CCHS 5 - Scope 1							
Natural Gas	6	0	1	6	0.1	115	2,173
Subtotal School, CCHS 5 - Sc	6	0	1	6	0.1	115	2,173
School, CCHS Athletic Fields - Scope 2							
Electricity	8	0	1	8	0.1	72	13,301
Subtotal School, CCHS Athleti	8	0	1	8	0.1	72	13,301
School, Peabody - Scope 1							
Natural Gas	255	0	24	255	2.9	4,797	13,532
Subtotal School, Peabody - Sc	255	0	24	255	2.9	4,797	13,532
School, Peabody - Scope 2							
Electricity	122	2	11	123	1.4	1,108	52,958
Subtotal School, Peabody - Sc	122	2	11	123	1.4	1,108	52,958
School, Ripley Admin Bldg - Scope 1							
Natural Gas	238	0	22	239	2.7	4,487	12,799
Subtotal School, Ripley Admin	238	0	22	239	2.7	4,487	12,799
School, Ripley Admin Bldg - Scope 2							
Electricity	156	3	14	157	1.8	1,415	72,686
Subtotal School, Ripley Admin	156	3	14	157	1.8	1,415	72,686
School, Sanborn - Scope 1							
Natural Gas	222	0	21	222	2.5	4,175	88,464
Subtotal School, Sanborn - Sc	222	0	21	222	2.5	4,175	88,464

Government Greenhouse Gas Emissions in 2008
Detailed Report

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	(%)	Energy (MMBtu)	Cost ($)
School, Sanborn - Scope 2							
Electricity	187	3	17	188	2.2	1,700	81,620
Subtotal School, Sanborn - Sc	187	3	17	188	2.2	1,700	81,620
School, Thoreau - Scope 1							
Natural Gas	237	0	22	237	2.7	4,460	12,616
Subtotal School, Thoreau - Sc	237	0	22	237	2.7	4,460	12,616
School, Thoreau - Scope 2							
Electricity	303	6	28	305	3.5	2,753	127,130
Subtotal School, Thoreau - Sc	303	6	28	305	3.5	2,753	127,130
School, Willard (Lights 2) - Scope 2							
Electricity	0	0	0	0	0.0	0	128
Subtotal School, Willard (Light	0	0	0	0	0.0	0	128
School, Willard (Lights) - Scope 2							
Electricity	0	0	0	0	0.0	0	128
Subtotal School, Willard (Light	0	0	0	0	0.0	0	128
School, Willard - Scope 1							
Natural Gas	244	0	23	244	2.8	4,592	12,989
Subtotal School, Willard - Sco	244	0	23	244	2.8	4,592	12,989
School, Willard - Scope 2							
Electricity	138	3	13	140	1.6	1,258	43,195
Subtotal School, Willard - Sco	138	3	13	140	1.6	1,258	43,195
Sleepy Hollow Maintenance Bldg - Scope 1							
Fuel Oil (#1 2 4)	15	0	2	15	0.2	203	3,419
Subtotal Sleepy Hollow Mainte	15	0	2	15	0.2	203	3,419
Sleepy Hollow Maintenance Bldg - Scope 2							
Electricity	1	0	0	1	0.0	7	408
Subtotal Sleepy Hollow Mainte	1	0	0	1	0.0	7	408

Government Greenhouse Gas Emissions in 2008
Detailed Report

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
The Knoll - Scope 1							
Propane	3	0	1	3	0.0	55	1,527
Subtotal The Knoll - Scope 1	3	0	1	3	0.0	55	1,527
The Knoll - Scope 2							
Electricity	0	0	0	0	0.0	4	259
Subtotal The Knoll - Scope 2	0	0	0	0	0.0	4	259
Thoreau St. Tennis Courts - Scope 2							
Electricity	0	0	0	0	0.0	0	111
Subtotal Thoreau St. Tennis C	0	0	0	0	0.0	0	111
Town House - Scope 1							
Natural Gas	35	0	3	35	0.4	658	11,696
Subtotal Town House - Scope	35	0	3	35	0.4	658	11,696
Town House - Scope 2							
Electricity	34	1	3	34	0.4	307	11,548
Subtotal Town House - Scope	34	1	3	34	0.4	307	11,548
Town House Chillers - Scope 2							
Electricity	4	0	0	4	0.0	39	3,761
Subtotal Town House Chillers	4	0	0	4	0.0	39	3,761
Visitor's Info Center - Scope 1							
Natural Gas	4	0	0	4	0.0	71	1,570
Subtotal Visitor's Info Center -	4	0	0	4	0.0	71	1,570
Visitor's Info Center - Scope 2							
Electricity	3	0	0	3	0.0	29	1,281
Subtotal Visitor's Info Center -	3	0	0	3	0.0	29	1,281
WC Fire - Scope 1							
Natural Gas	43	0	4	43	0.5	817	13,428
Subtotal WC Fire - Scope 1	43	0	4	43	0.5	817	13,428

Government Greenhouse Gas Emissions in 2008
Detailed Report

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
WC Fire - Scope 2							
Electricity	15	0	1	15	0.2	133	5,530
Subtotal WC Fire - Scope 2	15	0	1	15	0.2	133	5,530
Subtotal Buildings and Facilities	6,318	67	593	6,351	72.6	86,186	1,487,063
Streetlights & Traffic Signals							
Concord, Massachusetts							
Light, Lowell Road - Scope 2							
Electricity	0	0	0	0	0.0	4	285
Subtotal Light, Lowell Road - S	0	0	0	0	0.0	4	285
Light, Main Street - Scope 2							
Electricity	0	0	0	0	0.0	1	165
Subtotal Light, Main Street - S	0	0	0	0	0.0	1	165
Light, Thoreau Street - Scope 2							
Electricity	4	0	0	4	0.0	34	1,518
Subtotal Light, Thoreau Street	4	0	0	4	0.0	34	1,518
Lights 2, Thoreau Street - Scope 2							
Electricity	0	0	0	0	0.0	0	120
Subtotal Lights 2, Thoreau Str	0	0	0	0	0.0	0	120
Lights, Thoreau Street - Scope 2							
Electricity	0	0	0	0	0.0	0	121
Subtotal Lights, Thoreau Stree	0	0	0	0	0.0	0	121
Radio Tower, Annursnac Hill - Scope 2							
Electricity	1	0	0	1	0.0	13	641
Subtotal Radio Tower, Annurs	1	0	0	1	0.0	13	641

Government Greenhouse Gas Emissions in 2008
Detailed Report

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
Streetlights - Scope 2							
Electricity	247	5	23	249	2.8	2,244	58,384
Subtotal Streetlights - Scope 2	247	5	23	249	2.8	2,244	58,384
Traffic Light 2, Main Street - Scope 2							
Electricity	4	0	0	4	0.0	32	1,412
Subtotal Traffic Light 2, Main S	4	0	0	4	0.0	32	1,412
Traffic Light 3, Main Street - Scope 2							
Electricity	5	0	0	5	0.1	41	1,801
Subtotal Traffic Light 3, Main S	5	0	0	5	0.1	41	1,801
Traffic Light, Main Street - Scope 2							
Electricity	4	0	0	4	0.0	34	1,478
Subtotal Traffic Light, Main Str	4	0	0	4	0.0	34	1,478
Traffic Light, Sudbury Road/117 - Scope 2							
Electricity	3	0	0	3	0.0	30	1,354
Subtotal Traffic Light, Sudbury	3	0	0	3	0.0	30	1,354
Traffic Signal 2, Old Marlboro Road - Scope 2							
Electricity	0	0	0	0	0.0	0	120
Subtotal Traffic Signal 2, Old M	0	0	0	0	0.0	0	120
Traffic Signal, Old Marlboro Road - Scope 2							
Electricity	0	0	0	0	0.0	0	120
Subtotal Traffic Signal, Old Ma	0	0	0	0	0.0	0	120
Traffic Signal, Thoreau Street - Scope 2							
Electricity	2	0	0	2	0.0	16	749
Subtotal Traffic Signal, Thorea	2	0	0	2	0.0	16	749
Subtotal Streetlights & Traffic Si	270	5	25	272	3.1	2,451	68,268

Government Greenhouse Gas Emissions in 2008
Detailed Report

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
Water Delivery Facilities							
Concord, Massachusetts							
Irrigation, Old Pickard Road - Scope 2							
Electricity	0	0	0	0	0.0	0	117
Subtotal Irrigation, Old Pickard	0	0	0	0	0.0	0	117
Irrigation, Ripley Field - Scope 2							
Electricity	0	0	0	0	0.0	4	281
Subtotal Irrigation, Ripley Field	0	0	0	0	0.0	4	281
Irrigation, Sanborn School - Scope 2							
Electricity	1	0	0	1	0.0	5	268
Subtotal Irrigation, Sanborn Sc	1	0	0	1	0.0	5	268
Nagog Pond Ozone Facility - Scope 1							
Propane	12	0	2	12	0.1	195	4,066
Subtotal Nagog Pond Ozone F	12	0	2	12	0.1	195	4,066
Nagog Pond Ozone Facility - Scope 2							
Electricity	43	1	4	43	0.5	387	0
Subtotal Nagog Pond Ozone F	43	1	4	43	0.5	387	0
Pumping Station, Route 2A - Scope 1							
Natural Gas	9	0	1	9	0.1	164	3,448
Subtotal Pumping Station, Rou	9	0	1	9	0.1	164	3,448
Pumping Station, Rte 2A - Scope 2							
Electricity	7	0	1	7	0.1	61	0
Subtotal Pumping Station, Rte	7	0	1	7	0.1	61	0
Reservoir, Annursnac Hill - Scope 2							
Electricity	4	0	0	4	0.0	34	1,498
Subtotal Reservoir, Annursnac	4	0	0	4	0.0	34	1,498

Government Greenhouse Gas Emissions in 2008
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	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	(%)	Energy (MMBtu)	Cost ($)
Reservoir, Pine Hill - Scope 2							
Electricity	3	0	0	3	0.0	29	1,299
Subtotal Reservoir, Pine Hill -	3	0	0	3	0.0	29	1,299
Treatment Plant, Deaconess - Scope 1							
Natural Gas	11	0	1	11	0.1	212	4,460
Subtotal Treatment Plant, Dea	11	0	1	11	0.1	212	4,460
Treatment Plant, Deaconess - Scope 2							
Electricity	151	3	14	152	1.7	1,372	43,931
Subtotal Treatment Plant, Dea	151	3	14	152	1.7	1,372	43,931
Well, 2nd Division - Scope 2							
Electricity	87	2	8	88	1.0	791	26,560
Subtotal Well, 2nd Division - S	87	2	8	88	1.0	791	26,560
Well, Hugh Cargill - Scope 2							
Electricity	72	1	7	73	0.8	658	21,453
Subtotal Well, Hugh Cargill - S	72	1	7	73	0.8	658	21,453
Well, Jennie Dugan - Scope 2							
Electricity	54	1	5	54	0.6	489	16,327
Subtotal Well, Jennie Dugan -	54	1	5	54	0.6	489	16,327
Well, Robinson - Scope 1							
Natural Gas	0	0	0	0	0.0	1	15
Subtotal Well, Robinson - Sco	0	0	0	0	0.0	1	15
Well, Robinson - Scope 2							
Electricity	77	1	7	77	0.9	696	22,967
Subtotal Well, Robinson - Sco	77	1	7	77	0.9	696	22,967
Well, White Pond - Scope 2							
Electricity	67	1	6	68	0.8	612	20,246
Subtotal Well, White Pond - Sc	67	1	6	68	0.8	612	20,246
Subtotal Water Delivery Facilities	598	11	57	602	6.9	5,711	166,935

