



Energy and Climate Protection Plan

Recommendations for Action

Submitted to Falmouth Town Council

On February 8, 2010

(rev July 16, 2010)

By

Falmouth Green Ribbon Commission

On Energy and Climate Protection



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EXECUTIVE SUMMARY

The Falmouth Town Council unanimously signed the U.S. Mayors Climate Protection Agreement in May 2007. The agreement pledges the town to take actions to reduce global warming emissions by 7% below 1990 levels by 2012. Subsequently, the Council formed and charged the Ad Hoc Falmouth Green Ribbon Commission on Energy and Climate Protection (“FGRC” or “The Commission”) to formulate a Climate Action Plan to meet the objectives of the Agreement.

Falmouth’s Climate Action Plan estimates the town’s current carbon footprint, identifies carbon reduction goals for the community, and presents recommended strategies to reduce our community’s emissions and energy consumption and costs. The Commission recognizes that this work must be ongoing and that initiatives are taking place at various levels of government, which may present other opportunities for meeting the objectives.

The attached report provides background on our community, the Emissions Inventory done by the Emissions Subcommittee, assisted by many volunteers, town staff and others (please see Acknowledgements in Appendix: Emissions Inventory), and recommendations by the Commission.

We have organized the recommendations in the report by Sector. In the following table, we assign responsibilities for the next step for each section of the report.

This first installment of Falmouth’s climate action plan does not include the full array of actions we will need to undertake to address energy and climate protection in our community. We view this as a living document to allow for continued analysis and further conversation with the Falmouth community and others about what additional measures might make sense for our community and our state. This effort will accelerate as we look beyond the 2020 goals to the deeper cuts in emissions needed to meet our 2050 goals. We hope and expect that new technologies will emerge that will enable us to reduce emissions more efficiently and to adapt better to global warming. For all of these reasons, we see this plan as a living document that will evolve along with the science, technology, economics and our understanding of the effects of climate change on our natural resources and environment. And, as the federal government engages on this vitally important issue – as it must do, and do soon – the Falmouth community will demonstrate that it understands its responsibilities and its role as it fits into that larger national effort. **THIS IS A LIVING DOCUMENT.**

It is imperative that we invest in Falmouth’s future at this time: the public, news media and politicians are focused on Climate Protection and Energy Security. Like Falmouth, communities and local governments throughout the country are at the forefront of planning and adapting to these issues. We have also concluded that it is reasonable to expect future generations will choose their places of residence based on energy efficiency, climate and environmental protection, and land use and transportation build-outs that are friendly to walking and cycling. Thus, for reasons of climate

protection, energy security, economic security, but to preserve Falmouth as a highly desirable place to live, it is vital that Falmouth anticipate and act on this trend.

The total budget request to take the next step for the recommendations in this report is \$5,000.

SUMMARY TABLE OF RECOMMENDATIONS

Recommendations which the Council can take up immediately:

1.	Pass a Resolution to Accept the Plan.	Accepting the plan does not mean that the Council endorses all of the recommendations or has decided the priorities on which actions to take, but it will put the plan in the public record as a document, and formally sunset the existing Ad Hoc Energy and Climate Protection Commission.
2.	Create Energy Committee	In this way, members would join in the fall appointments schedule with other committees. The Energy Committee would work with the Council to establish priorities on what to work on first among this Plan's recommendations.
3.	Charge to LPAC re Comp Plan	If the Council accepts the plan, LPAC can officially refer to the plan in its work, and incorporate consideration of energy and climate protection in its plan update.
3.	PACE Ordinance	State has been awarded money to fund local PACE programs, and this is time sensitive.

