

# SECTION XII. ENERGY

## A. INTRODUCTION

The purpose of this chapter is to provide background information on the City of Concord's energy use, issues and concerns, and to provide recommendations as to how the City should prepare for energy related challenges now and into the future. As a result of significant reliance on fossil fuels, especially foreign oil, and mounting concerns about climate change, many public entities in the U.S. have made efforts to better understand and decrease their energy consumption of non-renewable energy. Community action is needed to prepare for energy supply and environmental changes in the years ahead.

Because Concord is located in a small state, at the end of nearly all fuel supply chains, much of the energy used in the community is susceptible to forces beyond local or even state control. In light of this vulnerability, it is in Concord's best interest to pursue energy conservation measures, and to explore energy sources that are more sustainable and less susceptible to external supply and price fluctuations.

In 2008, the state amended the master planning statute, adding New Hampshire Revised Statutes Annotated (RSA) 674:2(n), which allows and encourages master plans to include "an energy section, which includes an analysis of energy and fuel resources, needs, scarcities, costs, and problems affecting the municipality and a statement of policy on the conservation of energy." The Master Plan 2030 was adopted by the Planning Board in June 2008. The document will be amended to incorporate the Energy Chapter as part of Concord's Master Plan 2030.

For several years, Concord has demonstrated a civic commitment to saving energy, preserving the environment, increasing public awareness of energy issues and advancing green jobs. In 2008, the Concord City Council passed a resolution to endorse the United States Conference of Mayors' Climate Protection Agreement. Following this endorsement, the City also joined the Sierra Club's "Cool Cities" program, a collaboration of community members, organizations, businesses and local leaders charged with implementing clean energy solutions that save money, create jobs and help curb climate change. The City also joined the U.S. Environmental Protection Agency's New England Community Energy Challenge and the NH Office of Energy and Planning's Rebuild New Hampshire Partnership.

The Concord Energy and Environment Committee was established in April 2008 by the Concord City Council. It is charged with recommending best practices, public and private actions, and projects and programs the City can undertake to improve energy efficiency, air quality and prepare for climate change. Committee members are Concord residents volunteering their time and skills. The main initiatives supported by the Energy and Environment Committee include:

- ◆ Energy efficiency projects for public and private properties;
- ◆ Assisting the City in identifying projects and funding sources for energy projects;
- ◆ Recycling and composting;

- ◆ Renewable energy installations on city facilities;
- ◆ Alternative transportation planning and events;
- ◆ Supporting local agriculture and food sourcing; and
- ◆ Energy workshops

The Committee has also championed community-based programs such as the New England Carbon Challenge to help residents reduce their energy use, and the Pay-As-You-Throw program to reduce solid waste and increase recycling rates. The membership of the committee is comprised of two City Councilors and eleven community members, and its meetings are posted and open to the public. The City Council also established an internal committee on energy management and conservation in order to monitor energy use in municipal facilities. This committee has undertaken several energy and money-saving projects over the last decade which is described in more detail in Section F.

## **ENERGY GOALS**

- ◆ Maximize energy conservation and efficiency in the City of Concord in both the private and public sectors, to promote a sustainable future for Concord
- ◆ Encourage Concord residents, businesses and institutions to reduce their carbon footprint
- ◆ Increase the use of renewable energy systems within the City of Concord
- ◆ Promote regulations and policies that support sustainable land use

## **B. STATE ACTIONS RELATED TO ENERGY & CLIMATE CHANGE**

As a result of significant reliance on foreign oil and the mounting concerns about climate change, many state and local governments have recently made efforts to better understand and begin to manage energy consumption and the use of non-renewable energy in the U.S. Because of New Hampshire's concerns about climate change and its heavy reliance on imported energy, the state has also taken the following steps to help communities prepare for the future:

- 2007 – Governor Lynch signed an executive order creating a Climate Change Task Force and directing it to develop a state-wide *Climate Action Plan*.
- 2008 – The New Hampshire Legislature adopted an amendment to the state Planning Enabling Legislation indicating that a town's master plan may include an energy chapter.
- 2009 – *The New Hampshire Climate Action Plan, a Plan for New Hampshire's Energy, Environmental and Economic Development Future* (NHCAP) was completed and released. This plan is aimed at achieving the greatest possible reductions in

greenhouse gas emissions, while also providing the greatest possible long-term economic benefits to the citizens of New Hampshire. The plan found that a warming climate would increase the number of days over 100°F in the state from one per year to 23 by the latter half of this century, if aggressive steps are not taken to combat the causes of global warming. The plan further highlighted the effects of this temperature change, which would put New Hampshire on par with the current climate conditions of North Carolina (see Figure 2).

To address these dramatic changes, the Plan set two primary goals:

- A mid-term goal of reducing greenhouse gases to 20% below 1990 levels by the year 2025; and
- A long term goal of reducing greenhouse gases to 80% below 1990 levels by the year 2050

## D. ENERGY USE IN NEW HAMPSHIRE

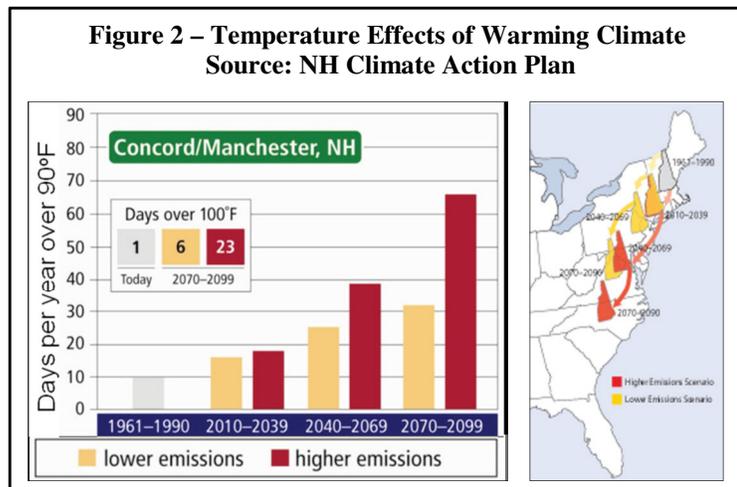
According to the US Energy Information Administration (USEIA), in 2010, New Hampshire had the eighth lowest total energy consumption per person in the country, at 224.4 million British Thermal Units (MMBtu). That is the equivalent of 1,967 gallons of gas consumed by each person in the state - every year.

By comparison, Rhode Island had the lowest per capita consumption, at 187.4 MMBTU/person. Wyoming had the highest, at 948.1 MMBTU. The per capita consumption average for the entire country was 315.9 MMBtu. (U.S. Energy Information Administration) Figure 1 shows the corresponding figures for the ten lowest per capita consumption states, which includes New Hampshire and nearly all of the other New England states.

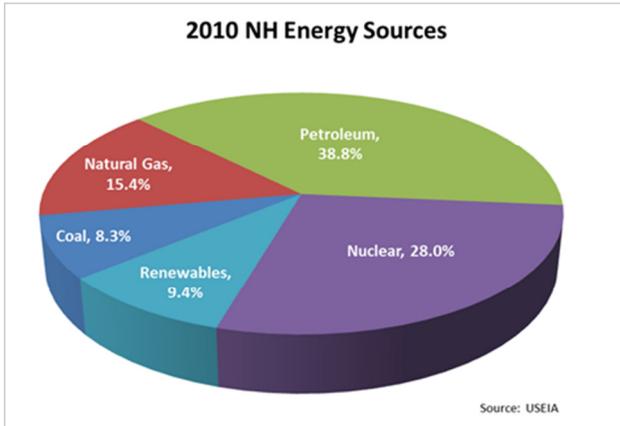
How do these numbers relate to Concord? Based on the state per capita consumption and the 2010 census population of 42,695, Concord residents use the energy equivalent of 84.0 million gallons of gasoline per year. Assuming that a typical car has a fuel efficiency of about 25 miles per gallon of gasoline, Concord residents use enough energy to drive over two *billion* miles every year – enough fuel to drive around the earth 84,300 times, or make 4,394 trips to the moon and back.