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	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
Wastewater Facilities							
Concord, Massachusetts							
Pump, Assabet/Main - Scope 1							
Natural Gas	4	0	0	4	0.0	70	2,100
Subtotal Pump, Assabet/Main	4	0	0	4	0.0	70	2,100
Pump, Assabet/Main - Scope 2							
Electricity	18	0	2	18	0.2	161	6,695
Subtotal Pump, Assabet/Main	18	0	2	18	0.2	161	6,695
Pump, Bedford Street - Scope 2							
Electricity	5	0	0	5	0.1	42	1,844
Subtotal Pump, Bedford Street	5	0	0	5	0.1	42	1,844
Pump, Cousins Park - Scope 2							
Electricity	4	0	0	4	0.0	38	1,648
Subtotal Pump, Cousins Park -	4	0	0	4	0.0	38	1,648
Pump, Gifford Lane - Scope 2							
Electricity	3	0	0	3	0.0	25	1,127
Subtotal Pump, Gifford Lane -	3	0	0	3	0.0	25	1,127
Pump, Laurel Street - Scope 2							
Electricity	2	0	0	2	0.0	16	744
Subtotal Pump, Laurel Street -	2	0	0	2	0.0	16	744
Pump, Lowell Road - Scope 2							
Electricity	83	2	8	83	1.0	753	30,657
Subtotal Pump, Lowell Road -	83	2	8	83	1.0	753	30,657
Pump, Park Lane - Scope 2							
Electricity	7	0	1	7	0.1	61	2,614
Subtotal Pump, Park Lane - Sc	7	0	1	7	0.1	61	2,614

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	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
Pump, Pilgrim Road - Scope 2							
Electricity	5	0	0	5	0.1	44	1,917
Subtotal Pump, Pilgrim Road -	5	0	0	5	0.1	44	1,917
Treatment Plant, 509 Bedford - Scope 1							
Fuel Oil (#1 2 4)	84	1	13	85	1.0	1,153	22,853
Subtotal Treatment Plant, 509	84	1	13	85	1.0	1,153	22,853
Treatment Plant, 509 Bedford - Scope 2							
Electricity	243	4	23	245	2.8	2,211	70,357
Subtotal Treatment Plant, 509	243	4	23	245	2.8	2,211	70,357
Subtotal Wastewater Facilities	457	7	47	460	5.3	4,573	142,554
Solid Waste Facilities							
Concord, Massachusetts							
Municipal Trash - Fitchburg Landfill - Scope 3							
Methane	0	0	-1,192	-25	-0.3	0	0
Subtotal Municipal Trash - Fitc	0	0	-1,192	-25	-0.3	0	0
School Trash - Fitchburg Landfill - Scope 3							
Methane	0	0	-2,023	-42	-0.5	0	0
Subtotal School Trash - Fitchb	0	0	-2,023	-42	-0.5	0	0
Subtotal Solid Waste Facilities	0	0	-3,215	-68	-0.8	0	0
Vehicle Fleet							
Concord, Massachusetts							
Building Department							
Gasoline	4	0	0	4	0.0	56	1,442
Subtotal Building Department	4	0	0	4	0.0	56	1,442

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	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	(%)	Energy (MMBtu)	Cost ($)
Concord Municipal Light Plant							
Diesel	47	0	0	47	0.5	645	18,517
Gasoline	47	1	2	48	0.5	669	16,890
OFF ROAD Diesel	5	0	0	5	0.1	72	2,058
OFF ROAD Gasoline	7	0	0	7	0.1	100	2,524
Subtotal Concord Municipal Li	107	2	2	108	1.2	1,486	39,989
Concord Public Works							
Diesel	41	0	0	41	0.5	564	15,343
Gasoline	37	3	2	38	0.4	522	11,951
OFF ROAD Diesel	22	1	1	22	0.3	304	8,261
OFF ROAD Gasoline	6	0	0	6	0.1	85	1,946
Subtotal Concord Public Work	106	4	4	108	1.2	1,474	37,501
Council on Aging							
Gasoline	24	0	1	24	0.3	341	8,430
Subtotal Council on Aging	24	0	1	24	0.3	341	8,430
Fire Department							
Diesel	74	0	0	74	0.8	1,010	29,888
Gasoline	23	1	1	23	0.3	318	7,972
Subtotal Fire Department	96	1	1	97	1.1	1,328	37,860
Grounds / Park & Tree Division							
Diesel	26	0	0	26	0.3	349	8,071
OFF ROAD Gasoline	38	1	2	39	0.4	539	17,428
Subtotal Grounds / Park & Tre	64	1	2	64	0.7	889	25,499
Health Division							
Gasoline	2	0	0	2	0.0	24	552
Subtotal Health Division	2	0	0	2	0.0	24	552

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	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	(%)	Energy (MMBtu)	Cost ($)
Highway Division							
Diesel	35	0	0	35	0.4	479	15,009
Gasoline	43	2	1	44	0.5	607	15,883
OFF ROAD Diesel	71	2	4	72	0.8	973	30,473
Subtotal Highway Division	149	4	6	151	1.7	2,060	61,365
Library							
Gasoline	1	0	0	1	0.0	19	472
Subtotal Library	1	0	0	1	0.0	19	472
Natural Resources Commission							
Gasoline	6	0	0	6	0.1	81	1,858
Subtotal Natural Resources Cc	6	0	0	6	0.1	81	1,858
Police Department							
Diesel	0	0	0	0	0.0	3	70
Gasoline	203	5	7	204	2.3	2,858	71,675
Subtotal Police Department	203	5	7	205	2.3	2,861	71,745
School Department							
Diesel	100	0	0	100	1.1	1,368	42,211
Gasoline	64	1	2	64	0.7	899	21,847
OFF ROAD Diesel	6	0	0	6	0.1	84	2,581
Subtotal School Department	170	2	2	170	1.9	2,350	66,639
Town of Concord							
Gasoline	8	1	0	8	0.1	111	2,709
Subtotal Town of Concord	8	1	0	8	0.1	111	2,709
Water/Sewer Division							
Diesel	9	0	0	9	0.1	117	3,530
Gasoline	78	2	2	79	0.9	1,106	27,747
OFF ROAD Diesel	13	0	1	13	0.1	176	5,295
Subtotal Water/Sewer Division	100	2	3	101	1.1	1,400	36,572
Subtotal Vehicle Fleet	1,040	22	28	1,048	12.0	14,479	392,634

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	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
Electric Power							
Concord, Massachusetts							
735 Main Street - Scope 2							
Electricity	44	1	4	44	0.5	399	17,556
Subtotal 735 Main Street - Scc	44	1	4	44	0.5	399	17,556
Substation 219 #1, Forest Ridge - Scope 2							
Electricity	10	0	1	10	0.1	91	4,020
Subtotal Substation 219 #1, Fc	10	0	1	10	0.1	91	4,020
Substation 219 #2, Forest Ridge - Scope 2							
Electricity	5	0	0	5	0.1	46	2,015
Subtotal Substation 219 #2, Fc	5	0	0	5	0.1	46	2,015
Substation 479 #1, Williams Road - Scope 2							
Electricity	19	0	2	20	0.2	177	7,788
Subtotal Substation 479 #1, W	19	0	2	20	0.2	177	7,788
Substation 479 #2, Williams Road - Scope 2							
Electricity	4	0	0	4	0.1	40	1,753
Subtotal Substation 479 #2, W	4	0	0	4	0.1	40	1,753
Subtotal Electric Power	83	2	8	84	1.0	754	33,132
Total	8,765	114	-2,457	8,749	100.0	114,153	2,290,586

Concord

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	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	(%)	Energy (MMBtu)	Cost ($)
Buildings and Facilities	6,506	67	610	6,540	72.5	89,426	0
Streetlights & Traffic Signals	247	4	23	249	2.8	2,247	0
Water Delivery Facilities	612	11	58	617	6.8	5,916	0
Wastewater Facilities	466	8	48	469	5.2	4,659	0
Solid Waste Facilities	0	0	-3,216	-68	-0.7	0	0
Vehicle Fleet	1,115	21	29	1,123	12.4	15,490	0
Electric Power	88	2	8	89	1.0	800	0
Total	9,035	113	-2,439	9,019	100.0	118,539	0

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Detailed Report

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
Buildings and Facilities							
Concord, Massachusetts							
105 Everett - Scope 1							
Fuel Oil (#1 2 4)	12	0	2	12	0.1	164	0
Natural Gas	1	0	0	1	0.0	15	0
Subtotal 105 Everett - Scope 1	13	0	2	13	0.1	179	0
105 Everett - Scope 2							
Electricity	2	0	0	2	0.0	15	0
Subtotal 105 Everett - Scope 2	2	0	0	2	0.0	15	0
133 Keyes Offices - Scope 1							
Natural Gas	50	0	5	51	0.6	951	0
Subtotal 133 Keyes Offices - S	50	0	5	51	0.6	951	0
133 Keyes Offices - Scope 2							
Electricity	57	1	5	58	0.6	521	0
Subtotal 133 Keyes Offices - S	57	1	5	58	0.6	521	0
133 Keyes Salt Shed - Scope 1							
Natural Gas	24	0	2	24	0.3	452	0
Subtotal 133 Keyes Salt Shed	24	0	2	24	0.3	452	0
133 Keyes Salt Shed - Scope 2							
Electricity	0	0	0	0	0.0	1	0
Subtotal 133 Keyes Salt Shed	0	0	0	0	0.0	1	0
135 Keyes Garage - Scope 2							
Electricity	4	0	0	4	0.0	38	0
Subtotal 135 Keyes Garage - S	4	0	0	4	0.0	38	0
135 Keyes Offices - Scope 1							
Natural Gas	8	0	1	9	0.1	160	0
Subtotal 135 Keyes Offices - S	8	0	1	9	0.1	160	0