Topic	Recommendation	Next Action Responsibility of:
Implementation	Create Implementation Committee	Council
	Outreach and Education	Energy Comm
	Web Site	Energy Comm
	Self Funding Energy Office	Energy Comm

	Energy & Emissions Data	Energy Comm
Energy Efficiency	Residential Energy Audit Program – REAP	Energy Comm
	Smart Meters	Energy Comm
	Cold Climate Heat Pump Demo Project	Energy Comm
	PACE (Property Assessed Clean Energy)	Council
	High Performance Energy Efficient Public Bldgs	Energy Comm
	Water Heaters	Energy Comm
	Streetlight and Parking Lot Lights	Staff and Energy Comm
Renewable Energy & Fuel Switching	Gas Pipeline & Wyman Station	Energy Comm
	Wind Generation – Land	Energy Comm
	Wind Generation – Off Shore	Energy Comm
	Renewable Municipal Energy Supply	Energy Comm
Transportation & Land Use	Charge to Comprehensive Plan Committee	Council
	Reduce Distance	Energy Comm
	Reduce Miles Travelled	Energy Comm
	Share the Ride	Energy Comm
	Watch Your Tailpipe Minimize Vehicle Emissions	Energy Comm
	Integrated Transportation Planning	Council & Town Staff
	Trees the Elegant Green Machine	Energy Comm
	Elephant in the Room	Community
Waste and Recycling	Curbside Recycling	Recycling Comm

	Business Recycling	Recycling Comm
	Public Recycling Containers	Recycling Comm
	Source Reduction	Recycling Comm

PART I: GENERAL INFORMATION

A. BACKGROUND

Prompted by the efforts of a citizens' action group, Cool Falmouth, the Falmouth town council joined hundreds of other local governments in signing the U.S. Mayors Climate Protection Agreement in May 2007 (Appendix I) and formed the Green Ribbon Commission on Energy and Climate Protection. The Commission was tasked to make climate protection recommendations to the Town Council and Town Manager on how the Falmouth Community can meet its pledge under the U. S. Mayors Climate Protection Agreement.

Commission members represent a diverse set of interests and backgrounds and were officially appointed by the Council in June 2008. The Commission met regularly throughout the past year to discuss emission inventories, reduction targets, review other community's approaches and to develop specific recommendations. The group strove to make decisions based on consensus and to ensure that all voices had a place at the table. Some of the recommendations in this plan are similar to those in plans developed by other towns and states, and some are unique as far as we know. The Commission's work has followed ICLEI Local Governments for Sustainability ("ICLEI") "Cities for Climate Protection Campaign Five Milestone Process" which recommends the following steps:

1. Complete a Greenhouse Gas Emissions Inventory and Report.
2. Set an Emissions Reduction Target.
3. Complete a Local Climate Action Plan to Reduce Greenhouse Gas Emissions.
4. Implement the Local Climate Action Plan.
5. Monitor the Impact of Emissions Reductions Measures.

B. FRAMEWORK: CLIMATE CHANGE, ADAPTATION, AND ENERGY SECURITY

"Climate change" is used to refer to the current change in the Earth's climate that scientists predict will bring extreme disruption to ecosystems, change in sea levels and weather patterns with consequences for humans, human health and economies of the world. [See http://www.pewclimate.org/global-warming-basics/climate_change_101 "Climate Change 101" from the Pew Center on Global Climate Change.] The world has seen climate change before, but this is the first time that scientists have implicated human activities in changing the way in which naturally occurring greenhouse gasses trap the

sun's heat. Human activities are increasing the amount of greenhouse gas emissions, primarily from the burning of fossil fuels such as oil and coal; other human activities which contribute to climate change include agriculture, deforestation, and industrial processes.¹

As stated in the U.S. Mayors Climate Protection Agreement:

*"Climate disruption of the magnitude now predicted by the scientific community will cause extremely costly disruption of human and natural systems throughout the world including: increased risk of floods or droughts; sea-level rises that interact with coastal storms to erode beaches, inundate land, and damage structures; more frequent and extreme heat waves; more frequent and greater concentrations of smog."*²

Scientists have also concluded that even if greenhouse gas emissions are stabilized today, the heat that is already in the oceans will warm the atmosphere over time. According to the US Environmental Protection Agency, climate adaptation³ will therefore become necessary in certain regions.