**Figure 1**

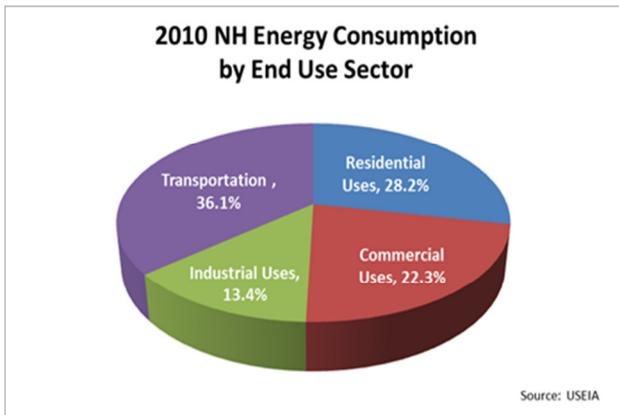
2010 Per Capita Energy Consumption by State (MBTU*)	
United States (Average)	315.9
Wyoming (Highest in U.S.)	948.1
Ten Lowest Consuming States in U.S.	
Vermont	235.9
Florida	232.6
<b>New Hampshire</b>	<b>224.4</b>
Arizona	218.2
Massachusetts	213.1
Connecticut	210.9
California	209.6
Hawaii	199.6
New York	192.2
Rhode Island (Lowest in U.S.)	187.4
*MBTU= Million British Thermal Units	



**Figure 3**



**Figure 4**



**Figure 5**

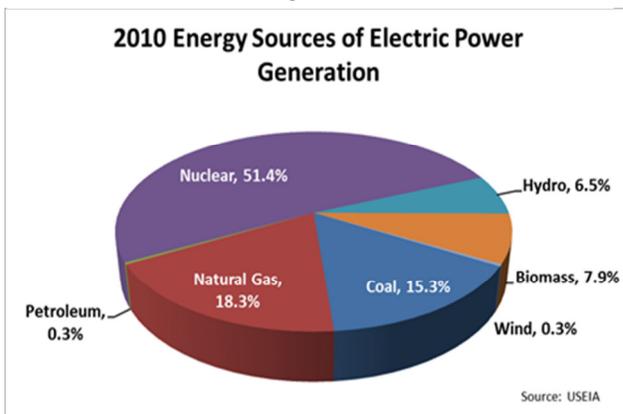


Figure 3 summarizes the state's major energy sources, highlighting the fact that nearly 40% of the state's energy comes from petroleum. Nuclear energy accounts for 28% and natural gas provides 15% of New Hampshire's needs. Currently only 9% of the state's power supply comes from renewable sources that include hydro, biomass (primarily wood), solar, wind and geothermal. It should be noted that renewables decreased by 1.9% between 2009 and 2010.

Figure 4 summarizes the state's end users by sector. Transportation accounts for 36% of all the energy used in the state. Residential uses consume 28%; commercial activity takes up another 22%, with industrial uses holding the smallest share at 13%.

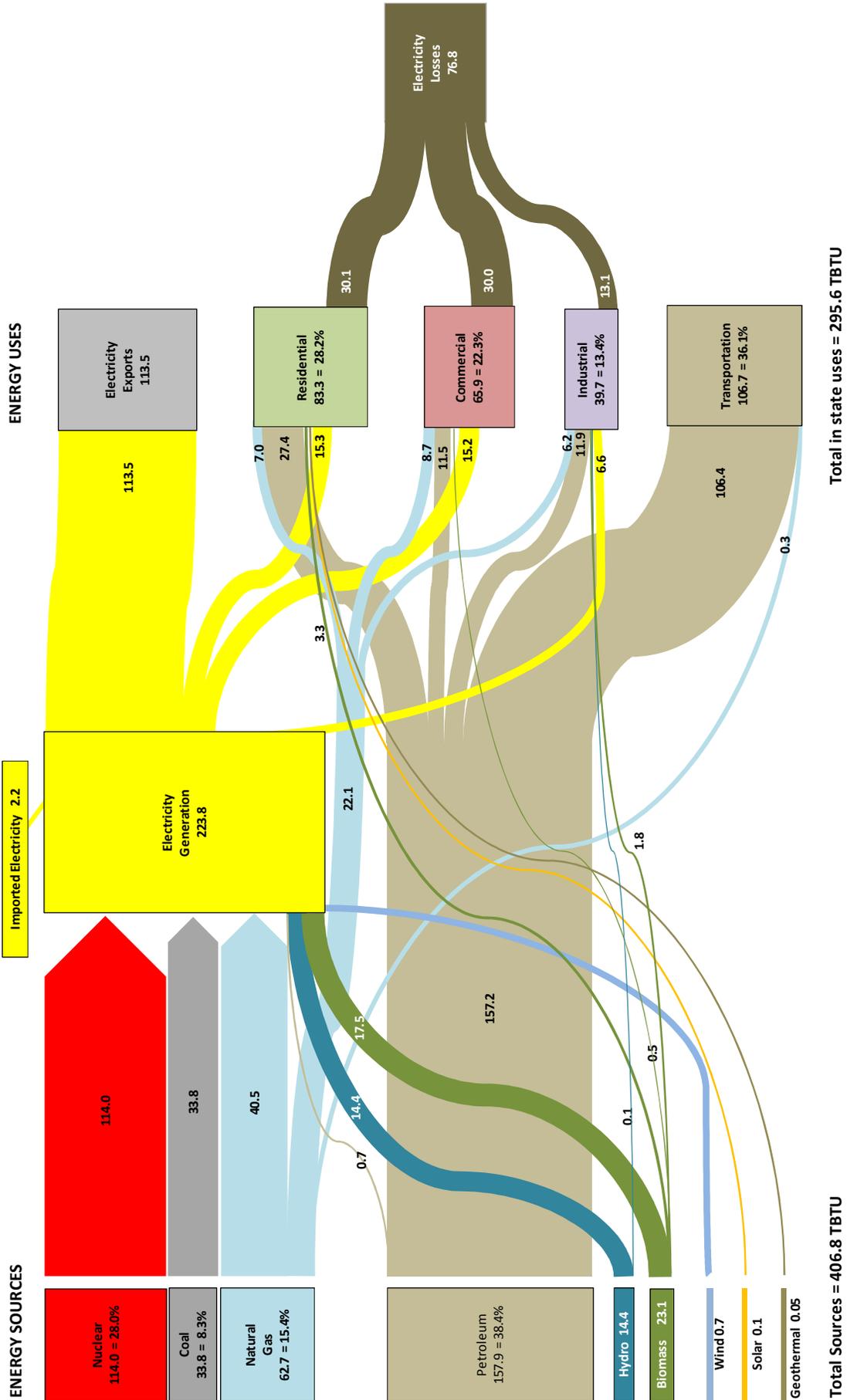
Figure 5 shows the sources of energy used to produce electricity in New Hampshire. Nuclear accounts for 51%, natural gas supplies 18%, coal provides 15%, and wood, wind and hydro contribute 15% collectively. While the state imports 1.0% of its electrical energy and exports 50.2% of the electricity generated statewide. This nearly equals the total electricity produced from nuclear power at the Seabrook power plant.

A comprehensive chart of the state's energy sources and uses can be found in Figure 6, New Hampshire Energy Flows 2010. This chart illustrates the following:

**Figure 6**

**New Hampshire Energy Flows -2010**

Total State Use: 295.6 Trillion British Thermal Units (TBTU)



- ◆ Electrical generation makes up nearly half of the energy supply produced in the state, and 51% of that is exported;
- ◆ Out of the total electricity that stays in the state, two-thirds of it is lost in electric generation and power transmission between the power source and the end user;
- ◆ 90.6% of the state's energy comes from non-renewable sources including: petroleum, nuclear, coal and natural gas;
- ◆ Between 2005 and 2010, NH's population grew from 1.304 million to 1.316 million residents, while net energy consumption declined from 335 trillion btu (Tbtu) to 295 Tbtu;
- ◆ Between 2008 and 2010 wind power production increased from 0.1 Tbtu to 0.7 Tbtu;
- ◆ The average NH resident consumed the equivalent of 1,967 gallons of gas per year, and of that, about 520 gallons were used for transportation; and
- ◆ NH vehicle registrations have grown from about 1.04 million vehicles in 2005 to about 1.22 million vehicles in 2010, yet transportation fuel use has declined from 834.4 million gallons gasoline equivalent to 676.8 million gallons.

Figure 6 indicates that New Hampshire produces only 9.4% of its own energy from local resources. While the state does generate a significant amount of electricity at the Seabrook Station Nuclear Power Plant, the nuclear fuel is brought in from elsewhere, and the electricity produced is largely exported out of state. Virtually all petroleum products are imported into the state (nationally 84% of petroleum is imported from abroad) for use by homes, businesses and transportation. New Hampshire's only native energy sources are wind, solar, hydro, geothermal and biomass (predominantly wood). New Hampshire does have policies in place to increase the use of renewable energy, including the Renewable Portfolio Standard (RPS). The RPS currently requires that 25% of the electricity sold in the state must come from renewable sources by 2025. In 2010, 14.7% of New Hampshire's net electricity came from renewable energy.

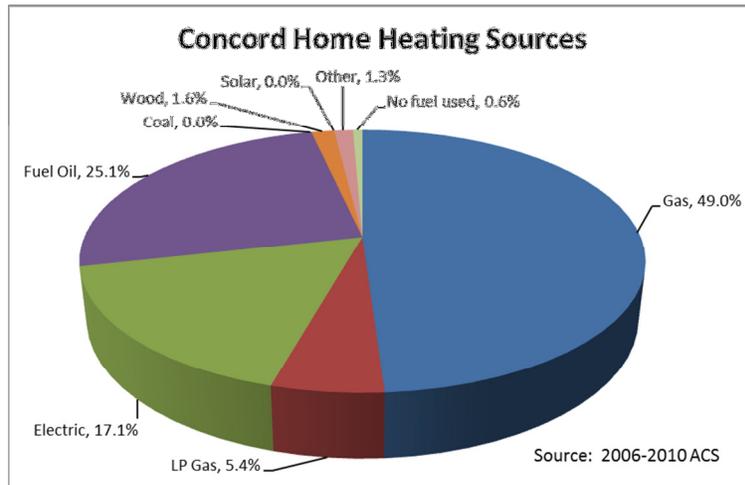
## **E. ENERGY USE IN CONCORD**

The actual energy use of Concord's residents, businesses and institutions is difficult to analyze because there is little city-specific information available. This section reviews the City's residential home heating information, overall gas use based on billing records from Liberty Utilities, and information from Unitil on the overall electricity consumption of homes, businesses and institutions within the City.