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	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
135 Keyes Offices - Scope 2							
Electricity	31	1	3	31	0.3	278	0
Subtotal 135 Keyes Offices - S	31	1	3	31	0.3	278	0
141 Keyes - Scope 1							
Natural Gas	24	0	2	24	0.3	443	0
Subtotal 141 Keyes - Scope 1	24	0	2	24	0.3	443	0
141 Keyes - Scope 2							
Electricity	34	1	3	34	0.4	309	0
Subtotal 141 Keyes - Scope 2	34	1	3	34	0.4	309	0
Beede Center - Scope 1							
Natural Gas	258	0	24	259	2.9	4,871	0
Subtotal Beede Center - Scope	258	0	24	259	2.9	4,871	0
Beede Center - Scope 2							
Electricity	446	8	41	450	5.0	4,055	0
Subtotal Beede Center - Scope	446	8	41	450	5.0	4,055	0
CMLP - Scope 2							
Electricity	180	3	17	181	2.0	1,632	0
Subtotal CMLP - Scope 2	180	3	17	181	2.0	1,632	0
Compost Site - Scope 2							
Electricity	0	0	0	0	0.0	3	0
Subtotal Compost Site - Scope	0	0	0	0	0.0	3	0
Fowler Branch Library - Scope 1							
Natural Gas	16	0	2	16	0.2	308	0
Subtotal Fowler Branch Library	16	0	2	16	0.2	308	0
Fowler Branch Library - Scope 2							
Electricity	14	0	1	14	0.2	128	0
Subtotal Fowler Branch Library	14	0	1	14	0.2	128	0

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	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
Gun House - Scope 2							
Electricity	0	0	0	0	0.0	2	0
Subtotal Gun House - Scope 2	0	0	0	0	0.0	2	0
Harvey Wheeler - Scope 1							
Natural Gas	74	0	7	75	0.8	1,404	0
Subtotal Harvey Wheeler - Scc	74	0	7	75	0.8	1,404	0
Harvey Wheeler - Scope 2							
Electricity	45	1	4	45	0.5	406	0
Subtotal Harvey Wheeler - Scc	45	1	4	45	0.5	406	0
Hunt Playground - Scope 2							
Electricity	1	0	0	1	0.0	9	0
Subtotal Hunt Playground - Sc	1	0	0	1	0.0	9	0
Hunt Rec - Scope 1							
Natural Gas	40	0	4	40	0.4	756	0
Subtotal Hunt Rec - Scope 1	40	0	4	40	0.4	756	0
Hunt Rec - Scope 2							
Electricity	30	1	3	30	0.3	274	0
Subtotal Hunt Rec - Scope 2	30	1	3	30	0.3	274	0
Info Center - Scope 1							
Natural Gas	3	0	0	3	0.0	66	0
Subtotal Info Center - Scope 1	3	0	0	3	0.0	66	0
Info Center - Scope 2							
Electricity	3	0	0	3	0.0	27	0
Subtotal Info Center - Scope 2	3	0	0	3	0.0	27	0
Main Library - Scope 1							
Natural Gas	65	0	6	65	0.7	1,221	0
Subtotal Main Library - Scope	65	0	6	65	0.7	1,221	0

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	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
Main Library - Scope 2							
Electricity	149	3	14	150	1.7	1,353	0
Subtotal Main Library - Scope	149	3	14	150	1.7	1,353	0
Police/Fire - Scope 1							
Natural Gas	70	0	7	70	0.8	1,325	0
Subtotal Police/Fire - Scope 1	70	0	7	70	0.8	1,325	0
Police/Fire - Scope 2							
Electricity	105	2	10	106	1.2	952	0
Subtotal Police/Fire - Scope 2	105	2	10	106	1.2	952	0
Police/Fire Garage - Scope 1							
Natural Gas	0	0	0	0	0.0	6	0
Subtotal Police/Fire Garage - S	0	0	0	0	0.0	6	0
Police/Fire Garage - Scope 2							
Electricity	0	0	0	0	0.0	4	0
Subtotal Police/Fire Garage - S	0	0	0	0	0.0	4	0
Rideout Playground - Scope 2							
Electricity	1	0	0	1	0.0	13	0
Subtotal Rideout Playground -	1	0	0	1	0.0	13	0
School, Alcott Elementary - Scope 1							
Natural Gas	210	0	20	210	2.3	3,949	0
Subtotal School, Alcott Elemer	210	0	20	210	2.3	3,949	0
School, Alcott Elementary - Scope 2							
Electricity	333	6	31	336	3.7	3,029	0
Subtotal School, Alcott Elemer	333	6	31	336	3.7	3,029	0
School, CCHS - Scope 1							
Natural Gas	874	2	82	876	9.7	16,470	0
Subtotal School, CCHS - Scop	874	2	82	876	9.7	16,470	0

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	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	(%)	Energy (MMBtu)	Cost ($)
School, CCHS - Scope 2							
Electricity	932	17	87	939	10.4	8,472	0
Subtotal School, CCHS - Scop	932	17	87	939	10.4	8,472	0
School, CCHS Athletic Fields - Scope 2							
Electricity	15	0	1	15	0.2	138	0
Subtotal School, CCHS Athleti	15	0	1	15	0.2	138	0
School, CCHS Transportation - Scope 2							
Electricity	10	0	1	10	0.1	87	0
Subtotal School, CCHS Transp	10	0	1	10	0.1	87	0
School, Peabody Middle - Scope 1							
Natural Gas	248	0	23	249	2.8	4,675	0
Subtotal School, Peabody Mid	248	0	23	249	2.8	4,675	0
School, Peabody Middle - Scope 2							
Electricity	123	2	11	124	1.4	1,117	0
Subtotal School, Peabody Mid	123	2	11	124	1.4	1,117	0
School, Ripley Admin Bldg - Scope 1							
Natural Gas	226	0	21	227	2.5	4,267	0
Subtotal School, Ripley Admin	226	0	21	227	2.5	4,267	0
School, Ripley Admin Bldg - Scope 2							
Electricity	153	3	14	154	1.7	1,388	0
Subtotal School, Ripley Admin	153	3	14	154	1.7	1,388	0
School, Sanborn Middle - Scope 1							
Natural Gas	396	1	37	397	4.4	7,460	0
Subtotal School, Sanborn Mid	396	1	37	397	4.4	7,460	0
School, Sanborn Middle - Scope 2							
Electricity	195	4	18	197	2.2	1,775	0
Subtotal School, Sanborn Mid	195	4	18	197	2.2	1,775	0

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	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
School, Thoreau Elementary - Scope 1							
Natural Gas	248	0	23	248	2.8	4,666	0
Subtotal School, Thoreau Elen	248	0	23	248	2.8	4,666	0
School, Thoreau Elementary - Scope 2							
Electricity	328	6	30	330	3.7	2,977	0
Subtotal School, Thoreau Elen	328	6	30	330	3.7	2,977	0
School, Willard Elementary - Scope 1							
Natural Gas	190	0	18	191	2.1	3,590	0
Subtotal School, Willard Eleme	190	0	18	191	2.1	3,590	0
School, Willard Elementary - Scope 2							
Electricity	150	3	14	151	1.7	1,365	0
Subtotal School, Willard Eleme	150	3	14	151	1.7	1,365	0
School, Willard Lights - Scope 2							
Electricity	0	0	0	0	0.0	0	0
Subtotal School, Willard Lights	0	0	0	0	0.0	0	0
School, Willard Lights 2 - Scope 2							
Electricity	0	0	0	0	0.0	0	0
Subtotal School, Willard Lights	0	0	0	0	0.0	0	0
Sleepy Hollow Maint. Bldg - Scope 1							
Fuel Oil (#1 2 4)	7	0	1	7	0.1	93	0
Natural Gas	1	0	0	1	0.0	19	0
Subtotal Sleepy Hollow Maint.	8	0	1	8	0.1	112	0
Sleepy Hollow Maint. Bldg - Scope 2							
Electricity	2	0	0	2	0.0	14	0
Subtotal Sleepy Hollow Maint.	2	0	0	2	0.0	14	0

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	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
The Knoll - Scope 1							
Propane	4	0	1	4	0.0	57	0
Subtotal The Knoll - Scope 1	4	0	1	4	0.0	57	0
The Knoll - Scope 2							
Electricity	0	0	0	0	0.0	3	0
Subtotal The Knoll - Scope 2	0	0	0	0	0.0	3	0
Town House - Scope 1							
Natural Gas	29	0	3	29	0.3	540	0
Subtotal Town House - Scope	29	0	3	29	0.3	540	0
Town House - Scope 2							
Electricity	30	1	3	30	0.3	273	0
Subtotal Town House - Scope	30	1	3	30	0.3	273	0
Town House Chillers - Scope 2							
Electricity	4	0	0	4	0.0	33	0
Subtotal Town House Chillers	4	0	0	4	0.0	33	0
WC Fire - Scope 1							
Natural Gas	36	0	3	37	0.4	688	0
Subtotal WC Fire - Scope 1	36	0	3	37	0.4	688	0
WC Fire - Scope 2							
Electricity	13	0	1	13	0.1	117	0
Subtotal WC Fire - Scope 2	13	0	1	13	0.1	117	0
Subtotal Buildings and Facilities	6,506	67	610	6,540	72.5	89,426	0

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	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
Streetlights & Traffic Signals							
Concord, Massachusetts							
Annursnac Hill Radio Tower - Scope 2							
Electricity	1	0	0	1	0.0	12	0
Subtotal Annursnac Hill Radio	1	0	0	1	0.0	12	0
Lowell Road Light - Scope 2							
Electricity	0	0	0	0	0.0	4	0
Subtotal Lowell Road Light - S	0	0	0	0	0.0	4	0
Main Street Light - Scope 2							
Electricity	0	0	0	0	0.0	1	0
Subtotal Main Street Light - Sc	0	0	0	0	0.0	1	0
Main Street Traffic Signal - Scope 2							
Electricity	3	0	0	3	0.0	30	0
Subtotal Main Street Traffic Si	3	0	0	3	0.0	30	0
Main Street Traffic Signal 2 - Scope 2							
Electricity	3	0	0	4	0.0	32	0
Subtotal Main Street Traffic Si	3	0	0	4	0.0	32	0
Main Street Traffic Signal 3 - Scope 2							
Electricity	4	0	0	4	0.0	40	0
Subtotal Main Street Traffic Si	4	0	0	4	0.0	40	0
Old Marlboro Traffic Signal - Scope 2							
Electricity	0	0	0	0	0.0	0	0
Subtotal Old Marlboro Traffic S	0	0	0	0	0.0	0	0
Old Marlboro Traffic Signal 2 - Scope 2							
Electricity	0	0	0	0	0.0	0	0
Subtotal Old Marlboro Traffic S	0	0	0	0	0.0	0	0

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Detailed Report

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
Streetlights - Scope 2							
Electricity	226	4	21	228	2.5	2,053	0
Subtotal Streetlights - Scope 2	226	4	21	228	2.5	2,053	0
Sudbury Road/117 Traffic Signal - Scope 2							
Electricity	3	0	0	3	0.0	28	0
Subtotal Sudbury Road/117 Tr	3	0	0	3	0.0	28	0
Thoreau Street Light - Scope 2							
Electricity	3	0	0	3	0.0	30	0
Subtotal Thoreau Street Light -	3	0	0	3	0.0	30	0
Thoreau Street Lights - Scope 2							
Electricity	0	0	0	0	0.0	0	0
Subtotal Thoreau Street Lights	0	0	0	0	0.0	0	0
Thoreau Street Lights 2 - Scope 2							
Electricity	0	0	0	0	0.0	0	0
Subtotal Thoreau Street Lights	0	0	0	0	0.0	0	0
Thoreau Street Traffic Signal - Scope 2							
Electricity	2	0	0	2	0.0	16	0
Subtotal Thoreau Street Traffic	2	0	0	2	0.0	16	0
Subtotal Streetlights & Traffic Si	247	4	23	249	2.8	2,247	0
Water Delivery Facilities							
Concord, Massachusetts							
2nd Division Well - Scope 2							
Electricity	82	1	8	83	0.9	746	0
Subtotal 2nd Division Well - Sc	82	1	8	83	0.9	746	0