Climate change also poses a risk to energy security. Energy security includes energy supplies, economic security and national defense. Our economy depends on our energy supply, and much of that energy supply is based on petroleum. The US is a net importer of energy, increasingly so. Many of us have personally experienced the economic fallout from spikes in oil prices during our lifetimes; in 1973, 1979 and 1990 oil price increases related to crises in the Middle East have resulted in recessions in the US.

Based on the US Department of Energy Information Administration's (EIA) latest figures, T. Boone Pickens has calculated that the US imported 60% of its oil in August 2009, sending approximately \$25 billion, or \$564,201 per minute,

*"We must treat
energy security and
climate security as
two sides of the same
coin"*

Tony Blair

October 20, 2006

*(then British Prime
Minister)*

¹ Pew Center on Global Climate Change, "Climate Change 101".

² U. S. Mayors Climate Change Agreement, paragraph 4.

³ The Intergovernmental Panel on Climate Change (IPCC) defines adaptation as the "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities" ([IPCC, 2007](#)).

overseas to foreign governments.⁴ Oil imports account for over 65% of the US trade deficit. We need oil to run our cars and trucks and in Maine, heat our homes (see Emissions Inventory later in this report).

Military analysts have long been concerned about the increasing need to source oil from politically unstable parts of the world. As reported by the New York Times in August 2009, the National Intelligence Council finished its first assessment of the national security implications of climate change. Recent war games by the US Military, and intelligence studies by the US National Intelligence Council, concluded that resulting storms, droughts and food shortages could weaken national governments, lead to regional conflict, and may significantly tax the capability of the US military to respond to widening destabilization in the world.⁵

C. COMMUNITY CONTEXT

As a coastal town, Falmouth has much to protect and treasure. It is remarkable for its natural beauty, resources and quality of life while being close to Portland, Maine's largest city. Its coastline is marked by islands, coves, streams, and rivers while its harbor embraces one of the largest anchorages in Maine. Its elevation rises to 504' at Blackstrap Mountain, and the interior is divided into seven distinct watersheds with abundant forests, wetlands and arable land.

The town's population is ~11,000, with over two thousand being of school-age. Falmouth's schools are among the best in the state. The income level is described as upper middle class with the majority of households living in single family dwellings. Although Falmouth experienced rapid growth in recent years, much of the housing stock was built before modern energy efficiency standards and codes were in place (more than half built before 1960).

Falmouth's development is suburban with generally low population density and no historic town center. Falmouth's commercial sector is concentrated along Route 1 and at Exit 53 of the Maine Turnpike and consists of retail, service, and office developments. While Portland is the dominant job center, jobs are increasingly dispersed throughout the region. Falmouth is now a significant employment centers, hosting ~5,600 jobs.

Residents are highly dependent on automobiles to access jobs, schools and commercial centers. There are a number of important transportation corridors that pass through the town including (I-295, I-95, Route 1, Route 88, Falmouth Road and Blackstrap Road). Falmouth is accessible via public bus transportation provided by the METRO – Greater Portland Transit District. The bus goes between

⁴ New Energy World Network, www.newenergyworldnetwork.com.

⁵ New York Times "Climate Change Seen as Threat to National Security", August 9, 2009.

Portland and Falmouth six days a week with stops in several areas of Falmouth. The People's Regional Opportunity Program's (PROP), Regional Transportation Program (RTP), provides transportation for citizens on an as needed basis. There are two railroad lines which pass through town, one of which will carry passengers from Brunswick south to Boston starting in 2010. No stop is currently planned in Falmouth. Bike routes are in place on Route 1 and Route 88.

There is a natural gas line which runs through Falmouth, but there are no laterals off this gas line servicing the town.

Two-thirds of the town is supplied with water from Sebago Lake through the Portland Water District with the remainder of the town using private wells. A Town-owned and run sewer system deals with wastewater for many homes including the town of Cumberland.