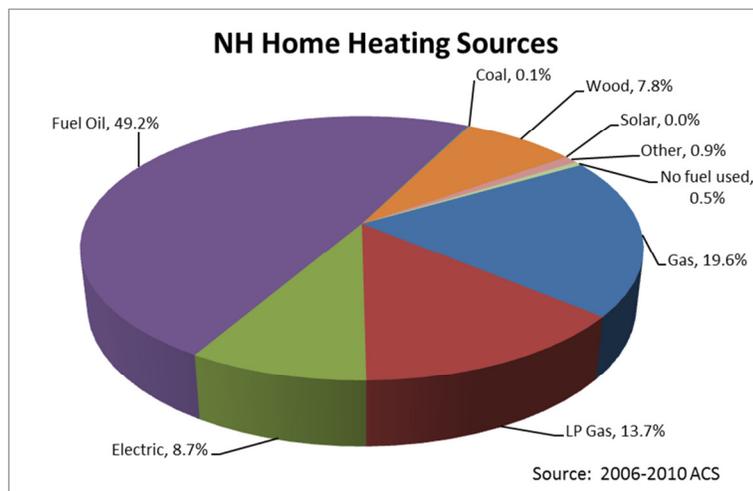
The U.S. Census American Community Survey estimates that 49% of Concord's households use natural gas to heat their homes and that only 25% heat with fuel oil. This is largely because the majority of Concord's population lives within the City's Urban Growth Boundary and therefore has access to piped natural gas. Statewide, approximately 49.2% of households heat their homes with fuel oil and only 19.6% use gas, and nationally, 49.5% of households are heated with natural gas and just 6.5% heat with fuel oil.

New Hampshire's dependence on fuel oil makes it highly vulnerable to fluctuations in price during the winter months. But because of Concord's access to natural gas, the City is less dependent than other communities in the state on fuel oil. In Concord, other home heating sources included electricity, liquid propane gas and wood.

**Figure 7**



**Figure 8**



Liberty Utilities, which provides piped natural gas, to the City, estimates that Concord consumed 23,990,293 Therms (energy units) of natural gas in 2011. Approximately 36.9% of the gas consumed was for residential home heating or other residential non-heating purposes, and the remaining 63.1% was consumed by Concord's businesses, industries and institutions.

According to the billing records provided by Unitil, the City used 473,858,826 kWh of electricity in 2011, which is the Btu equivalent of 14.2 million gallons of gasoline. Some of the largest electricity users were the municipal water and wastewater treatment plants. 49.63% of the

energy consumed was from commercial accounts, 24.94% was from residential accounts, 15.11% was from municipal and state accounts and 10.32% was from industrial accounts. Overall the City would need approximately 54.08 MW of power to operate at any given point in time. The total power produced within the city equals approximately 40.5 MW.

## **1. Local Energy Supply**

Electricity – Unitil Energy Systems supplies electricity to most of Concord. Unitil currently has 25,444 customers within Concord, including 21,859 residential accounts, 3,292 commercial accounts, 275 state/municipal accounts and 18 industrial accounts. Only one residence in Concord is served by Public Service of New Hampshire (PSNH).

Natural Gas – Liberty Utilities provides piped natural gas service to approximately 40% of the total land area within the City. The gas company reports that in 2011 there were 11,903 meters for natural gas in the City.

Steam – Concord Steam Company (CSC) provides piped pressurized steam for heating properties in downtown Concord, the New Hampshire State Office Park South and buildings along the west side of Pleasant Street to the St. Paul's School campus. The steam generating plant is currently located south of Pleasant Street at the State Office Park South. CSC is planning to relocate to a new steam plant off of Langdon Avenue, which. The new steam plant would be an 18 Megawatt (MW) wood-fired co-generation facility. Construction is anticipated to begin in 2013.

Fuel Oil/Propane – Several small suppliers in central New Hampshire deliver fuel oil and propane gas to homes primarily in the more rural areas of Concord. The American Community Survey (2006-2010) indicated that there were 985 households who heated their homes mainly with propane and 4,575 households who used fuel oil as their primary home heating source.

Fuel Gasoline/Diesel – Vehicle registrations in Concord declined from about 47,100 in fiscal year 2006 to about 45,000 in fiscal year 2010, which reflects decreased registrations and fuel use state-wide for the same time period.

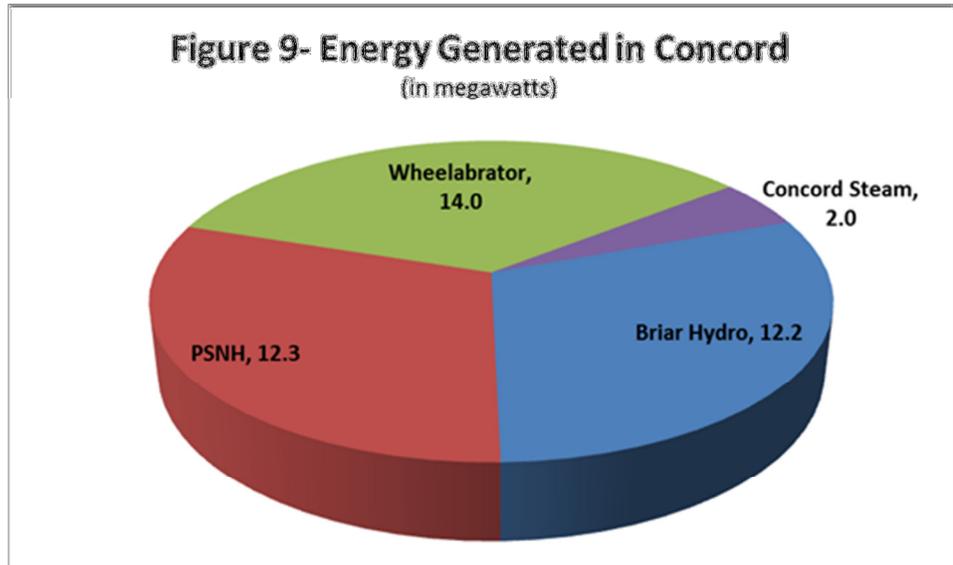
## **2. Power Generated in Concord**

The power generated in Concord today equals approximately 40.5 MW, or 74.9% of the 54.08 MW of demand. There is the potential to generate an additional 16 MW when the new Concord Steam facility is constructed. Concord contains a variety of generators of electricity: hydropower along the Merrimack and Contoocook Rivers; a waste-to-energy plant; a co-generation facility; and several small-scale biomass operations. Concord is unique in that all locally generated power is not dependent on foreign imports.

Hydropower – Hydropower generated in Concord consists of the Briar Hydro facilities in Penacook and the Public Service of New Hampshire (PSNH) dam at Garvins Falls. Both of these facilities operate under a Federal Energy Regulatory Commission License. The Briar Hydro operation in Concord includes two facilities along the Contoocook River, and one at the confluence of the Contoocook River and Merrimack River. These small hydro stations produce a total of 12.2 MW of electricity. The PSNH Garvins Falls Dam facility is located on Merrimack River at the Bow/Concord town line, and produces approximately 12.3 MW of electricity annually.

Waste to Energy – Wheelabrator Concord Company operates a waste-to-energy facility on Whitney Road. The operation includes two mass burning furnace/boiler processing trains that have the capacity of processing up to 500 tons of solid waste per day. The facility produces a high pressure steam that is used to generate electric power and produces approximately 14 MW of electricity annually.

Co-generation– Concord Steam Company operates a wood-fired boiler that generates high pressure steam that is primarily used for heating, but is also used for sterilizing, cleaning, cooking, and creating chilled water for air conditioning. In addition, the steam is used to generate approximately 2 MW of electricity through a combined heat and power system. The facility burns green woodchips, clean wood waste, recycled waste oil and natural gas.



Other Small Energy Producers –There are several small wood biomass heating facilities in Concord. The Merrimack Valley School District has installed a wood chip heating system that produces approximately 6.74 MMBtu/hour and supports the heating demands of a 230,000 sq. ft. building. The wood chip furnace burns approximately 636 tons of wood chips annually. The New Hampshire Audubon McLane Center and the Society for the Protection of New Hampshire Forest also have wood fueled boilers for heating and domestic hot water, and procure the wood products locally. There may be other small biomass generators in the City.

## F. MUNICIPAL ENERGY USE

In 2004, the City of Concord undertook its first audit of municipal energy use. A second audit was completed in 2011. Both studies included all of the municipal buildings, pedestrian crossing signals, wastewater treatment and water treatment plants and pumps. However the audits did not take into account traffic signals or street lights operated by Unitil.

The audits identified energy conservation measures that had been put in place, and provided a benchmark from which to measure the effectiveness of future energy reduction efforts. The table below consolidates the information from the 2011 audit, by combining related facilities, such as fire stations and buildings within the City Hall complex. The table illustrates the estimated annual municipal energy costs by facility, and also shows usage and efficiency.