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	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
Annursnac Hill Reservoir - Scope 2							
Electricity	3	0	0	3	0.0	25	0
Subtotal Annursnac Hill Reser	3	0	0	3	0.0	25	0
Deaconness Water Treatment Plant - Scope 1							
Natural Gas	16	0	2	16	0.2	304	0
Subtotal Deaconness Water Tr	16	0	2	16	0.2	304	0
Deaconness Water Treatment Plant - Scope 2							
Electricity	149	3	14	150	1.7	1,353	0
Subtotal Deaconness Water Tr	149	3	14	150	1.7	1,353	0
Hugh Cargill Well - Scope 2							
Electricity	58	1	5	59	0.6	528	0
Subtotal Hugh Cargill Well - Sc	58	1	5	59	0.6	528	0
Irrigation - Old Pickard Rd. - Scope 2							
Electricity	0	0	0	0	0.0	0	0
Subtotal Irrigation - Old Pickar	0	0	0	0	0.0	0	0
Irrigation - Ripley Fields - Scope 2							
Electricity	0	0	0	0	0.0	2	0
Subtotal Irrigation - Ripley Fiel	0	0	0	0	0.0	2	0
Irrigation - Sanborn Fields - Scope 2							
Electricity	1	0	0	1	0.0	8	0
Subtotal Irrigation - Sanborn Fi	1	0	0	1	0.0	8	0
Jennie Dugan Well - Scope 2							
Electricity	51	1	5	51	0.6	464	0
Subtotal Jennie Dugan Well - S	51	1	5	51	0.6	464	0
Nagog Pond Ozone Facility - Scope 1							
Propane	12	0	2	13	0.1	198	0
Subtotal Nagog Pond Ozone F	12	0	2	13	0.1	198	0

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	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
Nagog Pond Ozone Facility - Scope 2							
Electricity	57	1	5	58	0.6	519	0
Subtotal Nagog Pond Ozone F	57	1	5	58	0.6	519	0
Pine Hill Reservoir - Scope 2							
Electricity	2	0	0	2	0.0	19	0
Subtotal Pine Hill Reservoir - S	2	0	0	2	0.0	19	0
Robinson Well - Scope 1							
Natural Gas	0	0	0	0	0.0	1	0
Subtotal Robinson Well - Scop	0	0	0	0	0.0	1	0
Robinson Well - Scope 2							
Electricity	101	2	9	101	1.1	915	0
Subtotal Robinson Well - Scop	101	2	9	101	1.1	915	0
Rte 2A Pumping Station - Scope 1							
Natural Gas	11	0	1	11	0.1	212	0
Subtotal Rte 2A Pumping Stati	11	0	1	11	0.1	212	0
Rte 2A Pumping Station - Scope 2							
Electricity	1	0	0	1	0.0	6	0
Subtotal Rte 2A Pumping Stati	1	0	0	1	0.0	6	0
White Pond Well - Scope 2							
Electricity	68	1	6	68	0.8	618	0
Subtotal White Pond Well - Sc	68	1	6	68	0.8	618	0
Subtotal Water Delivery Facilitie	612	11	58	617	6.8	5,916	0

Government Greenhouse Gas Emissions in 2009
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	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
Wastewater Facilities							
Concord, Massachusetts							
Assabet/Main St. Pump - Scope 1							
Natural Gas	4	0	0	4	0.0	82	0
Subtotal Assabet/Main St. Pun	4	0	0	4	0.0	82	0
Assabet/Main St. Pump - Scope 2							
Electricity	13	0	1	13	0.1	118	0
Subtotal Assabet/Main St. Pun	13	0	1	13	0.1	118	0
Bedford Street Pump - Scope 2							
Electricity	4	0	0	5	0.1	41	0
Subtotal Bedford Street Pump	4	0	0	5	0.1	41	0
Cousins Park Pump - Scope 2							
Electricity	4	0	0	4	0.0	37	0
Subtotal Cousins Park Pump -	4	0	0	4	0.0	37	0
Gifford Lane Pump - Scope 2							
Electricity	2	0	0	2	0.0	22	0
Subtotal Gifford Lane Pump - S	2	0	0	2	0.0	22	0
Laurel/Walden St. Pump - Scope 2							
Electricity	3	0	0	3	0.0	23	0
Subtotal Laurel/Walden St. Pu	3	0	0	3	0.0	23	0
Lowell/Keyes Rd. Pump - Scope 2							
Electricity	83	2	8	84	0.9	756	0
Subtotal Lowell/Keyes Rd. Pur	83	2	8	84	0.9	756	0
Park Lane Pump - Scope 2							
Electricity	7	0	1	7	0.1	61	0
Subtotal Park Lane Pump - Sc	7	0	1	7	0.1	61	0

Government Greenhouse Gas Emissions in 2009
Detailed Report

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	(%)	Energy (MMBtu)	Cost ($)
Pilgrim Road Pump - Scope 2							
Electricity	4	0	0	4	0.0	37	0
Subtotal Pilgrim Road Pump -	4	0	0	4	0.0	37	0
Wastewater Treatment Plant - Scope 1							
Fuel Oil (#1 2 4)	84	1	13	84	0.9	1,144	0
Subtotal Wastewater Treatmer	84	1	13	84	0.9	1,144	0
Wastewater Treatment Plant - Scope 2							
Electricity	257	5	24	259	2.9	2,338	0
Subtotal Wastewater Treatmer	257	5	24	259	2.9	2,338	0
Subtotal Wastewater Facilities	466	8	48	469	5.2	4,659	0
Solid Waste Facilities							
Concord, Massachusetts							
Municipal Trash - Fitchburg Landfill - Scope 3							
Methane	0	0	-1,190	-25	-0.3	0	0
Subtotal Municipal Trash - Fitc	0	0	-1,190	-25	-0.3	0	0
School Trash - Fitchburg Landfill - Scope 3							
Methane	0	0	-2,026	-43	-0.5	0	0
Subtotal School Trash - Fitchb	0	0	-2,026	-43	-0.5	0	0
Subtotal Solid Waste Facilities	0	0	-3,216	-68	-0.7	0	0
Vehicle Fleet							
Concord, Massachusetts							
Building Department							
Gasoline	4	0	0	4	0.0	51	0
Subtotal Building Department	4	0	0	4	0.0	51	0

Government Greenhouse Gas Emissions in 2009
Detailed Report

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
Cemetery							
Gasoline	8	0	0	8	0.1	114	0
Subtotal Cemetery	8	0	0	8	0.1	114	0
Concord Housing Authority							
Gasoline	11	0	0	11	0.1	160	0
Subtotal Concord Housing Aut	11	0	0	11	0.1	160	0
Concord Municipal Light Plant							
Diesel	53	0	0	53	0.6	726	0
Gasoline	41	1	1	41	0.5	579	0
OFF ROAD Diesel	6	0	0	6	0.1	81	0
OFF ROAD Gasoline	6	0	1	6	0.1	87	0
Subtotal Concord Municipal Li	106	2	3	107	1.2	1,472	0
Concord Public Works							
Diesel	41	0	0	41	0.5	555	0
Gasoline	7	1	0	8	0.1	104	0
OFF ROAD Diesel	23	1	1	23	0.3	312	0
OFF ROAD Gasoline	1	0	0	1	0.0	18	0
Subtotal Concord Public Work	72	1	2	73	0.8	990	0
Council On Aging/Veterans							
Gasoline	23	0	1	23	0.3	325	0
Subtotal Council On Aging/Vet	23	0	1	23	0.3	325	0
Fire Department							
Diesel	72	0	0	72	0.8	990	0
Gasoline	20	0	0	20	0.2	279	0
Subtotal Fire Department	92	1	1	92	1.0	1,269	0
Grounds / Park & Tree							
Diesel	49	0	0	49	0.5	676	0

Government Greenhouse Gas Emissions in 2009
Detailed Report

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	(%)	Energy (MMBtu)	Cost ($)
Gasoline	11	0	0	11	0.1	152	0
OFF ROAD Gasoline	11	0	1	11	0.1	152	0
Subtotal Grounds / Park & Tre	71	1	1	71	0.8	980	0
Health Division							
Gasoline	1	0	0	1	0.0	20	0
Subtotal Health Division	1	0	0	1	0.0	20	0
Highway/Snow Division							
Diesel	61	0	0	62	0.7	840	0
Gasoline	52	2	2	53	0.6	740	0
OFF ROAD Diesel	125	3	7	126	1.4	1,706	0
Subtotal Highway/Snow Divisi	239	5	9	241	2.7	3,286	0
Library							
Gasoline	1	0	0	2	0.0	21	0
Subtotal Library	1	0	0	2	0.0	21	0
Natural Resources Division							
Gasoline	4	0	0	4	0.0	53	0
Subtotal Natural Resources Di	4	0	0	4	0.0	53	0
Police Department							
Diesel	1	0	0	1	0.0	10	0
Gasoline	204	6	7	206	2.3	2,874	0
Subtotal Police Department	204	6	7	206	2.3	2,884	0
School Department							
Diesel	100	0	0	100	1.1	1,368	0
Gasoline	70	2	2	71	0.8	993	0
OFF ROAD Diesel	6	0	0	6	0.1	84	0
Subtotal School Department	177	2	2	177	2.0	2,444	0

Government Greenhouse Gas Emissions in 2009
Detailed Report

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
Water/Sewer Division							
Diesel	9	0	0	10	0.1	130	0
Gasoline	78	2	2	78	0.9	1,098	0
OFF ROAD Diesel	14	0	1	14	0.2	195	0
Subtotal Water/Sewer Division	102	2	3	102	1.1	1,423	0
Subtotal Vehicle Fleet	1,115	21	29	1,123	12.4	15,490	0
Electric Power							
Concord, Massachusetts							
735 Main Street #223 - Scope 2							
Electricity	46	1	4	46	0.5	415	0
Subtotal 735 Main Street #223	46	1	4	46	0.5	415	0
Forest Ridge Sub 219 #1 - Scope 2							
Electricity	11	0	1	11	0.1	101	0
Subtotal Forest Ridge Sub 219	11	0	1	11	0.1	101	0
Forest Ridge Sub 219 #2 - Scope 2							
Electricity	5	0	0	5	0.1	45	0
Subtotal Forest Ridge Sub 219	5	0	0	5	0.1	45	0
Williams Road Sub 479 #373 - Scope 2							
Electricity	4	0	0	4	0.0	40	0
Subtotal Williams Road Sub 47	4	0	0	4	0.0	40	0
Williams Road Sub 479 #374 - Scope 2							
Electricity	22	0	2	22	0.2	199	0
Subtotal Williams Road Sub 47	22	0	2	22	0.2	199	0
Subtotal Electric Power	88	2	8	89	1.0	800	0
Total	9,035	113	-2,439	9,019	100.0	118,539	0