Household waste is hauled for incineration to Ecomaine in Westbrook using a curbside pay-per-bag system. The town provides bins for single-sort recyclables pick-up, and has one of the highest recycling rates in the state, recording rates at over 50% in 2007. The Town maintains a Transfer Station which takes pay-per-bag, recyclables and yard waste brought to the site. Some yard waste is composted by the town and a significant amount of brush is collected and hauled for incineration used to produce electricity outside of Falmouth.

D. EMISSIONS INVENTORY

"What you can measure, you can manage." Thus, initial step in creating a Climate Action Plan is to take inventory of current emissions levels. The Emissions Subcommittee produced the town's first Emissions Inventory in 2008, examining data collected for calendar year 2007. The complete report is attached as an Appendix. We strongly encourage the reader of this Report to read the Emissions Inventory.

The Falmouth Emissions Inventory was completed using the Clean Air and Climate Protection (CACP) software obtained through the town's membership in ICLEI, Local Governments for Sustainability. CACP software calculates emissions resulting from energy consumption and waste generation. The software determines emissions using specific factors according to the type of fuel used, and aggregates and reports the three main greenhouse gases (carbon dioxide, methane, and nitrous oxide) in terms of equivalent carbon dioxide units, or CO₂e. Converting all emissions to equivalent carbon dioxide units allows for the consideration of different greenhouse gases in comparable terms.

The Inventory is necessarily limited in scope. The Inventory attempts to estimate emissions directly attributable to activities within the geographic boundaries of Falmouth. Due to availability of data and the infancy of emissions inventory tools, there are emissions directly attributable to activities within the geographic boundaries of Falmouth which are not captured in this Inventory: boating, yard maintenance, off road vehicles or agricultural activities.

The Inventory is not attempting to measure emissions produced by airplane or automobile travel by Falmouth residents outside the town boundaries, or emissions used to produce or transport products consumed within town borders.

The Falmouth “Carbon Footprint” per this method is 162,000 CO₂e tons annually (2007). The big picture is below:



Driving (gasoline & diesel) 43%
69,600 CO₂e



Heating oil in homes 31%
50,000 CO₂e



Electricity 19%
30,600 CO₂e (lighting, heating, appliances)
Homes 15,400 CO₂e tons
Business & Government 15,200 CO₂e tons

E. EMISSIONS GOAL AND TARGET

The goal and timeline of the U.S. Mayors Climate Protection Agreement (USMCPA) is to reduce global warming emissions (CO₂e) community-wide by 7% below 1990 levels by 2012.

The Falmouth Green Ribbon Commission is recommending that the Town achieve this target by adopting a target of 2% average annual reductions. The 2% average goal is easy to understand, measure and plan for, and provides a realistic long-term planning tool. It also recognizes that in some years the emissions reduction will be greater than other years, depending on the timing of implementation of solutions. In addition, many other communities have adopted the "2% solution" goal, most notably the more than 40 counties that signed the Cool Counties Climate Stabilization Initiative.

"Do, or do not. There is no "try".

- Jedi Master Yoda



The 2% average goal puts the Town on target to meet not only the USMCPA target but also a long-term goal of approximately 80% reductions from current levels by 2050, the goal that the scientific community believes is the minimum to prevent the worst effects of climate change. This also supports the state of Maine's long term target of 75% to 80% below 2003 levels (LD 845) and the long-term goal (80% reduction by 2050) adopted by the American Clean Energy and Security Act, passed in the U.S. House of Representatives and pending passage by the Senate.

PART II: ACTION RECOMMENDATIONS

A. INTRODUCTION

The good news is that we can provide our desired energy services—warm well-lit homes, hot water, transportation, fresh food, and entertainment—while reducing short and long-term energy costs. As a result, we have the opportunity to reduce our emissions, increase our energy security, and capture some of the \$30 million that the town residents are currently spending **each year** on energy.