City of Concord, NH Annual Energy Consumption Summary									
Name of Facility	Modeled	Electricity	Natural Gas	#2 Fuel Oil	Steam	Water & Sewer	Annual Energy Use		Simulated
	Building Size						MMBtu/yr	BTU/s.f.	Baseline Use (at Stipulated Rates)
	sq. ft.	kWh	Therm	Gallon	MLb	CCF			\$
Fire Department Facilities (Stations & Headquarters)	33909	527550	44727			1128	6274	1095538	\$131,635.00
Police Station	19825	326432			608	323	1723	86886	\$65,706.00
Parking Garages	360986	588352					2008	16386	\$65,975.00
City Hall Complex	52840	489648	136		1828	701	3513	226666	\$88,655.00
Library (including Penacook Branch)	3837	200490		1470	932	294	1820	118118	\$72,764.00
COMF	80032	416200	51363			433	6557	170556	\$127,817.00
Maintenance Shop	7680	50458	3550				527	68648	\$10,166.00
Green Street Community Center	15800	65286			614	220	837	52982	\$20,988.00
West Street Ward House	6793	576366	2310			22	2198	323588	\$88,837.00
East Concord Community Center	7140	596282	9265			24	2962	414788	\$93,317.00
Welfare Office	5056	588896	11144	8		117	3125	618152	\$95,412.00
White Park - Recreation Office and Skate House	6640	35564	5207	1380		35	833	432671	\$15,777.00
Misc. Parks & Cemeteries	10000	206931	3015			2110	1008	100774	\$44,726.00
Pedestrian Signals	10000	171095	5243				1108	110830	\$28,514.00
Airport Terminal & Hangers	46629	95974	9089	1220		113	1405	153245	\$136,696.00
SRE Building	4200	7868		2418		1	362	86171	\$8,803.00
Golf Course	7988	85122	5086	1500		268	1007	508898	\$131,621.00
Ice Arena	28935	375262	15875			1128	2868	99128	\$36,613.00
Water Treatment Plant & Pumps	40571	2621194	21900	5341		10025	11876	10809574	\$564,305.00
Wastewater Treatment Plant - Hall Street	53400	3139386	47472			15599	15462	289549	\$226,835.00
Wastewater Treatment Plant - Penacook	13200	734400	9745			522	3481	263713	\$112,260.00
East Concord Wastewater Pump	3440	585189	2384	6			2236	650125	\$89,684.00
<b>Total</b>	<b>818901</b>	<b>12483945</b>	<b>247511</b>	<b>13343</b>	<b>3982</b>	<b>33063</b>	<b>73190</b>		<b>\$2,257,106.00</b>

Based on the model created for the audit, the total annual energy costs including non-building related expenses was \$2,257,106. The most expensive energy user was the water treatment plant and the related water pumping stations, at 11,876 MBtu per year, with an annual cost of \$564,305. The municipal buildings, which contain a total of 722,746 square feet, cost \$1,118,574 annually in energy related expenses, and consumed 73,190 MBtu per year. The most energy intensive building was the welfare office, at 618,152 Btu per square foot which is a measurement of the energy expended per square foot to heat, cool and provide electricity to an area. The welfare office was relocated in the fall of 2012 to a newer, more energy efficient structure.

In addition to completing the energy audit, the City entered into performance contracts with Energy Service Companies (ESCOs) in order to ensure that conservation measures that were implemented would result in a guaranteed cost savings that met or exceeded the cost of improvements. Concord has completed three phases of improvements that collectively save \$269,513 per year. The fourth and fifth phases are currently being implemented and once complete, will provide an additional annual savings of \$62,746.

The following timeline summarizes the major energy conservation efforts the City has undertaken regarding its municipal facilities and equipment:

- ◆ 2004 -- The City contracted with Siemen's Building Technologies, Inc. to complete an Investment Grade Energy Audit and Energy Improvement Plan for City Hall, City Hall Annex, Concord Police Department, Concord Public Library, Green Street Community Center, Combined Operations and Maintenance Facility (COMF), and the Hall Street Wastewater Treatment Plant. The Energy Improvement Plan currently includes four phases of improvements, and also included assistance to the City for the purchase of electricity and natural gas. The audit set the benchmark for municipal energy use, and provided recommendations for improvements that would reduce the City's energy consumption and carbon footprint. It also calculated the energy savings payback period for proposed improvements.
- ◆ 2004 –The City joined the Rebuild New Hampshire Partnership, an initiative of the New Hampshire Governor's Office of Energy and Community Services, which helps communities improve the efficiency of their buildings in collaboration with the U.S. Department of Energy.
- ◆ 2005 – The City Council passed a resolution to appropriate \$1.6 million for the implementation of Phase 1 & 2 of the Energy Improvement Plan, and appropriated an additional \$155,000 for improvements to the Everett Ice Arena. Collectively, the proposed improvements had a payback period of approximately 7.9 years.
- ◆ 2010 – The City contracted with ConEdison Solutions to conduct a second investment grade energy audit, in order to identify energy savings improvements that would be self-sustaining over a 10 to 15 year financing period. The second audit identified the third and fourth phases of improvements.
- ◆ 2011 – The City completed Phase 3 of the proposed energy improvements identified in the ConEdison Solutions report. This work cost approximately \$435,095, but was largely paid for by \$374,372 of American Recovery & Reinvestment Act funds and \$25,578 of N.H. Public Utility Commission incentive funds and utility rebates. Phase 3 will generate an additional \$47,685 in guaranteed annual savings, with an overall return on investment of 9.1 years
- ◆ 2011 - The City entered into a long-term power purchase agreement with a third party for the purchase of approximately 40% of its electricity requirements from Concord Power and Steam once its new wood-burning biomass facility is complete. This electricity will be 100% renewable power.

- ◆ 2012 – The City is developing the Phase 4 and 5 energy improvement plans, which will be included in the 2013 – 2022 Capital Improvement Plan. These phases will cost a total of \$627,349, and will generate an additional \$62,746 in guaranteed annual savings, with a 10 year return on investment.

Summary of Municipal Energy Improvements		
Energy Improvement Plan	Program Cost	Guaranteed Annual Energy Cost Savings
Phase 1	\$196,097	\$32,371
Phase 2	\$1,598,094	\$189,457
Phase 3	\$435,095	\$47,685
Phase 4	\$571,082	\$47,685
Phase 5	\$56,267	\$7,814
Total	\$2,856,635	\$325,012

Phase 1 – This work included \$196,097 of energy improvements at the Everett Ice Arena with a guaranteed annual energy savings of \$32,371 and a guaranteed annual savings of 272,969 kWh of electricity and 4,812 therms of natural gas. The improvements included the following:

- Lighting system upgrades throughout the facility;
- Installation of new low-e (reflective) ceiling at the arena; and
- Replacement of the compressor, ice temperature set-back and de-humidifier controls and variable frequency drives.

Phase 2 – The second phase of improvements included a variety of lighting and system upgrades at several city-owned facilities. The improvements cost \$1,598,094 with a guaranteed annual energy savings of \$189,457. The work included the following:

- Lighting system upgrades installed city-wide (municipal complex, library, Combined Operations and Maintenance Facility (COMF), police station, wastewater treatment plant, fire stations, parking garages);
- The conversion of the COMF from propane to natural gas;
- Heating and cooling equipment upgrades at City Hall, Police Station, Library, Hall Street Wastewater Treatment Plant and COMF including demand control ventilation, expansion of energy management system, motor replacements, installation of variable frequency drives, boiler replacements and exhaust fans;
- Installation of drop ceilings at the COMF; and
- Replacement of pumps at the Hall Street Treatment Plant.

Phase 3 – The third phase of improvements cost \$435,095 with an annual energy savings of \$47,685. The improvements included the following:

- Installation of eight anti-idling devices in city-owned vehicles to save 3,000 gallons of gasoline annually and 32,378 pounds of carbon dioxide reduction;

- Review of 3,587 light fixtures and replacement of 982 fixtures with more efficient lamps;
- Replacement of 116 incandescent pedestrian crosswalk signal light modules with LED light modules and replacing 42 incandescent crosswalk signals with LED countdown displays;
- Installation of solar thermal domestic hot water systems at three fire stations and the Hall Street Wastewater Treatment Facility;
- HVAC upgrade at the Heights fire station; and
- Re-lamping of all municipal traffic signals with energy efficient fixtures.

Phase 4 – The fourth phase of energy improvements is currently being implemented at a cost of \$571,082 with guaranteed annual energy savings of \$54,932. The improvements include the following:

- Upgrades to the HVAC systems in the 3 buildings at Fire Department Headquarters and adding these buildings to the City’s energy management system;
- Upgrades to the HVAC systems at the Water Treatment Plant and adding this facility to the City’s energy management system;
- Upgrades to the HVAC systems at the Penacook Wastewater Treatment Facility and adding this facility to the City’s energy management system.

Phase 5 – The fifth phase of energy improvements is currently being implemented, without the assistance of the ESCO, at a cost of \$56,267. This phase has an estimated annual energy savings of \$7,814. The improvements include the following:

- Conversion of the heating systems from #2 fuel oil to natural gas at the Snow Removal Building at the Concord Municipal Airport, Beaver Meadow Golf Course maintenance building, Blossom Hill Cemetery maintenance building and potentially the Penacook Branch Library.

The City has also implemented a purchasing policy that requires the acquisition of energy efficient equipment and appliances with Energy Star certification whenever possible. The Energy Star Program is a joint program between the U.S. Environmental Protection Agency and the U.S. Department of Energy to promote energy efficient products.