Concord

Government Greenhouse Gas Emissions in 2010

Summary Report

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	(%)	Energy (MMBtu)	Cost ($)
Buildings and Facilities	6,277	68	588	6,311	71.5	84,512	0
Streetlights & Traffic Signals	195	4	18	196	2.2	1,769	0
Water Delivery Facilities	689	12	65	695	7.9	6,670	0
Wastewater Facilities	445	8	44	448	5.1	4,278	0
Solid Waste Facilities	0	0	-3,205	-67	-0.8	0	0
Vehicle Fleet	1,149	22	30	1,157	13.1	15,956	0
Electric Power	82	1	8	83	0.9	748	0
Total	8,838	114	-2,452	8,822	100.0	113,933	0

Government Greenhouse Gas Emissions in 2010
Detailed Report

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
Buildings and Facilities							
Concord, Massachusetts							
105 Everett - Scope 1							
Fuel Oil (#1 2 4)	12	0	2	12	0.1	164	0
Natural Gas	1	0	0	1	0.0	16	0
Subtotal 105 Everett - Scope 1	13	0	2	13	0.1	180	0
105 Everett - Scope 2							
Electricity	2	0	0	2	0.0	14	0
Subtotal 105 Everett - Scope 2	2	0	0	2	0.0	14	0
133 Keyes Offices - Scope 1							
Natural Gas	51	0	5	52	0.6	970	0
Subtotal 133 Keyes Offices - S	51	0	5	52	0.6	970	0
133 Keyes Offices - Scope 2							
Electricity	56	1	5	56	0.6	506	0
Subtotal 133 Keyes Offices - S	56	1	5	56	0.6	506	0
133 Keyes Salt Shed - Scope 1							
Natural Gas	25	0	2	25	0.3	462	0
Subtotal 133 Keyes Salt Shed	25	0	2	25	0.3	462	0
133 Keyes Salt Shed - Scope 2							
Electricity	0	0	0	0	0.0	3	0
Subtotal 133 Keyes Salt Shed	0	0	0	0	0.0	3	0
135 Keyes Garage - Scope 2							
Electricity	5	0	0	5	0.1	41	0
Subtotal 135 Keyes Garage - S	5	0	0	5	0.1	41	0
135 Keyes Offices - Scope 1							
Natural Gas	13	0	1	13	0.1	237	0
Subtotal 135 Keyes Offices - S	13	0	1	13	0.1	237	0

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	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
135 Keyes Offices - Scope 2							
Electricity	21	0	2	21	0.2	188	0
Subtotal 135 Keyes Offices - S	21	0	2	21	0.2	188	0
141 Keyes - Scope 1							
Natural Gas	24	0	2	24	0.3	460	0
Subtotal 141 Keyes - Scope 1	24	0	2	24	0.3	460	0
141 Keyes - Scope 2							
Electricity	36	1	3	37	0.4	330	0
Subtotal 141 Keyes - Scope 2	36	1	3	37	0.4	330	0
Assessor's Office - Scope 1							
Natural Gas	2	0	0	2	0.0	39	0
Subtotal Assessor's Office - Sc	2	0	0	2	0.0	39	0
Assessor's Office - Scope 2							
Electricity	4	0	0	4	0.0	34	0
Subtotal Assessor's Office - Sc	4	0	0	4	0.0	34	0
Beede Center - Scope 1							
Natural Gas	201	0	19	202	2.3	3,792	0
Subtotal Beede Center - Scope	201	0	19	202	2.3	3,792	0
Beede Center - Scope 2							
Electricity	476	9	44	479	5.4	4,321	0
Subtotal Beede Center - Scope	476	9	44	479	5.4	4,321	0
CMLP - Scope 2							
Electricity	166	3	15	167	1.9	1,510	0
Subtotal CMLP - Scope 2	166	3	15	167	1.9	1,510	0
Compost Site - Scope 2							
Electricity	0	0	0	0	0.0	1	0
Subtotal Compost Site - Scope	0	0	0	0	0.0	1	0

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	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
Fowler Branch Library - Scope 1							
Natural Gas	17	0	2	17	0.2	322	0
Subtotal Fowler Branch Library	17	0	2	17	0.2	322	0
Fowler Branch Library - Scope 2							
Electricity	8	0	1	8	0.1	71	0
Subtotal Fowler Branch Library	8	0	1	8	0.1	71	0
Gun House - Scope 2							
Electricity	0	0	0	0	0.0	1	0
Subtotal Gun House - Scope 2	0	0	0	0	0.0	1	0
Harvey Wheeler - Scope 1							
Natural Gas	67	0	6	67	0.8	1,265	0
Subtotal Harvey Wheeler - Sco	67	0	6	67	0.8	1,265	0
Harvey Wheeler - Scope 2							
Electricity	47	1	4	47	0.5	428	0
Subtotal Harvey Wheeler - Sco	47	1	4	47	0.5	428	0
Hunt Playground - Scope 2							
Electricity	3	0	0	3	0.0	29	0
Subtotal Hunt Playground - Sc	3	0	0	3	0.0	29	0
Hunt Rec - Scope 1							
Natural Gas	38	0	4	38	0.4	711	0
Subtotal Hunt Rec - Scope 1	38	0	4	38	0.4	711	0
Hunt Rec - Scope 2							
Electricity	28	1	3	29	0.3	258	0
Subtotal Hunt Rec - Scope 2	28	1	3	29	0.3	258	0
Info Center - Scope 1							
Natural Gas	4	0	0	4	0.0	69	0
Subtotal Info Center - Scope 1	4	0	0	4	0.0	69	0

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	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	(%)	Energy (MMBtu)	Cost ($)
Info Center - Scope 2							
Electricity	3	0	0	3	0.0	27	0
Subtotal Info Center - Scope 2	3	0	0	3	0.0	27	0
Main Library - Scope 1							
Natural Gas	62	0	6	62	0.7	1,166	0
Subtotal Main Library - Scope	62	0	6	62	0.7	1,166	0
Main Library - Scope 2							
Electricity	151	3	14	152	1.7	1,375	0
Subtotal Main Library - Scope	151	3	14	152	1.7	1,375	0
Police/Fire - Scope 1							
Natural Gas	76	0	7	76	0.9	1,436	0
Subtotal Police/Fire - Scope 1	76	0	7	76	0.9	1,436	0
Police/Fire - Scope 2							
Electricity	112	2	10	113	1.3	1,021	0
Subtotal Police/Fire - Scope 2	112	2	10	113	1.3	1,021	0
Police/Fire Garage - Scope 1							
Natural Gas	4	0	0	4	0.0	80	0
Subtotal Police/Fire Garage - S	4	0	0	4	0.0	80	0
Police/Fire Garage - Scope 2							
Electricity	1	0	0	1	0.0	6	0
Subtotal Police/Fire Garage - S	1	0	0	1	0.0	6	0
Rideout Playground - Scope 2							
Electricity	2	0	0	2	0.0	22	0
Subtotal Rideout Playground -	2	0	0	2	0.0	22	0
School, Alcott Elementary - Scope 1							
Natural Gas	204	0	19	204	2.3	3,842	0
Subtotal School, Alcott Elemer	204	0	19	204	2.3	3,842	0

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	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	(%)	Energy (MMBtu)	Cost ($)
School, Alcott Elementary - Scope 2							
Electricity	306	6	29	309	3.5	2,785	0
Subtotal School, Alcott Elemer	306	6	29	309	3.5	2,785	0
School, CCHS - Scope 1							
Natural Gas	814	2	77	816	9.3	15,342	0
Subtotal School, CCHS - Scop	814	2	77	816	9.3	15,342	0
School, CCHS - Scope 2							
Electricity	917	17	85	924	10.5	8,337	0
Subtotal School, CCHS - Scop	917	17	85	924	10.5	8,337	0
School, CCHS Athletic Fields - Scope 2							
Electricity	13	0	1	13	0.1	118	0
Subtotal School, CCHS Athleti	13	0	1	13	0.1	118	0
School, CCHS Transportation Bldg - Scope 2							
Electricity	15	0	1	15	0.2	133	0
Subtotal School, CCHS Transp	15	0	1	15	0.2	133	0
School, Peabody Middle - Scope 1							
Natural Gas	224	0	21	224	2.5	4,216	0
Subtotal School, Peabody Mid	224	0	21	224	2.5	4,216	0
School, Peabody Middle - Scope 2							
Electricity	123	2	11	123	1.4	1,113	0
Subtotal School, Peabody Mid	123	2	11	123	1.4	1,113	0
School, Ripley Admin Bldg - Scope 1							
Natural Gas	227	0	21	227	2.6	4,274	0
Subtotal School, Ripley Admin	227	0	21	227	2.6	4,274	0
School, Ripley Admin Bldg - Scope 2							
Electricity	155	3	14	156	1.8	1,409	0
Subtotal School, Ripley Admin	155	3	14	156	1.8	1,409	0

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Detailed Report

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	(%)	Energy (MMBtu)	Cost ($)
School, Sanborn Middle - Scope 1							
Natural Gas	363	1	34	364	4.1	6,841	0
Subtotal School, Sanborn Midc	363	1	34	364	4.1	6,841	0
School, Sanborn Middle - Scope 2							
Electricity	191	3	18	192	2.2	1,735	0
Subtotal School, Sanborn Midc	191	3	18	192	2.2	1,735	0
School, Thoreau Elementary - Scope 1							
Natural Gas	203	0	19	204	2.3	3,834	0
Subtotal School, Thoreau Elen	203	0	19	204	2.3	3,834	0
School, Thoreau Elementary - Scope 2							
Electricity	321	6	30	323	3.7	2,915	0
Subtotal School, Thoreau Elen	321	6	30	323	3.7	2,915	0
School, Willard Elementary - Scope 1							
Natural Gas	141	0	13	142	1.6	2,660	0
Subtotal School, Willard Eleme	141	0	13	142	1.6	2,660	0
School, Willard Elementary - Scope 2							
Electricity	239	4	22	241	2.7	2,175	0
Subtotal School, Willard Eleme	239	4	22	241	2.7	2,175	0
School, Willard Lights - Scope 2							
Electricity	0	0	0	0	0.0	0	0
Subtotal School, Willard Lights	0	0	0	0	0.0	0	0
School, Willard Lights 2 - Scope 2							
Electricity	0	0	0	0	0.0	1	0
Subtotal School, Willard Lights	0	0	0	0	0.0	1	0
The Knoll - Scope 1							
Propane	1	0	0	1	0.0	22	0
Subtotal The Knoll - Scope 1	1	0	0	1	0.0	22	0