The Falmouth Climate Action Plan recognizes that addressing climate change and energy security issues requires action and coordination by individuals, government, and business. There is no single solution to reducing emissions and energy use. Our recommendations include a mixture of small, achievable steps that provide immediate results and longer-term solutions that will require initial investments that will be recovered over time.

We envision that additional action recommendations beyond those contained in this report will be appropriate in the coming months and years, particularly as the public's understanding of the urgency and options continue to increase, and as the federal and state governments also take actions.

B. GUIDING PRINCIPLES

The Falmouth Green Ribbon Commission developed its strategies and recommendations based on a number of core principles and observations including:

- Focus on areas of agreement. All members of the Commission agreed that reducing energy waste, increasing energy efficiency, moving towards cleaner energy sources, and smarter transportation and land use planning have numerous overlapping benefits of addressing climate change and air pollution, lowering costs to consumers and taxpayers, stimulating economic growth, providing greater energy security, and improving quality of life.
- Bold actions are called for, and ambitious, innovative, and pioneering approaches are required. In general, the obstacles to reaching our goals are not technological, scientific or economic, but rather changing how we think and do business.
- Utilize a variety of types of recommendations: some by government, some by individuals, some by business; some small, some big, some easy, some not, some which we expect will be greeted with consensus, others which require further work and dialogue.
- A mixture of incentives, regulation and education is necessary.
- A well-informed community is critical and a substantial role for education and outreach is called for in the plan.
- Fossil fuel costs do not reflect the actual costs to the environment or society.
- Recommendations should be evaluated based on their reduction potential, cost effectiveness, feasibility, additional benefits provided, and the opportunity for rapid deployment.
- Utilize “low hanging fruit”, actions which can take place immediately and are relatively simple, and “big ideas”, more complex, may take longer to execute but are “game changing.”

C. CATEGORIZING THE ACTION RECOMMENDATIONS

While we categorize the recommendations as though all actions are to be taken by the Town Council or an Implementation Committee (see “Recommendations: Implementation”), these recommendations will directly and indirectly affect the community at large. We expect that the Implementation Committee will call on residents and businesses to take further actions to curb their emissions and reduce energy consumption.

The Commission is confident that its recommendations are feasible and cost effective, will result in cost savings for individuals, businesses, and local government, and meaningful reductions of emissions and energy use. Ideally, each recommendation should include associated specific emissions reductions, fiscal cost/benefit, and rate of return/payback period; however, the Commission did not have the resources and expertise to conduct such detailed analysis.

Some recommendations are ready for adoption immediately by the Council; these actions are already in place in other communities or are relatively straightforward. Other recommendations should be implemented as quickly as possible, but are more complicated, need further investigation, or require outreach and education.

For each recommendation, we have indicated an “Action Path” as follows:

- A. Actions to be taken by the Council without delay.
- B. Actions to be taken by the Implementation Committee.
- C. Actions to be carried out by town staff.

See the table contained in the Executive Summary for the party responsible for each recommendation’s next step.

D. RECOMMENDATIONS: IMPLEMENTATION

1. IMPLEMENTATION COMMITTEE

As currently set up, the Green Ribbon Commission will sunset once its report is finalized and submitted. This report contains a number of recommendations, most of which require further action in order to implement. Some of the recommendations are outreach and education to the broader community, some require drafting of ordinances for consideration by the Council, some require further research. We recommend that the Council either remove the provision that this Committee sunsets when the report is filed (putting it on a par with other Ad Hoc committees like Work Force Housing), create a new Ad Hoc committee, or create a Standing Committee on energy and climate protection to implement the recommendations proposed herein and to continue the work of meeting the US Mayor’s Climate Protection Agreement. (Regardless of the form chosen, this report will refer to the committee as the “Implementation Committee”). Yarmouth, Eliot, Kennebunk and Rockland are among Maine communities which have committees devoted to energy and climate change issues.