Adding up all of the building energy efficiency improvements completed by the City, annual savings of \$325,012 are being achieved based on total energy improvement expenditures of \$2,856,635, resulting in an 8.8 year payback on these energy efficiency investments.

#### Efficiency Improvements to the City Fleet

In addition to the energy improvements the City has made to municipal buildings and infrastructure, it has implemented a fleet efficiency plan to reduce fuel consumption and vehicle miles traveled (VMT).

The City has purchased two compressed natural gas (CNG) Ford Transit Connect Vans, in part through using American Recovery Reinvestment Grant (ARRA) funds received through the New Hampshire Department of Environmental Services. The City contributed \$41,852 for the purchase of the vehicles and the ARRA grant contributed \$25,540 for the purchase and

installation of the CNG conversion kits. Concord purchases compressed natural gas from the State of New Hampshire facility on Stickney Avenue, which is currently the only CNG fueling facility in the region. The City is also exploring other opportunities to use vehicles that use alternative fuels.

The City has worked to reduce fuel consumption through improved operations and maintenance of the fleet. Vehicles have been right-sized and maintenance and vehicle routing have been optimized in order to reduce vehicle miles traveled (VMT) and fuel use. The Purchasing Department also requires fuel economy specifications for all new bids.

Police Vehicle Fuel Consumption							
Fiscal Year	2007	2008	2009	2010	2011	2012	Average
Gasoline (Gallons)	58,001	52,820	45,648	48,083	47,532	47,661	49,958

The City has adopted an engine anti-idling policy for all Fire, Police and General Services vehicles, and anti-idling signs have been posted at City facilities. The anti-idling policy will reduce the amount of fuel consumed by parked vehicles. The table above illustrates a declining trend in fuel consumption by the police vehicle fleet between 2007 and 2012 fiscal years.

## **G. PLANNING FOR ENERGY REDUCTION AND SUSTAINABILITY**

### **1. Land Use**

Concord's land use policies and regulations have a key role to play in reducing residents' demand for transportation-related energy by reduce the distances residents need to travel within the City to get goods and services. A dispersed pattern of low-density development relies almost exclusively on cars as the primary mode for transportation, while denser urban centers like downtown Concord and some other neighborhoods combine different land uses in closer proximity, which residents can access without needing their cars

In 1993 the City established the Urban Growth Boundary (UGB) as a policy to differentiate land that that should remain rural with sparse development from land that would be more densely developed. The goal of the UGB is to limit sprawl and to direct new development to growth centers in the City while also preserving the land and natural resources outside of the UGB. Planning for higher density residential development coupled with mixed land uses that are typically found in village centers will help to reduce Vehicle Miles Travelled (by increasing the number of destinations and public transit stations within walking and bicycling distance of residential development.

Mixed uses, together with higher density single family, duplex and multifamily residential uses are encouraged in several zoning districts in Concord: General Commercial, Urban Commercial, Central Business Performance, Neighborhood Commercial, Civic Performance, Institutional, and Urban Transitional. Multifamily residential development is also permitted in the Downtown Residential District and High Density Residential Districts.

The City's zoning ordinance also includes an Opportunity Corridor Performance District, which focuses on the redevelopment and reuse of underutilized land and buildings within the Urban Growth Boundary. Overall, the current zoning supports the density and mix of land uses that will help to reduce Concord's energy demand in the future. The Land Use Chapter of the Master Plan provides a more detailed discussion of Concord's existing and future land use.

## **2. Transportation**

Transportation systems and land use patterns influence each other. Roads, transit, and other transportation elements shape land development, while the distribution and types of land uses affect travel patterns and transportation facilities. Nationally, the transportation sector is the second largest source of greenhouse gas emissions and is the fastest growing sector concerning greenhouse gas emissions (with a projected 102% increase by 2030).

New Hampshire ranks 44th (sixth from the bottom) in terms of transportation sector energy consumption, by burning 106.7 trillion BTUs in 2010. New Hampshire's high transportation sector energy consumption can be attributed to the predominately rural nature of the region, as well as a lack of the infrastructure needed to support alternative transportation options other than motorized vehicles.

Major strategies to reduce greenhouse gas emissions from the transportation sector include: establishing land use and transportation policies that reduce the reliance on the automobile, as indicated by the previous section; improving the efficiency of the automobile; and providing the appropriate infrastructure for alternative fueled vehicles.

The City has demonstrated a commitment to improving the availability of alternative modes of transportation. In 2009, the City Council adopted a "Complete Streets" initiative committing the City *"To design, build and operate its roads and streets to safely accommodate all users and modes of Transportation."* Since the policy was adopted, efforts have been made to improve the existing transportation systems so they could better accommodate walking, bicycling, carpooling and public transit and so could help residents shift more easily to these less energy-intensive modes of transportation. Small shifts toward each of these modes for short and longer trips will have cumulative effects in reducing energy use and greenhouse gas emissions.

Approximately 20% of Concord residents travel to work using a mode other than the single occupancy vehicle, and their most frequent alternative transportation choices are carpooling (9.0 %) and walking (4.8 %). This reflects the City's commitment to developing livable, walkable neighborhoods.

Public transportation within the City is provided by Concord Area Transit (CAT), which operates a fixed route transit service which serves the general public and also operates a Senior Transit System and ADA para-transit service.

Because Concord is also the hub of the state and county government, it is a destination that serves many commuters outside of the community and region. Regional inter-city bus service is provided by Concord Trailways from the Stickney Avenue Station, with service to Manchester and Boston. Vermont Transit Lines provides limited bus service from Concord to White River Junction, Vermont and Boston. Peter Pan Bus Lines also provides limited service to points south of Concord. With continued need for access to Boston for both jobs and recreational opportunities, the demand for bus service will continue to grow.

New England Southern Rail operates a small freight yard on the New Hampshire Main Line. There is no commuter rail service to Concord, but the state continues to study the possible extension of commuter rail to the Massachusetts Bay Transportation Authority (MBTA) station in Lowell, Massachusetts. Phase 1 of the Boston to Montreal High-Speed Rail (BMHSR) Feasibility Study was completed in 2002 and identified Concord as a potential station location on the BMHSR corridor. The State has also established the New Hampshire Rail Transit Authority and has a State Rail Plan. The City and Central New Hampshire Regional Planning Commission participate in the ongoing planning efforts regarding transit that are identified in this plan and other documents.

Two Park & Ride facilities serve the transportation needs of a number of area residents who ride-share. One is located at Exit 14 off Interstate 93 and the other is at Exit 2 off Interstate 89. There are also two Park & Ride facilities in neighboring towns that are widely used. The first is at the junction of Interstates 89 and 93 at the Bow town line and the second is located off of exit 17 in Canterbury

The Interstate 93 facility (340 spaces) is consistently at 90-95 % occupancy, while the I-89 facility (100 spaces) fluctuates at 65-75 % occupancy. The Concord Bus Terminal is at the center of the Exit 14 Park & Ride, and services CAT and all intercity bus services. Use of the Park & Ride facilities correlate roughly with the fluctuation of fuel prices, especially when gas prices spike upwards rapidly.

Concord needs to plan for the increased use of alternative fuel vehicles. There are currently between 20 and 30 plug-in cars in Concord, which is an increase from 2010, when it was estimated that there were less than five in the City. Two electric vehicle charging stations were installed at both the Grappone Conference Center and the Radison Hotel. They were the first charge stations to be installed in the State. Concord will be an important electric vehicle charging location because of its location at the junction of Interstate 89 and Interstate 93. At this time, the City's regulations neither require nor discourage the installation of electric charging stations in private parking lots.

The State has recently constructed a compressed natural gas (CNG) fueling station off of Stickney Avenue. This facility primarily serves state and city vehicles, but will also serve private CNG vehicles. The City's recently purchased Ford Transit Connect CNG vans will refuel at this facility.

### **3. Land Conservation**

The City of Concord contains 67.41 square miles of land and water. Approximately one-third of this area is located within the Urban Growth Boundary (UGB), and the remaining two-thirds is located outside of the UGB. The outlying land is mainly rural in character and includes large tracts of undeveloped land. Without land use policies to properly guide new development in the rural areas, this land could easily be developed into sprawling subdivisions that would generally increase the vehicle miles travelled (VMT) of the average Concord resident.

In order to achieve the mixed-use, compact land development pattern within the UGB that is envisioned by the Master Plan, the City has implemented zoning and land use policies to encourage the preservation of open space and the clustering of residential development in the rural areas. In 2007, the City Council mandated the clustering of residential subdivisions in the Residential Open Space (RO) District. The RO District includes almost all of the land outside of the UGB. The cluster subdivision standards require that a minimum of 60% of the tract of land to

be subdivided will be set aside as open space, and also provides for reduced lot size and road frontage requirements in order to encourage more compact development. At this time over 600 acres have been permanently protected as open space through the cluster subdivision review process.

The City has also implemented policies to aid in the purchase of conservation land. The City has established a dedicated conservation trust fund pursuant to RSA 36A for the purchase and management of open space. At this time, 50% of the revenue from the land use change tax is placed in this conservation fund. In 2002, the City Council also appropriated \$5,000,000 in bonds and notes to the fund that the Conservation Commission may use to purchase land, subject to authorization by the City Council. As of 2013, approximately 6,000 acres of land, or 15.6% of the City has been permanently protected as open space. Chapter VII, Conservation and Open Space, of the Master Plan provides more detailed recommendations on land protection efforts in Concord.