Government Greenhouse Gas Emissions in 2010
Detailed Report

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
The Knoll - Scope 2							
Electricity	3	0	0	3	0.0	24	0
Subtotal The Knoll - Scope 2	3	0	0	3	0.0	24	0
Town House - Scope 1							
Natural Gas	28	0	3	28	0.3	530	0
Subtotal Town House - Scope	28	0	3	28	0.3	530	0
Town House - Scope 2							
Electricity	30	1	3	30	0.3	269	0
Subtotal Town House - Scope	30	1	3	30	0.3	269	0
Town House Chillers - Scope 2							
Electricity	6	0	1	6	0.1	53	0
Subtotal Town House Chillers	6	0	1	6	0.1	53	0
WC Fire - Scope 1							
Natural Gas	19	0	2	19	0.2	356	0
Subtotal WC Fire - Scope 1	19	0	2	19	0.2	356	0
WC Fire - Scope 2							
Electricity	17	0	2	17	0.2	151	0
Subtotal WC Fire - Scope 2	17	0	2	17	0.2	151	0
Subtotal Buildings and Facilities	6,277	68	588	6,311	71.5	84,512	0
Streetlights & Traffic Signals							
Concord, Massachusetts							
Annursnac Hill Radio Tower - Scope 2							
Electricity	1	0	0	1	0.0	12	0
Subtotal Annursnac Hill Radio	1	0	0	1	0.0	12	0

Government Greenhouse Gas Emissions in 2010
Detailed Report

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	(%)	Energy (MMBtu)	Cost ($)
Elm St. Streetlight @ CMLP Entrance - Scope 2							
Electricity	0	0	0	0	0.0	1	0
Subtotal Elm St. Streetlight @	0	0	0	0	0.0	1	0
Lowell Road Light - Scope 2							
Electricity	0	0	0	0	0.0	4	0
Subtotal Lowell Road Light - S	0	0	0	0	0.0	4	0
Main Street Light							
Electricity	0	0	0	0	0.0	1	0
Subtotal Main Street Light	0	0	0	0	0.0	1	0
Main Street Traffic Signal - Scope 2							
Electricity	4	0	0	4	0.0	33	0
Subtotal Main Street Traffic Si	4	0	0	4	0.0	33	0
Main Street Traffic Signal 2 - Scope 2							
Electricity	3	0	0	3	0.0	29	0
Subtotal Main Street Traffic Si	3	0	0	3	0.0	29	0
Main Street Traffic Signal 3 - Scope 2							
Electricity	4	0	0	4	0.0	32	0
Subtotal Main Street Traffic Si	4	0	0	4	0.0	32	0
Old Marlboro Traffic Signal - Scope 2							
Electricity	0	0	0	0	0.0	0	0
Subtotal Old Marlboro Traffic S	0	0	0	0	0.0	0	0
Old Marlboro Traffic Signal 2 - Scope 2							
Electricity	0	0	0	0	0.0	0	0
Subtotal Old Marlboro Traffic S	0	0	0	0	0.0	0	0
Streetlights - Scope 2							
Electricity	175	3	16	177	2.0	1,594	0
Subtotal Streetlights - Scope 2	175	3	16	177	2.0	1,594	0

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	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
Sudbury Road/117 Traffic Signal - Scope 2							
Electricity	3	0	0	3	0.0	29	0
Subtotal Sudbury Road/117 Tr	3	0	0	3	0.0	29	0
Thoreau St. Traffic Signal - Scope 2							
Electricity	2	0	0	2	0.0	15	0
Subtotal Thoreau St. Traffic Si	2	0	0	2	0.0	15	0
Thoreau Street Light - Scope 2							
Electricity	2	0	0	2	0.0	18	0
Subtotal Thoreau Street Light	2	0	0	2	0.0	18	0
Thoreau Street Lights - Scope 2							
Electricity	0	0	0	0	0.0	0	0
Subtotal Thoreau Street Lights	0	0	0	0	0.0	0	0
Thoreau Street Lights 2 - Scope 2							
Electricity	0	0	0	0	0.0	0	0
Subtotal Thoreau Street Lights	0	0	0	0	0.0	0	0
Subtotal Streetlights & Traffic Si	195	4	18	196	2.2	1,769	0
Water Delivery Facilities							
Concord, Massachusetts							
2nd Division Well - Scope 2							
Electricity	100	2	9	101	1.1	909	0
Subtotal 2nd Division Well - Sc	100	2	9	101	1.1	909	0
Annursnac Hill Reservoir - Scope 2							
Electricity	4	0	0	4	0.0	34	0
Subtotal Annursnac Hill Reser	4	0	0	4	0.0	34	0

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Detailed Report

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
Deaconness Water Treatment Plant - Scope 1							
Natural Gas	16	0	2	17	0.2	311	0
Subtotal Deaconness Water Ti	16	0	2	17	0.2	311	0
Deaconness Water Treatment Plant - Scope 2							
Electricity	167	3	16	169	1.9	1,521	0
Subtotal Deaconness Water Ti	167	3	16	169	1.9	1,521	0
Hugh Cargill Well - Scope 2							
Electricity	67	1	6	68	0.8	611	0
Subtotal Hugh Cargill Well - Sc	67	1	6	68	0.8	611	0
Irrigation - Peabody Fields - Scope 2							
Electricity	0	0	0	0	0.0	0	0
Subtotal Irrigation - Peabody F	0	0	0	0	0.0	0	0
Irrigation - Ripley Fields - Scope 2							
Electricity	1	0	0	1	0.0	8	0
Subtotal Irrigation - Ripley Fiel	1	0	0	1	0.0	8	0
Irrigation - Sanborn Fields - Scope 2							
Electricity	1	0	0	2	0.0	14	0
Subtotal Irrigation - Sanborn Fi	1	0	0	2	0.0	14	0
Jennie Dugan Well - Scope 2							
Electricity	61	1	6	62	0.7	557	0
Subtotal Jennie Dugan Well - S	61	1	6	62	0.7	557	0
Nagog Pond Ozone Facility - Scope 1							
Propane	16	0	3	16	0.2	257	0
Subtotal Nagog Pond Ozone F	16	0	3	16	0.2	257	0
Nagog Pond Ozone Facility - Scope 2							
Electricity	70	1	7	70	0.8	636	0
Subtotal Nagog Pond Ozone F	70	1	7	70	0.8	636	0

Government Greenhouse Gas Emissions in 2010
Detailed Report

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
Pine Hill Reservoir - Scope 2							
Electricity	3	0	0	3	0.0	25	0
Subtotal Pine Hill Reservoir - S	3	0	0	3	0.0	25	0
Robinson Well - Scope 1							
Natural Gas	0	0	0	0	0.0	1	0
Subtotal Robinson Well - Scop	0	0	0	0	0.0	1	0
Robinson Well - Scope 2							
Electricity	86	2	8	87	1.0	782	0
Subtotal Robinson Well - Scop	86	2	8	87	1.0	782	0
Rte 2A Pumping Station - Scope 1							
Natural Gas	14	0	1	14	0.2	259	0
Subtotal Rte 2A Pumping Stati	14	0	1	14	0.2	259	0
Rte 2A Pumping Station - Scope 2							
Electricity	9	0	1	9	0.1	78	0
Subtotal Rte 2A Pumping Stati	9	0	1	9	0.1	78	0
White Pond Well - Scope 2							
Electricity	74	1	7	74	0.8	669	0
Subtotal White Pond Well - Sc	74	1	7	74	0.8	669	0
Subtotal Water Delivery Facilities	689	12	65	695	7.9	6,670	0
Wastewater Facilities							
Concord, Massachusetts							
Assabet/Main St. Pump - Scope 1							
Natural Gas	3	0	0	3	0.0	54	0
Subtotal Assabet/Main St. Pun	3	0	0	3	0.0	54	0

Government Greenhouse Gas Emissions in 2010
Detailed Report

	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
Assabet/Main St. Pump - Scope 2							
Electricity	17	0	2	17	0.2	156	0
Subtotal Assabet/Main St. Pun	17	0	2	17	0.2	156	0
Bedford Street Pump - Scope 2							
Electricity	5	0	0	5	0.1	43	0
Subtotal Bedford Street Pump	5	0	0	5	0.1	43	0
Cousins Park Pump - Scope 2							
Electricity	4	0	0	4	0.0	37	0
Subtotal Cousins Park Pump -	4	0	0	4	0.0	37	0
Gifford Lane Pump - Scope 2							
Electricity	5	0	0	5	0.1	43	0
Subtotal Gifford Lane Pump - S	5	0	0	5	0.1	43	0
Laurel/Walden St. Pump - Scope 2							
Electricity	2	0	0	2	0.0	15	0
Subtotal Laurel/Walden St. Pu	2	0	0	2	0.0	15	0
Lowell/Keyes Rd Pump Station - Scope 2							
Electricity	95	2	9	96	1.1	865	0
Subtotal Lowell/Keyes Rd Pun	95	2	9	96	1.1	865	0
Park Lane Pump - Scope 2							
Electricity	7	0	1	7	0.1	60	0
Subtotal Park Lane Pump - Sc	7	0	1	7	0.1	60	0
Pilgrim Road Pump - Scope 2							
Electricity	3	0	0	3	0.0	26	0
Subtotal Pilgrim Road Pump -	3	0	0	3	0.0	26	0
Wastewater Treatment Plant - Scope 1							
Fuel Oil (#1 2 4)	46	0	7	46	0.5	624	0
Subtotal Wastewater Treatmer	46	0	7	46	0.5	624	0

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	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
Wastewater Treatment Plant - Scope 2							
Electricity	259	5	24	261	3.0	2,355	0
Subtotal Wastewater Treatmer	259	5	24	261	3.0	2,355	0
Subtotal Wastewater Facilities	445	8	44	448	5.1	4,278	0
Solid Waste Facilities							
Concord, Massachusetts							
Municipal Trash - Fitchburg Landfill - Scope 3							
Methane	0	0	-1,177	-25	-0.3	0	0
Subtotal Municipal Trash - Fitc	0	0	-1,177	-25	-0.3	0	0
School Trash - Fitchburg Landfill - Scope 3							
Methane	0	0	-2,028	-43	-0.5	0	0
Subtotal School Trash - Fitchb	0	0	-2,028	-43	-0.5	0	0
Subtotal Solid Waste Facilities	0	0	-3,205	-67	-0.8	0	0
Vehicle Fleet							
Concord, Massachusetts							
Building Division							
Gasoline	3	0	0	4	0.0	49	0
Subtotal Building Division	3	0	0	4	0.0	49	0
Cemetery							
Gasoline	8	0	0	8	0.1	119	0
Subtotal Cemetery	8	0	0	8	0.1	119	0
Concord Housing Authority							
Gasoline	18	0	0	18	0.2	254	0
Subtotal Concord Housing Aut	18	0	0	18	0.2	254	0