Recommendation:

Create a new Ad Hoc Energy and Climate Protection committee.

Requested budget: \$0.

2. OUTREACH AND EDUCATION

The importance of outreach and education in dealing with energy and climate change related issues cannot be over stated. Measures to reduce energy use and adopt new behaviors and/or technologies may be mandated or incented, but will have limited success if not accompanied by education and outreach. The sustainability coordinator of a Maine-based trucking company stated that incentives to get their drivers to drive at 60 miles per hour did not bring about the desired result; however, when education was added to incentive, the greatest reduction in fuel consumption resulted. Examples of such initiatives might include some of the following:

*“People say time changes things, but you really have to change them yourself.”
-Andy Warhol*

- Weatherization workshops.
- Educational events at the Library and at Falmouth Schools.
- Programs offered by Community Programs.
- Competitions and/or challenges in the schools and/or neighborhoods.
- Tours of “green” homes and buildings.
- Communicate available incentives and financing options.

Recommendation:

Create an ongoing outreach and education effort on energy and climate protection.

Requested budget: \$0, though there could be a budget request in future years.

3. WEB PAGE ON CLIMATE CHANGE AND ENERGY EFFICIENCY

A Town web page devoted to climate change and energy efficiency is an ideal medium for keeping the community informed on Town efforts and opportunities, and allows the public to give input and suggest ideas.

We encourage the Implementation Committee to fully explore the power of communication and community outreach through a graphical and dynamic web communication strategy. This could include a forum for exchange of ideas, calendar of upcoming events, individual challenges to reduce energy use, reach out to other communities, community groups, etc.

Recommendation:

Establish a web presence on energy and climate protection which is educational, graphically friendly and interactive.

Requested budget: \$0, though there may be a request for web assistance in future years.

4. SELF FINANCING TOWN “ENERGY OFFICE”

According to ICLEI USA’s web site:

“Opening an energy office is an opportunity for local governments to make a clear commitment to energy efficiency and clean energy. When energy is identified as a priority for the local government and an office is established to staff and support it, energy savings programs get implemented; energy savings are realized; and energy [awareness and conservation] becomes part of the community’s culture. An energy office can and should complement local government’s leadership on climate, energy and sustainability. Implementing a successful and self-financing energy office is the single best way for a local government to slash energy use and costs, reduce greenhouse gas emissions and move to sustainable use.”

According to ICLEI, local energy offices have been shown to pay for themselves within two years by reducing energy use and operating cost for town facilities and operations.⁶

The American Recovery and Reinvestment Act (ARRA) provides billions of dollars to support energy efficiency and clean energy solutions and to fund local government programs to reduce energy use and create jobs. The ARRA funding represents an unprecedented opportunity for Falmouth to create an Energy Office which will guide us into a sustainable and energy efficient future.

The responsibilities of the Energy Office would include:

- Coordinating and directing an overall energy plan;
- Tracking energy use;
- Assessing the potential value of energy improvements;
- Securing resources to implement the energy plan;
- Measuring, tracking and communicating results;
- Raising visibility of the program and what the community can do to reduce private energy use; and
- Provide staffing support to the Implementation Committee.

ICLEI provides guidance on how to create a self funding energy office. See <http://www.icleiusa.org/action-center/financing-staffing/energyoffice>.

Portland has created a three year position through a grant received from the US Dept of Energy’s funding from the ARRA.

⁶ ICLEI www.icleiusa.org.

Recommendation: Create a self financing Energy Office, either for the town or in conjunction with neighboring communities.

Requested budget: \$5,000 to pursue grants or funding.

5. MONITOR AND RE-INVENTORY EMISSIONS & UPDATE RECOMMENDATIONS

It is difficult to control what is not measured. We believe systems will continue to improve on monitoring energy consumption and emissions at many levels: by buildings, by individuals, by communities, by sectors. The recommendations contained in this report will need to be tracked, implemented, and evaluated. In addition, the Plan will need to be updated in light of new information and external events, and the emissions inventory will need to be updated.