An important benefit of land protection is that forested land serves as a carbon sink by removing CO<sub>2</sub> from the atmosphere through photosynthesis. In New Hampshire, 25% of the state's annual manmade CO<sub>2</sub> emissions are taken up by forested land. (EPA State and Local Greenhouse Inventory Tool, NH Climate Action Plan, Appendix 4.7) The New Hampshire Climate Action Plan recommends that forest land should be managed in a sustainable manner, and should be protected from conversion to non-forested uses. Approximately 20% of global manmade CO<sub>2</sub> emissions are caused by the conversion of forest land to non-forested uses. (NH Climate Action Plan)

There are 26 city-owned forests in Concord, comprising approximately 5,000 acres. This land is managed by the Conservation Commission with the guidance of a sustainable forest management plan to ensure that the forestry resources are preserved for future generations. The City also actively seeks to purchase additional forest land, in order to enlarge the existing tracts of protected open space in Concord, which means that this land will continue to serve as a carbon sink for the central New Hampshire region.

#### **4. Site and Building Design**

The City acts to reduce the energy demand of new development through the Site Plan Review processes. The City's land use regulations require shade tree plantings in parking lots; set minimum standards for internal landscaping within large parking areas; establishes maximum lot coverage requirements for impervious surfaces within in each district; requires accommodations for pedestrian circulation and sidewalk construction; and provides standards for stormwater management and infiltration.

The City also works to reduce energy demand through its building code and the building permit process. In 2010, both the State and the City adopted the 2009 International Energy Conservation Code (IECC). The 2009 IECC increased the requirements for residential wall insulation from R-19 to R-20 and increased the requirements for inspection and testing of the building's thermal envelope to include standards for blower door tests. HVAC equipment and lighting standards were also enhanced to increase energy savings. Homes built to 2009 IECC standards are generally 14% more efficient than homes constructed using the 2006 IECC.

Aside from adopting the 2009 IECC for new construction, the City does not require or provide incentives for buildings or sites to be designed to meet certain sustainability and energy

conservation thresholds. However, private developers have voluntarily constructed buildings to achieve these higher levels of sustainability. In recent years, “green building” has become an accepted term for describing the paradigm shift from conventional construction methods to more sustainable and energy efficient building practices. Concord is fortunate to be home to several businesses, non-profit organizations and residential properties that have successfully constructed green buildings. The private sector has demonstrated an increasing awareness and desire to build “green” or energy efficient buildings. There are ten U.S. Green Building Council, Leadership in Energy and Environmental Design (LEED), certified buildings in Concord; the projects are listed in the table below.

<b>LEED Certified Projects in Concord</b>		
<b>Name</b>	<b>Owner</b>	<b>Certification</b>
Concord Hospital	Capital Region Healthcare	Certified
French Wing Addition to Conservation Center	Society for the Protection of New Hampshire Forests	Gold
Weston Solutions	Greenlands Redevelopment, LLC	Gold
NH Audubon McLane Center	NH Audubon Society	Gold
North Branch Construction Corporation Headquarters	North Branch Construction, Inc.	Silver
Primex Addition	Primex	Silver
Readiness Center	NH Army National Guard	Certified
St. Paul’s School Athletic and Fitness Center	St. Paul’s School	Certified
The Duprey Center (SMILE! Building)	The Duprey Center, LLC	Certified
St. Paul’s School Lindsay Center for Mathematics and Science	St. Paul’s School	Gold

**Source: US Green Building Council ([www.usgb.org/LEED/Project/CertifiedProjectList](http://www.usgb.org/LEED/Project/CertifiedProjectList))**

These LEED certified buildings are local examples of how to implement green building standards in Concord. The key components of green building and sustainable development are: site design and selection, solar orientation, landscape, stormwater, lighting, integrated building design, resources and materials and indoor air quality.

It is a proven fact that demolishing an old building and constructing a new one uses more energy than renovating an existing structure. This is due to the loss of the “embodied energy” within an existing building. Concord encourages the rehabilitation and/or reuse of old/historic buildings through its zoning and land use regulations. The City has a demolition review ordinance that gives residents advanced notice before a building is torn down. The demolition review process is used to initiate a dialogue with the property owner regarding the preservation of the building and its historic features. This process also provides an opportunity to raise public awareness about the embodied energy within a building and encourage the reuse or preservation of a structure.

There is a small locally designated Historic District located south of Horseshoe Pond, north of Interstate 393 and east of North State Street, which protects the historic buildings within that district. However most of the buildings within the district are single family residential homes and the district is very small in area. The Historic Resources chapter of the Master Plan identifies several potential neighborhood heritage districts and historic districts. The designation of additional local historic districts would provide the highest level local regulatory control over the renovation and removal of historic buildings.

Concord residents are encouraged to weatherize older housing stock to preserve the condition of their homes and to improve energy efficiency. Through the Revolving Loan Fund, the City offers loans for weatherization and housing rehabilitation to residents with low and moderate incomes.

## **5. Renewable Energy Sources for Small Scale Production**

The use of small scale renewable energy systems, including solar (hot air, thermal and photovoltaic), geothermal, biomass and small wind energy systems generating less than 1 MW, has the capacity to reduce the Concord’s overall carbon footprint.

The actual use of renewable energy in Concord for heating is not well documented, but to the extent that data exists, it shows that with the exception of 96 commercial and mixed-use buildings that are heated by wood through Concord Steam, there is very little use of renewable energy sources to heat or power homes and commercial buildings. According to the City Assessor’s records, of 10,641 structures in the city, nearly all use some type of fossil fuel for heat. Similar findings are evident in data from the American Community Survey home heating data, which estimated that only 284 homes in Concord (1.6% of the total residences) are heated with wood.

The use of renewable energy sources for electricity is also limited in Concord. Unitol, the local electric distribution company, indicates that three business and 12 residential customers have net metering of electricity, all from solar sources. In addition, the Public Utilities Commission Renewable Energy Fund, which is supported through alternative compliance payments by retail energy suppliers, shows that a total of eight rebates were granted to Concord residents for solar thermal hot water systems.

While most public policy programs associated with enhanced use of renewable energy focus on large scale supports for electric generation, Concord can undertake efforts to support smaller scale, residential and commercial renewable energy enhancements. NH RSA 72:61-72 allows municipalities to offer exemptions from local property taxes for certain renewable energy installations, including: thermal and photovoltaic solar systems, wind turbines and central heating systems. The program aims to create a tax neutral policy for renewable energy

installations by eliminating the consequence of higher property taxes, once a renewable energy system has been installed.

The City of Concord has not yet adopted a local property tax exemption program for renewable energy systems, and the property tax assessments in Concord do not include information about renewable energy systems or use on the property. The Energy and Environment Committee is in the process of reviewing this with the City Administration, and is discussing the idea of implementing a system to track and inventory these renewable energy improvements on private property.

NH RSA 53-F enables municipalities to establish a city-wide Property Assessed Clean Energy (PACE) District, and establish a sustainable energy efficiency bond for the purpose of underwriting residential and commercial energy efficiency investment programs. Due to mortgage financing concerns at the national level, the City has not yet initiated a local PACE program. There are a number of legislative efforts at the state and federal level that are attempting to rectify this structural problem with the program.

The City has adopted regulations for construction of small wind energy systems as an accessory use. These regulations aim to accommodate the installation of wind turbines in appropriate locations without causing harm or nuisance to neighboring properties.

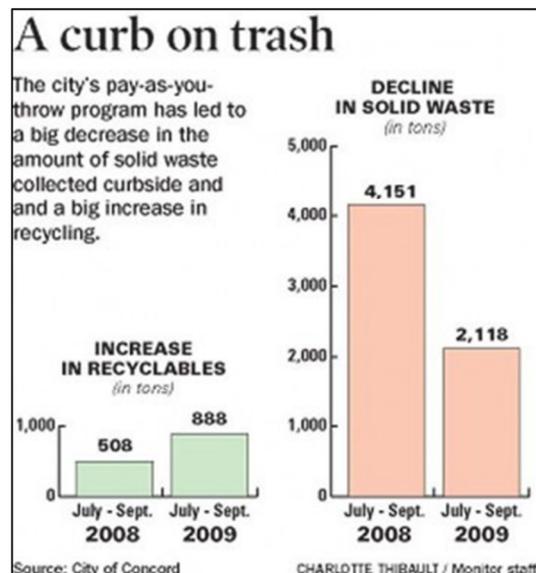
A comprehensive review of city building codes to ensure that there are no barriers to the installation of renewable energy systems has not yet been done.

## 6. Waste Management

The City can reduce dependence on fossil fuels by reducing the overall amount of waste hauled to the incinerator or landfill. This can be accomplished by encouraging residents to reduce household waste and increase materials that are recycled or composted.

### Pay As You Throw (PAYT)

In 2009, the City implemented a PAYT policy to offset the increasing costs of solid waste services. PAYT requires residents to pay for waste disposal based on the amount of trash that is thrown away, and does not impose a fee on the amount of material recycled. Consequently PAYT allows each household to control their volume of trash and their associated costs.