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	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	(%)	Energy (MMBtu)	Cost ($)
Concord Municipal Light Plant							
Diesel	57	0	0	57	0.6	777	0
Gasoline	38	1	1	38	0.4	537	0
OFF ROAD Diesel	6	0	0	6	0.1	86	0
OFF ROAD Gasoline	6	0	0	6	0.1	79	0
Subtotal Concord Municipal Li	107	2	2	107	1.2	1,479	0
Concord Public Works							
Diesel	43	0	0	43	0.5	581	0
Gasoline	4	0	0	4	0.0	58	0
OFF ROAD Diesel	21	1	1	21	0.2	286	0
OFF ROAD Gasoline	1	0	0	1	0.0	11	0
Subtotal Concord Public Work	68	1	1	69	0.8	937	0
Council On Aging/Veterans							
Gasoline	26	0	1	26	0.3	367	0
Subtotal Council On Aging/Vet	26	0	1	26	0.3	367	0
Fire Department							
Diesel	80	0	0	80	0.9	1,091	0
Gasoline	18	0	0	19	0.2	260	0
Subtotal Fire Department	98	1	1	98	1.1	1,350	0
Grounds / Park & Tree							
Diesel	51	0	0	51	0.6	702	0
Gasoline	15	0	0	15	0.2	208	0
OFF ROAD Gasoline	15	0	1	15	0.2	208	0
Subtotal Grounds / Park & Tre	81	1	1	81	0.9	1,118	0
Health Division							
Gasoline	1	0	0	1	0.0	10	0
Subtotal Health Division	1	0	0	1	0.0	10	0

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	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
Highway/Snow Division							
Diesel	76	0	0	76	0.9	1,044	0
Gasoline	51	2	2	52	0.6	725	0
OFF ROAD Diesel	115	3	7	116	1.3	1,566	0
Subtotal Highway/Snow Divisi	242	5	9	244	2.8	3,336	0
Library							
Gasoline	1	0	0	1	0.0	19	0
Subtotal Library	1	0	0	1	0.0	19	0
Natural Resources Division							
Gasoline	2	0	0	2	0.0	34	0
Subtotal Natural Resources Di	2	0	0	2	0.0	34	0
Police Department							
Diesel	0	0	0	0	0.0	4	0
Gasoline	191	6	8	193	2.2	2,696	0
Subtotal Police Department	191	6	8	194	2.2	2,700	0
School Department							
Diesel	100	0	0	100	1.1	1,368	0
Gasoline	72	2	2	73	0.8	1,019	0
OFF ROAD Diesel	6	0	0	6	0.1	84	0
Subtotal School Department	178	2	3	179	2.0	2,470	0
Town							
Gasoline	11	0	0	11	0.1	160	0
Subtotal Town	11	0	0	11	0.1	160	0
Water/Sewer Division							
Diesel	12	0	0	12	0.1	157	0
Gasoline	82	2	2	83	0.9	1,159	0
OFF ROAD Diesel	17	0	1	17	0.2	236	0
Subtotal Water/Sewer Division	111	2	3	112	1.3	1,552	0
Subtotal Vehicle Fleet	1,149	22	30	1,157	13.1	15,956	0

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	CO_2 (tonnes)	N_2O (kg)	CH_4 (kg)	Equiv CO_2 (tonnes)	(%)	Energy (MMBtu)	Cost ($)
Electric Power							
Concord, Massachusetts							
735 Main #223 - Scope 2							
Electricity	44	1	4	44	0.5	398	0
Subtotal 735 Main #223 - Scop	44	1	4	44	0.5	398	0
Forest Ridge Sub 219 #1 - Scope 2							
Electricity	10	0	1	10	0.1	89	0
Subtotal Forest Ridge Sub 219	10	0	1	10	0.1	89	0
Forest Ridge Sub 219 #2 - Scope 2							
Electricity	5	0	0	5	0.1	44	0
Subtotal Forest Ridge Sub 219	5	0	0	5	0.1	44	0
Williams Road Sub 479 #373 - Scope 2							
Electricity	4	0	0	4	0.0	38	0
Subtotal Williams Road Sub 47	4	0	0	4	0.0	38	0
Williams Road Sub 479 #374 - Scope 2							
Electricity	20	0	2	20	0.2	179	0
Subtotal Williams Road Sub 47	20	0	2	20	0.2	179	0
Subtotal Electric Power	82	1	8	83	0.9	748	0
Total	8,838	114	-2,452	8,822	100.0	113,933	0

Buildings & Facilities										
Facility	Elec. (kWh)	Cost	Nat. Gas (Therms)	Cost	Oil (Gals)	Cost	Propane (Gals)	Cost	CO2e	Total Cost
CMLP	430,560	$64,584.00								$64,584.00
141 Keyes Offices	97,680	$12,357.95	4,003	$6,886.85						$19,244.80
133 Keyes Offices	158,960	$19,955.36	10,244	$16,701.88						$36,657.24
133 Keyes Salt Shed	381	$161.78	4,721	$8,245.12						$8,406.90
135 Keyes Offices	89,600	$14,178.39	1,873	$3,474.66						$17,653.05
135 Keyes Garage	11,488	$1,703.70								$1,703.70
HWCC	114,080	$16,211.29	13,152	$18,446.93						$34,658.22
Town House	90,000	$11,548.07	6,580	$11,695.50						$23,243.57
Town House Chillers	11,545	$3,761.24								$3,761.24
Sleepy Hollow Maint Bldg	2,151	$407.51			1,466	$3,419.00				$3,826.51
Info Center	8,371	$1,280.76	709	$1,569.88						$2,850.64
Gun House	619	$195.61								$195.61
The Knoll	1,067	$258.89					602	$1,526.78		$1,785.67
Compost Site	266	$147.00								$147.00
Police/Fire	299,160	$34,746.51	14,609	$24,449.29						$59,195.80
Police/Fire Garage	1,198	$277.25	4	$265.62						$542.87
WC Fire	38,920	$5,530.06	8,174	$13,428.45						$18,958.51
Hunt Rec	93,360	$11,697.64	8,191	$15,007.09						$26,704.73
105 Everett	5,005	$807.65	435	$902.68	1,735	$5,255.41				$6,965.74
Beede Center	1,247,760	$115,281.40	45,634	$11,655.28						$126,936.68
Main Library	469,560	$55,992.60	15,887	$25,187.00						$81,179.60
Fowler Branch Library	44,200	$7,586.84	3,798	$6,296.00						$13,882.84
Tennis Courts - Thoreau St	11	$111.28								$111.28
Hunt Playground	3,621	$617.84								$617.84
Rideout Playground	4,924	$801.71								$801.71
	3,224,487	$380,202.33	138,014	$164,212.23	3,201	$8,674.41	602	$1,526.78	1,990	$554,615.75

Streetlights & Traffic Signals										
Facility	kWh	Cost	Therms	Cost	Oil (Gals)	Cost	Propane (Gals)	Cost	CO2e	Total Cost
Streetlights	657,598	$58,383.60								$58,383.60
Main Street Light	400	$165.43								$165.43
Main Street Traffic Signal	9,825	$1,477.82								$1,477.82
Main Street Traffic Signal 2	9,348	$1,411.91								$1,411.91
Main Street Traffic Signal 3	12,140	$1,801.10								$1,801.10
Old Marlboro Traffic Signal	74	$120.00								$120.00
Old Marlboro Traffic Signal 2	71	$119.61								$119.61

Thoreau St Traffic Signal	4,570	$748.79								$748.79
Thoreau Street Lights	79	$120.78								$120.78
Thoreau Street Lights 2	76	$120.36								$120.36
Thoreau Street Light	10,043	$1,518.41								$1,518.41
Lowell Road Light	1,254	$285.45								$285.45
Sudbury Road/117 Traffic Light	8,840	$1,354.44								$1,354.44
Annursnac Hill Radio Tower	3,787	$640.63								$640.63
	718,105	$68,268.33							272	$68,268.33

Water Delivery Facilities										
Facility	kWh	Cost	Therms	Cost	Oil (Gals)	Cost	Propane (Gals)	Cost	CO2e	Total Cost
Deaconness Water Treatment Plant	402,000	$43,931.43	2,124	$4,460.00						$48,391.43
Rte 2A Pumping Station	17,760		1,642	$3,448.00						$3,448.00
2nd Division Well	231,817	$26,560.44								$26,560.44
Jennie Dugan Well	143,261	$16,327.23								$16,327.23
Hugh Cargill Well	192,801	$21,453.00								$21,453.00
White Pond Well	179,440	$20,245.80								$20,245.80
Robinson Well	203,876	$22,966.69	6	$15.00						$22,981.69
Nagog Pond Ozone Facility	113,492						2,140	$4,066.00		$4,066.00
Pine Hill Reservoir (Acton)	8,553	$1,299.47								$1,299.47
Annursnac Hill Reservoir	9,905	$1,497.75								$1,497.75
	1,502,905	$154,281.81	3,772	$7,923.00				$4,066.00	601	$166,270.81

Wastewater Facilities										
Facility	kWh	Cost	Therms	Cost	Oil (Gals)	Cost	Propane (Gals)	Cost	CO2e	Total Cost
Wastewater Treatment Plant	647,680	$70,356.59			8,311	$22,853.00				$93,209.59
Assabet/Main St Pump	47,317	$6,694.81	700	$2,100.00						$8,794.81
Laurel St (Walden) Pump	4,545	$743.88								$743.88
Cousins Park Pump	11,077	$1,648.07								$1,648.07
Lowell/Keyes Road Pump	220,560	$30,656.96								$30,656.96
Bedford Street Pump	12,425	$1,844.14								$1,844.14
Park Lane Pump	17,848	$2,613.78								$2,613.78
Pilgrim Road Pump	12,879	$1,916.80								$1,916.80
Gifford Lane Pump	7,249	$1,126.67								$1,126.67
	981,580	$117,601.70	700	$2,100.00	8,311	$22,853.00			460	$142,554.70

Municipal Solid Waste										
Facility	tons	CH4 (lbs)	CO2e (tonnes)							

Municipal Trash - Fitchburg Landfill	214	-2627	-25							

Electric Power										
Facility	kWh	Cost	Therms	Cost	Oil (Gals)	Cost	Propane (Gals)	Cost	CO2e	Total Cost
Forest Ridge Sub 219 #1	26,803	$4,020.45								$4,020.45
Forest Ridge Sub 219 #2	13,435	$2,015.25								$2,015.25
Williams Rd Sub 479 #1	51,921.0	$7,788.20								$7,788.20
Williams Rd Sub 479 #2	11,686.5	$1,752.97								$1,752.97
735 Main - CMLP	117,040	$17,556.00								$17,556.00
	220,886	$33,132.87							247	$33,132.87

School Buildings & Facilities										
Facility	kWh	Cost	Therms	Cost	Oil (Gals)	Cost	Propane (Gals)	Cost	CO2e	Total Cost
Ripley Administration	414,640	$72,685.72	44,869	$12,798.68						$85,484.40
Willard Elementary	368,720	$43,194.53	45,920	$13,318.54						$56,513.07
Willard Lights	127	$127.63								$127.63
Willard Lights 2	130	$128.01								$128.01
Thoreau Elementary	806,760	$127,129.91	44,603	$12,616.31						$139,746.22
Alcott Elementary	695,160	$83,282.72	38,681	$11,255.62						$94,538.34
Peabody Middle	324,640	$52,957.57	47,968	$13,351.72						$66,309.29
Sanborn Middle	498,000	$81,619.58	41,750	$12,646.61						$94,266.19
CCHS	2,570,785	$254,736.87	150,482	$51,628.64						$306,365.51
CCHS Athletic Fields	21,007	$13,301.29								$13,301.29
	5,699,969	$729,163.83	414,273	$127,616.12					4,361	$856,779.95