Recommendation:

Measure and publicize energy consumption and carbon emissions; track and evaluate recommendations contained in this plan; update recommendations as appropriate; and monitor and re-inventory emissions.

Requested budget: \$0.

E. RECOMMENDATIONS: ENERGY EFFICIENCY

1. RESIDENTIAL ENERGY AUDIT PROGRAM ("REAP")

The goal of the Residential Energy Audit Program ("REAP") is to decrease residential energy use and increase building quality and performance, thereby lowering energy bills and decreasing the demand for fossil fuels for residents of Falmouth. Getting every home owner to know the Home Energy Rating System Index (HERS Index) number for their house will further this goal.

HERS is an objective rating system developed by Residential Energy Services Network that establishes a numeric grade for the performance of a house in terms of relative energy use (see www.natresnet.org). A HERS Index of 100 represents the energy use of the "American Standard Building" (The HERS Reference Home) and an Index of 0 (zero) indicates that the proposed building uses no net purchased energy (a Zero Energy Building). Energy Star™ standards require a HERS Index of 85 in our climate zone. Each 1-point decrease in the HERS Index corresponds to a 1% reduction in energy consumption compared to the HERS Reference Home.

REAP has two parts:

- Requiring new residential construction to obtain a HERS rating:
 - A projected HERS index to be submitted with the application for a building permit.
 - Actual HERS index after construction to be submitted with request for Certificate of Occupancy.
- Adding a HERS index to the listing sheet for home sales.

Over time, a familiarity with home energy performance and a market demand for energy efficient homes will be created.

The town will not require any specific Index to be achieved. Realtors will begin to understand that this measurable and objective information on individual homes is available. Buyers can look for the HERS index before purchasing new homes, in much the same way people look for the MPG measure when buying a car.

A proven parallel to this method is the now ubiquitous radon test: law does not require it, but it's perceived by homeowners to be of great importance. Realtors have increased awareness of radon by demanding the results of the radon test. We have much the same hope for the HERS Index.

Recommendation:

Require HERS index for new home construction or major renovations.

Work with the real estate community to encourage adding HERS index to market information.

Educate the citizenry about HERS index.

Requested budget: \$0.

2. SMART METERS

Innovations in technology enable the average homeowner to monitor their individual electrical usage. One such innovation is a “smart meter”. Fundamentally, a smart meter allows both the homeowner and the utility to monitor usage in real time. Some are in an easy to read digital format; some show the consumption from a device, some are web based. For purposes here, we will assume that any smart meter is paired with an indoor display device or web interface. In any form, a “smart meter” provides the homeowner with greater awareness of electrical use and thus the possibility of savings based on decisions made by the user. The idea behind Smart Meters is that by giving a consumer real time data on their electricity consumption, the consumer will alter his/her behavior. Studies show that such

information yields ~ 10% reduction in power consumption. (Although a smart meter is one of the components of a smarter grid, a smart meter is not the same thing as a “Smart Grid.”)

In the summer of 2008 Baltimore Gas & Electric tested a new pricing system that rewarded its customers for reducing their demand during peak hours. Those in the testing program that were alerted in advance of a peak power condition via phone, email or text showed an average of 24% decreases in electricity usage.

Others were notified via “orbs” which turned red during peak times. Those customers decreased their power usage by 37%.



With both a smart meter and a properly incented “time of use” rate structure, both the user and the producer would have the capability to monitor and react to the demand in electrical load. A “time of use” rate structure prices power according to when demand is highest or lowest. This is not unlike the early days of cell phones, when users would often get “free minutes on nights and weekends”. Too many calls during peak hours would have required additional cell towers to handle higher volume, and thus consumers were incented to place calls outside of “peak” demand time. If electricity were less expensive, for example, Monday after 7 pm, than it was Monday at 9 am when businesses are keeping office hours and turning on office equipment, a consumer would have an incentive to run that dishwasher in the evening before they go to bed, rather than in the morning when they get up.