The program is intended to create a balance in terms of services provided to residents; achievement of lower long-term waste disposal costs; and encouragement of recycling and a decrease in waste disposal. There were immediate results with the launch of PAYT in Concord, with first quarter data showing a decrease in solid waste by 50% and an increase in recycling by 75%. (Concord Monitor, 10/28/09)

The U.S Environmental Protection Agency (EPA) reports that the greenhouse gas emissions emitted directly from waste being burned in an incinerator or buried in a landfill account for

about 3% of the total greenhouse gas emitted in the U.S. each year. When trash is burned, incinerators emit carbon dioxide (CO<sub>2</sub>) and also emit nitrous oxide (N<sub>2</sub>O), which is a greenhouse gas that is 310 times more powerful than carbon dioxide in regard to atmospheric warming.

### Curbside and Drop-off Recycling

Concord has a curbside recycling program and currently accepts glass, tin, aluminum, plastics 1 through 7 (no plastic bags), newspapers, mixed paper and corrugated cardboard from residents. Most recycled items are placed into a single container, and residents do not need to separate items, except for corrugated cardboard, which is placed in a separate container. The City also operates a drop-off recycle service free to residents. The recycling center offers recycling of motor vehicle waste including tires, motor oil, car batteries and antifreeze, as well as household items, cell phone batteries and fluorescent bulbs. The recycle center does not accept plastic bags or Styrofoam.

The benefits of recycling include the reduction of landfill tipping fees; the diversion of usable material from the landfill to local markets; and generation of revenue for the city. In addition, using recycled materials to make new products requires less energy, less water and less chemicals for reprocessing than using virgin materials requires.

### Spring/Fall Leaf Pick-up,

Composting leaves, yard waste, food and certain compostable plastics helps to reduce the overall tonnage of solid waste, while eliminating the unnecessary production of harmful methane emissions at landfills. Twice a year the City provides a leaf and yard waste pick-up service to residents. The current acceptable materials for these collections system include leaves, grass, hedge trimmings, weeds, fruit tree droppings, mulch and garden plant waste.

Yard waste is often considered to be an unusable resource from residents, but when managed properly it can be converted into valuable products such as bark mulch and compost. During spring/fall leaf pick-up, Concord residents are asked to purchase special bags from local retailers to help consolidate and control the collection of this waste stream. This process reduces solid waste disposal fees; reduces carbon emissions, since yard waste is composted or chipped, as opposed to being incinerated; reduces landfill tipping fees; and reduces organic matter in landfills, which decreases the amount of methane and other greenhouse gas emissions.

Concord does not provide a curbside pick-up of other types of compostable materials, such as food waste and paper. Vegetable scraps, fruit peels, coffee grounds and even certain plastics can be diverted from the landfill waste stream, and can potentially result in a significant reduction in typical household disposal tonnage. These materials decompose anaerobically at a landfill, producing methane which has a significantly greater heat trapping capability than carbon dioxide. By composting these materials, the generation of greenhouse gases, particularly methane, is avoided. Compostable material is also considered by many people to be a vital resource, since it can be used as an alternative to fertilizer.

## 7. Sustainable Food Systems

The dominant food system in the United States is one of large-scale production, processing, and long-distance transportation. At each stage, significant amounts of energy are consumed: fuel for farm equipment; petroleum-based fertilizers and crop inputs; energy for cold storage, processing, and packaging; fuel to distribute products across the nation and globe; energy for consumers to travel to grocery stores; and finally, energy used in the home for food storage, preparation, and waste handling.

New Hampshire currently relies heavily on this food system. A recent study estimated that the State of New Hampshire imports 94% of its food. While a localized food system does not necessarily use less energy in production, it does have other benefits such as requiring less energy for transport, and potentially less energy for processing and packaging.

Organic farming helps to reduce dependence on petroleum based fertilizers. Additionally, the protection of agricultural soils and the working landscape can help to focus development in more compact areas, and prevent energy-intensive sprawl. Finally, a local food system may be more adaptable in the face of fluctuating energy prices and changes in climate patterns. The Conservation and Open Space and Land Use chapters of the Master Plan 2030 articulate the City's desire to protect its agricultural lands, avoid sprawl, and encourage local food production.

### Local Agriculture

The City has acquired a number of agricultural properties, and has also contributed to the purchase of conservation easements on working farms. The City has also negotiated lease agreements with some local farmers to ensure continued agricultural use of approximately 216 acres of farmland. In addition to the purchase of fee simple interest in important agricultural properties, the City has financially supported the conservation of several local working farms including: Rossvie Farm (545 acres), Dimond Hill Farm (108 acres), Carter Hill Orchard (155 acres) and Maplewood Farm (78 acres).

The City's Urban Growth Boundary, zoning districts, and cluster development regulations all contribute to the protection of agricultural lands and the discouragement of energy-intensive development patterns. The City of Concord zoning ordinance specifically permits community gardens, agricultural and horticultural operations as accessory uses to the cluster development.

Concord does not have a food hub, which is a facility that manages the collection, storage, processing, distribution and marketing of locally and regionally produced food products. A food hub would offer potential energy savings to producers and processors and to consumers, by centralizing operations and promoting a sustainable local food system. A growing number of food hubs are being established elsewhere in the country including Hardwick and Burlington, Vermont, Portland, Maine, and Boston, Massachusetts.

### Farmer's Markets

Farmers' markets provide a centralized space for the sale of local food products, and can reduce the number of trips consumers must take to procure local food. The energy benefits of farmers' markets appear to derive more from the lack of processing and packaging of products than from "food miles" saved. Holding farmers' markets in walkable downtown neighborhoods also may encourage the use of alternate forms of transportation to and from the market, and

can potentially reach some underserved demographics. Currently, there are two summer farmers' markets in Concord, one located downtown and one in Penacook. There is also a winter farmers' market, which is held at Cole Gardens from January through March. The downtown Concord Farmers' Market recently established a no-cost bike valet service that parks and stores bicycles while shoppers are at the market.

### Community and Home Gardens

Community gardens are plots of land that are worked by a group of people either collectively or in individual sections, usually to grow food for home consumption. The garden may be privately or publicly owned, and may be managed by a volunteer group, public agency or nonprofit organization. Community gardens often encourage or mandate low-input growing methods, and are a source of low cost, fresh, whole foods for City residents. Some gardens may be located on vacant lots, marginal land or otherwise unused land, thus creating a more productive use within the city. There are three community garden sites in Concord: Sycamore Garden at the New Hampshire Technical Institute campus; NH Department of Resources and Economic Development gardens off of Clinton Street; and the Unitarian Universalist Church off of Pleasant Street.

Backyard gardens offer the most local source of food for Concord residents. If cultivated using low-input methods, food produced in home gardens may require very little energy aside from the physical energy the gardener expends. Converting lawn space to garden plots can also reduce the amount of mowing and watering required to maintain a homestead. Home gardening has been on the rise: a recent survey indicated that nationwide, 43 million households planned to grow their own produce in 2009, which is a 19% increase from just the year before. In Concord, a nonprofit organization called the Capital City Organic Gardeners shares, learns about and teaches organic gardening methods to community members throughout the city.

Each of the elements described above contributes to a strong local food system. Due to climate characteristics and soil composition, it is not likely that all or even most of the food consumed in Concord will be produced here. However, expanding and strengthening the local food system will allow residents to adapt more readily to fluctuating energy and food prices in the future.

## **H. PUBLIC EDUCATION AND OUTREACH**

City government can serve as an important resource for the education of residents and businesses on energy related matters. The City Council, Energy and Environment Committee and the Planning Board are all positioned to promote Concord as an energy conscious community, and to help educate the public on ways to improve energy efficiency and sustainability. The Energy and Environment Committee meets monthly and the meetings are open to the public. The group also maintains a website which serves as a community resource for energy related information.

# **I. ENERGY OBJECTIVES AND ACTIONS**

## **1. General Energy Use and Efficiency**

### Policies and Objectives:

- a. Support amendments to state and local laws that encourage or promote energy conservation and efficiency.
- b. Encourage local businesses and residents to implement energy efficiency improvements and to utilize loans and rebate programs to assist with implementation.
- c. Promote the use of energy audits for residential and commercial properties in order to identify opportunities to reduce energy use in these sectors.
- d. Provide weatherization assistance and education to residents, and provide resource links on the City's website to promote special rebate programs.
- e. Partner with utility companies, state agencies and nonprofit organizations to promote energy conservation and efficiency and implementation of private energy audits.

### Actions:

- a. Monitor pending energy related legislation and particularly the viability of PACE legislation (RSA 53-F) and implement PACE as soon as practical.
- b. Propose changes to City regulations in response to new state laws that support energy efficiency.
- c. The City should collect and publish baseline data on overall energy use within the City.
- d. Review the possibility of establishing a loan program for renewable energy installations and energy efficiency improvements, either directly through the City or together with a local lending institution.

## **2. Municipal Energy Use and Conservation**

### Policies and Objectives:

- a. Design and construct all new municipal buildings to the highest energy efficiency standards available.
- b. Improve the energy efficiency of existing municipal buildings, infrastructure and fleet vehicles.

- c. Continue to identify and implement municipal energy efficiency improvements for existing municipal buildings, infrastructure and fleet vehicles.
- d. Continue to evaluate and update municipal energy policies.
- e. Encourage the use of innovative energy efficiency technologies on municipal buildings, such as green roofs and solar installations.