School Water Delivery Facilities										
Facility	kWh	Cost	Therms	Cost	Oil (Gals)	Cost	Propane (Gals)	Cost	CO2e	Total Cost
IRRG - Peabody School Fields	50	$116.73								$116.73
IRRG - Sanborn School Fields	1,505	$268.11								$268.11
IRRG - Ripley Fields	1,189	$280.89								$280.89
	2,744	$665.73							1	$665.73

School Solid Waste										
Facility	tons	CH4 (lbs)	CO2e (tonnes)							
School Trash - Fitchburg Landfill	364	-4,460	-42							

Buildings & Facilities										
Facility	Elec. (kWh)	Cost	Nat. Gas (Therms)	Cost	Oil (Gals)	Cost	Propane (Gals)	Cost	CO2e	Total Cost
CMLP	478,320									
141 Keyes Offices	90,600		4,434							
133 Keyes Offices	152,560		9,510							
133 Keyes Salt Shed	437		4,517							
135 Keyes Offices	81,600		1,601							
135 Keyes Garage	11,207									
HWCC	119,040		14,035							
Town House	80,080		5,401							
Town House Chillers	9,796									
Sleepy Hollow Maint Bldg	4,192		188		670					
Info Center	7,902		655							
Gun House	541									
The Knoll	903						628			
Compost Site	748									
Police/Fire	279,080		13,250							
Police/Fire Garage	1,044		57							
WC Fire	34,341		6,875							
Hunt Rec	80,240		7,555							
105 Everett	4,475		150		1,183					
Beede Center	1,188,120		48,711							
Main Library	396,360		12,211							
Fowler Branch Library	37,600		3,077							
Tennis Courts - Thoreau St	0									
Hunt Playground	2,674									
Rideout Playground	3,853									
	3,065,713		132,227		1,853		628		1,886	

Streetlights & Traffic Signals										
Facility	kWh	Cost	Therms	Cost	Oil (Gals)	Cost	Propane (Gals)	Cost	CO2e	Total Cost
Streetlights	601,644									
Main Street Light	396									
Main Street Traffic Signal	8,724									
Main Street Traffic Signal 2	9,255									
Main Street Traffic Signal 3	11,811									
Old Marlboro Traffic Signal	69									
Old Marlboro Traffic Signal 2	64									

Thoreau St Traffic Signal	4,647									
Thoreau Street Lights	72									
Thoreau Street Lights 2	73									
Thoreau Street Light	8,848									
Lowell Road Light	1,214									
Sudbury Road/117 Traffic Light	8,218									
Annursnac Hill Radio Tower	3,433									
	658,468								249	

Water Delivery Facilities										
Facility	kWh	Cost	Therms	Cost	Oil (Gals)	Cost	Propane (Gals)	Cost	CO2e	Total Cost
Deaconness Water Treatment Plant	396,480		3,035							
Rte 2A Pumping Station	1,760		2,116							
2nd Division Well	218,554									
Jennie Dugan Well	135,961									
Hugh Cargill Well	154,626									
White Pond Well	180,968									
Robinson Well	268,016		5							
Nagog Pond Ozone Facility	151,984						2,176			
Pine Hill Reservoir (Acton)	5,433									
Annursnac Hill Reservoir	7,400									
	1,521,182		5,156				2,176		616	

Wastewater Facilities										
Facility	kWh	Cost	Therms	Cost	Oil (Gals)	Cost	Propane (Gals)	Cost	CO2e	Total Cost
Wastewater Treatment Plant	685,120				8,250					
Assabet/Main St Pump	34,582		815							
Laurel St (Walden) Pump	6,829									
Cousins Park Pump	10,921									
Lowell/Keyes Road Pump	221,440									
Bedford Street Pump	11,935									
Park Lane Pump	17,899									
Pilgrim Road Pump	10,844									
Gifford Lane Pump	6,521									
	1,006,091		815		8,250				469	

Municipal Solid Waste										
Facility	tons	CH4 (lbs)	CO2e (tonnes)							

Municipal Trash - Fitchburg Landfill	214	-2624	-25							

Electric Power										
Facility	kWh	Cost	Therms	Cost	Oil (Gals)	Cost	Propane (Gals)	Cost	CO2e	Total Cost
Forest Ridge Sub 219 #1	29,634									
Forest Ridge Sub 219 #2	13,094									
Williams Rd Sub 479 #1	58,350									
Williams Rd Sub 479 #2	11,837									
735 Main - CMLP	121,600									
	234,515								89	

School Buildings & Facilities										
Facility	kWh	Cost	Therms	Cost	Oil (Gals)	Cost	Propane (Gals)	Cost	CO2e	Total Cost
Ripley Administration	406,800		42,674							
Willard Elementary	399,840		35,902							
Willard Lights	114									
Willard Lights 2	88									
Thoreau Elementary	872,160		46,663							
Alcott Elementary	887,520		39,494							
Peabody Middle	327,200		46,751							
Sanborn Middle	520,200		74,597							
CCHS	2,482,291		164,695							
CCHS Transportation Bldg	25,350									
CCHS Athletic Fields	40,520									
	5,962,083		450,776						4,654	

School Water Delivery Facilities										
Facility	kWh	Cost	Therms	Cost	Oil (Gals)	Cost	Propane (Gals)	Cost	CO2e	Total Cost
IRRG - Peabody School Fields	48									
IRRG - Sanborn School Fields	2,399									
IRRG - Ripley Fields	617									
	3,064								1	

School Solid Waste										
Facility	tons	CH4 (lbs)	CO2e (tonnes)							
School Trash - Fitchburg Landfill	364	-4,466	-43							

Buildings & Facilities										
Facility	Elec. (kWh)	Cost	Nat. Gas (Therms)	Cost	Oil (Gals)	Cost	Propane (Gals)	Cost	CO2e	Total Cost
CMLP	442,320									
141 Keyes Offices	96,600		4,600							
133 Keyes Offices	148,400		9,703							
133 Keyes Salt Shed	810		4,620							
135 Keyes Offices	54,960		2,373							
135 Keyes Garage	12,017									
HWCC	125,440		12,650							
Town House	78,800		5,299							
Town House Chillers	15,618									
Assessor's Offices	9,938		394							
Info Center	7,888		694							
Gun House	282									
The Knoll	6,898						240			
Compost Site	206									
Police/Fire	299,280		14,362							
Police/Fire Garage	1,763		798							
WC Fire	44,132		3,557							
Hunt Rec	75,520		7,107							
105 Everett	4,109		158		1,181					
Beede Center	1,266,120		37,924							
Main Library	402,960		11,661							
Fowler Branch Library	20,720		3,222							
Tennis Courts - Thoreau St	0									
Hunt Playground	8,635									
Rideout Playground	6,321									
	3,129,737		119,122		1,181		240		1,833	

Streetlights & Traffic Signals										
Facility	kWh	Cost	Therms	Cost	Oil (Gals)	Cost	Propane (Gals)	Cost	CO2e	Total Cost
Streetlights	467,146									
Elm St. Streetlight @ CMLP Entrance	177									
Main Street Light	394									
Main Street Traffic Signal	9,553									
Main Street Traffic Signal 2	8,602									
Main Street Traffic Signal 3	9,429									
Old Marlboro Traffic Signal	66									

Old Marlboro Traffic Signal 2	62									
Thoreau St Traffic Signal	4,539									
Thoreau Street Lights	70									
Thoreau Street Lights 2	70									
Thoreau Street Light	5,165									
Lowell Road Light	1,160									
Sudbury Road/117 Traffic Light	8,453									
Annursnac Hill Radio Tower	3,527									
	518,413								196	

Water Delivery Facilities										
Facility	kWh	Cost	Therms	Cost	Oil (Gals)	Cost	Propane (Gals)	Cost	CO2e	Total Cost
Deaconness Water Treatment Plant	445,760		3,105							
Rte 2A Pumping Station	22,720		2,587							
2nd Division Well	266,310									
Jennie Dugan Well	163,254									
Hugh Cargill Well	179,150									
White Pond Well	196,162									
Robinson Well	229,122		7							
Nagog Pond Ozone Facility	186,236						2,822			
Pine Hill Reservoir (Acton)	7,292									
Annursnac Hill Reservoir	9,898									
	1,705,904		5,699				2,822		692	

Wastewater Facilities										
Facility	kWh	Cost	Therms	Cost	Oil (Gals)	Cost	Propane (Gals)	Cost	CO2e	Total Cost
Wastewater Treatment Plant	690,080				4,500					
Assabet/Main St Pump	45,756		539							
Laurel St (Walden) Pump	4,386									
Cousins Park Pump	10,714									
Lowell/Keyes Road Pump	253,440									
Bedford Street Pump	12,502									
Park Lane Pump	17,667									
Pilgrim Road Pump	7,588									
Gifford Lane Pump	12,743									
	1,054,876		539		4,500				448	

Municipal Solid Waste

Facility	tons	CH4 (lbs)	CO2e (tonnes)							
Municipal Trash - Fitchburg Landfill	212	-2595	-25							

Electric Power										
Facility	kWh	Cost	Therms	Cost	Oil (Gals)	Cost	Propane (Gals)	Cost	CO2e	Total Cost
Forest Ridge Sub 219 #1	26,123									
Forest Ridge Sub 219 #2	12,954									
Williams Rd Sub 479 #1	52,514									
Williams Rd Sub 479 #2	11,109									
735 Main - CMLP	116,480									
	219,180								83	

School Buildings & Facilities										
Facility	kWh	Cost	Therms	Cost	Oil (Gals)	Cost	Propane (Gals)	Cost	CO2e	Total Cost
Ripley Administration	412,960		42,737							
Willard Elementary	637,320		26,604							
Willard Lights	111									
Willard Lights 2	150									
Thoreau Elementary	854,160		38,341							
Alcott Elementary	816,000		38,421							
Peabody Middle	326,240		42,164							
Sanborn Middle	508,500		68,408							
CCHS	2,442,846		153,420							
CCHS Transportation Bldg	38,824									
CCHS Athletic Fields	34,680									
	6,071,791		410,095						4,477	

School Water Delivery Facilities										
Facility	kWh	Cost	Therms	Cost	Oil (Gals)	Cost	Propane (Gals)	Cost	CO2e	Total Cost
IRRG - Peabody School Fields	50									
IRRG - Sanborn School Fields	3,985									
IRRG - Ripley Fields	2,219									
	6,254								3	

School Solid Waste										
Facility	tons	CH4 (lbs)	CO2e (tonnes)							
School Trash - Fitchburg Landfill	365	-4,471	-43							