Actions:

- a. Continue to pursue grant funding for municipal energy efficiency improvements to facilities, infrastructure and fleet vehicles.
- b. Continue to convert street lights and traffic signals to the most efficient equipment available.
- c. Include requirements for purchasing renewable energy when negotiating contracts for municipal facilities.
- d. Continue to improve the efficiency of the City's fleet vehicles by installing vehicle anti-idling technologies and replacing vehicles with more fuel efficient or alternative fueled models.
- e. Continue to track municipal energy consumption and report improvements based on the baseline information collected through the energy audit.
- f. Establish a municipal energy efficiency trust fund to provide funding for new municipal energy initiatives, utilizing a portion of funds saved from prior projects.

### **3. Land Use Planning to Reduce Vehicle Trips**

Policies and Objectives:

- a. Continue to promote land use patterns that increase energy efficiency in transportation systems.
- b. Encourage mixed use development within the urban growth boundary and particularly in the downtowns and village centers.
- c. Expand upon the opportunities for a variety of residential development types in the downtowns, village centers and near future rail transit stations and employment areas.
- d. Continue to provide and expand opportunities for infill development and encourage the redevelopment of underutilized sites within the Urban Growth Boundary.
- e. Continue to support rural land protection and funding for the conservation trust fund, and pursue other mechanisms to discourage further development outside the Urban Growth Boundary, such as the transfer of development rights.

- f. Provide opportunities for high density residential development adjacent to services, transit and job centers.

Actions:

- a. Review land use regulations for consistency with long-term energy goals and implement zoning amendments and amendments to the site plan and subdivision regulations as needed to support the goals.
- b. Support the development of new village centers with mixed uses where appropriate.
- c. Identify and implement incentives for residential development on the upper stories of buildings downtown.
- d. Implement zoning amendments to allow for the establishment of accessory dwelling units in residential districts throughout the City.
- e. Provide for the development of zero lot line construction throughout the City including the Open Space Residential District.
- f. Pursue grants, partnerships and leveraging opportunities to support the protection of land outside the Urban Growth Boundary including the transfer of development rights.

#### **4. Transportation to Reduce Vehicle Miles Traveled and Dependence on Fossil Fuels**

Policies and Objectives:

- a. Continue to support the “Complete Streets” policy.
- b. Promote walking and bicycle commuting throughout the City.
- c. Continue to support inter-city public transportation.
- d. Support planning for rail service from Concord to Boston and potentially north to Montreal.
- e. Encourage children to walk and bike to school through an aggressive safe route to school program and adequate sidewalks and bicycle routes around all schools.
- f. Encourage residents to reduce reliance on fossil fuels by reducing their vehicle miles travelled through trip chaining, use of public transportation, ridesharing, using the “park once” policy, carpooling, and driving more fuel efficient vehicles.
- g. Promote businesses allowing telecommuting in order to reduce vehicle miles travelled.
- h. Support the development of incentives for driving and owning fuel efficient vehicles such as a tiered municipal vehicle registration program based on fuel efficiency.
- i. Support the use of alternative fueling facilities and electric charging stations.

- j. Continue to work with the School Districts to implement the Safe Routes to Schools Program.

Actions:

- a. Retrofit existing transportation corridors to “Complete Streets” in order to improve walkability and bicycling within the City.
- b. Review site plan and subdivision applications to ensure adequate bicycle and pedestrian accommodations in and around new development.
- c. Continue to develop sidewalk connections and shared use paths throughout the City, with special emphasis on improving accessibility to schools and parks.
- d. Establish a bike share program for the downtown.
- e. Support the establishment of bicycle lockers downtown.
- f. Continue to provide public transit within the City and increase ridership through frequent and regular routes.
- g. Encourage business owners to establish preferred parking for carpooling and high efficiency and alternative fueled vehicles.
- h. Maintain the City’s sidewalk system during winter months to improve walkability, particularly around schools.
- i. Establish an outreach program to educate residents on the energy impacts of their driving habits, and promote alternatives to the single occupancy vehicle.
- j. Preserve active rail corridors and connections to rail service throughout the City.

## **5. Site and Building Design**

Policies and Objectives:

- a. Encourage all new buildings to be constructed to the highest energy efficiency standards available.
- b. Promote energy efficient site design including the use of Low Impact Development techniques (LID), sustainable landscaping, green roofs, reduced lot coverage and pervious pavement.
- c. Promote the reuse and preservation of existing buildings and pursue tools to preserve and adaptively reuse existing buildings wherever this feasible.

### Actions:

- a. Continue to review the City's building code and make recommendations to modify the building code as standards evolve to be more energy efficient.
- b. Review and revise existing regulations and standards for exterior site lighting in order to reduce the intensity of light required when sites are illuminated, and to set standards for lighting efficiency.
- c. Consider incorporating concepts from the LEED Neighborhood and the Sustainable Sites Initiative into Concord's land use regulations.
- d. Amend the City's zoning ordinance to require all large-scale development to be constructed to meet specific higher energy efficiency standards.
- e. Host a green home or building tour in Concord to demonstrate local applications of energy efficiency technologies.
- f. Expand the City's street tree planting program to increase shade and street tree plantings that reduce the heat island effect of large impervious areas and higher density neighborhoods.
- g. Review the possibility of expanding the Historic District in Concord and establishing Neighborhood Heritage districts throughout the City, to promote the preservation of embodied energy in existing buildings.

## **6. Renewable Energy Sources for Small Scale Production**

### Policies and Objectives:

- a. Promote local energy stability and independence through the use of small scale renewable energy systems including solar, geothermal, biomass and small wind energy systems.
- b. Support local renewable energy sources and production.
- c. Educate residents and businesses about renewable energy technologies and incentive programs that may be available.

### Actions:

- a. Establish a Property Assessed Clean Energy District (PACE) financing program for the installation of renewable energy improvements to residential and nonresidential properties.
- b. Establish a property tax exemption program in accordance with NH RSA 72:61-72, for small scale renewable energy systems; and track the installation of these systems throughout the City.

- c. Review the City's building code and land use regulations for impediments to the installation of small and large scale renewable energy technologies, and make regulatory changes as needed.
- d. Consider the installation of renewable energy systems at municipal facilities as a means of reducing fossil fuel use and demonstrating renewable technologies to the public.

## **7. Waste Management**

### Policies and Objectives:

- a. Continue to support the municipal Pay As You Throw, curb-side recycling and spring leaf pick up programs.
- b. Reduce the overall tonnage of waste produced in Concord.
- c. Promote recycling in all sectors.
- d. Encourage the recovery of recyclable materials from waste stream for reuse.
- e. Educate residents about the environmental and energy related consequences of the waste stream.
- f. Encourage residents to purchase products from recycled materials.
- g. Promote the reduction of plastic shopping bags at business establishments in Concord and encourage the use of reusable/recyclable packaging at all food and beverage establishments.
- h. Continue to encourage the use of reclaimed asphalt.
- i. Continue to encourage the sale of commercial compost.

### Actions:

- a. Require recycling and compostable products for any special event permits issued by the City.
- b. Implement a plastic bag ban in the City.
- c. Place recycling bins next to all municipal trash receptacles.
- d. Conduct a feasibility study on establishing a municipal curbside composting program and composting facility.
- e. Review the possibility of adopting a recycling ordinance to require the recycling of construction waste, household waste and waste from other users.

- f. Educate residents about household hazardous waste and the appropriate methods of disposing of and recycling these products.
- g. Adopt a construction demolition ordinance that would require a minimum amount of materials to be recycled or re-used.

## **8. Sustainable Foods as a Means of Conserving Energy**

### Policies and Objectives:

- a. Encourage the consumption, distribution and production of locally grown and/or raised food products.
- b. Support the protection and preservation of land with high value agricultural soils.
- c. Support the local agricultural economy and efforts to produce food locally.
- d. Encourage residents to support the local agricultural economy and efforts to produce food locally.

### Actions:

- a. Review the City's land use regulations for obstacles to urban and rural agriculture, including working farms, community gardens, backyard gardens, agricultural tourism and farmer's markets, and implement amendments as necessary.
- b. Identify and protect land containing important agricultural soils.
- c. Continue to support land protection efforts in order to preserve working farms in Concord.

## **9. Public Education and Outreach**

### Policies and Objectives:

- a. Promote Concord as an energy conscious community.
- b. Continue to provide leadership to the community on sustainability and energy efficiency topics.
- c. Create partnerships and programs with Chamber of Commerce and business owners throughout the City to further the City's energy goals.

### Actions:

- a. The Concord Energy and Environment Committee will collaborate with City Staff and elected officials on energy related initiatives.

- b. Creatively engage the community and host public workshops, events and Concord Community Television shows related to energy conservation and renewable topics.
- c. Serve as a clearinghouse for information and resources on energy issues and technologies for the entire community, utilizing the City's website, Concord Energy and Environment Committee website, the Library and other information outlets.
- d. Prepare annual reports with metrics.
- e. Regularly update the Energy and Environment Committee's Climate Action Agenda.

## J. SUPPORTING STUDIES

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Table C10: Energy Consumption by End-Use Sector, Ranked by State, 2009; U.S. Energy Information Administration at:  
[http://www.eia.gov/state/seds/hf.jsp?incfile=sep\\_sum/plain\\_html/rank\\_use.html](http://www.eia.gov/state/seds/hf.jsp?incfile=sep_sum/plain_html/rank_use.html)

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