Big picture benefits from the above include reduction in energy consumption and emissions; reduction of the need for peaking plants; and a more reliable grid by smoothing out power consumption.

There are a variety of ways to implement smart meters. Recently CMP has obtained a grant from the Federal Government for \$96 million to install smart meters in all residences in its power district. This presents a great opportunity to provide Falmouth residents with free

or low cost smart metering in the very near future. This will require CMP to invest \$100 million, and it is not yet clear whether CMP will accept this grant.

Recommendation:

Communicate to and work with the Public Utilities Commission and CMP to obtain smart meters with a user friendly indoor consumer interface for Falmouth residences.

Petition the Public Utilities Commission to implement a Residential Time of Use rate that provides an incentive for the homeowner to modify their time of electricity consumption.

Requested budget: \$0.

3. COLD CLIMATE HEAT PUMP DEMONSTRATION PROJECT

Currently, the majority of buildings in Maine are heated by fuel oil. A promising alternative to fuel oil may be Cold Climate (sometimes called low temperature) Heat Pumps. Heat pumps are fairly common throughout the United States, and are usually used in conjunction with electricity as the source of their energy. Until recently, in cold northern areas there was no effective heat pump that could be used in extreme conditions.

When thinking about heat pumps visualize a refrigerator. The concept is similar, but when heating the process is reversed. By using compressors and economizers the temperature of a refrigerant can be controlled to draw off heat from the air. That heated refrigerant is then pressurized making the temperature rise. At the higher temperature the heat is transferred to the air in the air handling system and distributed as heat. The refrigerant is then passed through an economizer where excess heat is drawn off and passed to the compressor as waste heat. A difference between this and geothermal heat pump systems is that in the case of a Cold Climate Heat Pump, air is used as the heat source rather than the water underground.

Regular heat pumps do not work well below 30 degrees F. The physics of the heat transfer requires supplementary heat sources rather than just compressed refrigerant (something needs to burn). In the case of the cold climate heat pump, an additional compressor is used to reheat the refrigerant with an additional stage of compression. This allows for use at temperatures below 30 degrees F.

- Advantages:
 - Reduces carbon emissions over fuel oil by 5000-7000 tons/year
 - Depending on electrical source, no carbon emissions.
 - Provides heating and air conditioning.
 - Can be retrofitted into older systems.
- Disadvantages:
 - Currently will not work with forced hot water heat.

A demonstration cold climate heat pump in a municipal facility will provide information on the operation of such units, and information could be given out to the public to educate residents on the advantages, costs and benefits and details of this equipment.

Recommendation:

Install a demonstration Cold Climate Heat Pump System in a municipal facility. Document the savings in energy costs and the reduction of CO₂ emissions. Use this information as an educational tool for the general public.

Requested budget: \$0 at this time until a specific proposal is presented to Council. Cost to town of proposal: Uncertain. May be funded with grants, or a cost benefit analysis may show sufficient return on investment.

4. PACE (PROPERTY ASSESSED CLEAN ENERGY)

There are a number of barriers to individual's investing in energy efficiency or renewable energy, including lack of information, uncertainty about the energy savings, and high upfront costs (which is both a psychological and financial barrier for many people). Property Assessed Clean Energy (PACE) is a voluntary program which lowers the barriers to these investments.

First an energy assessment is conducted on the home. The homeowner identifies the work they want to do, selects the contractor, applies for financing and repays the investment through an additional assessment on their property tax bill for periods of up to 20 years. The homeowner benefits through reduced energy bills which offset the assessment. There is little or no upfront cost to the property owner. As the upgrades stay with the property, so does the loan. If the property is transferred or sold, the new owners are obligated to continue the remaining payments due under the assessment. PACE requires an agreement by municipality to collect and disburse these payments. The capital for the improvements can come from banks or from bonds. Because the loans are secured by priority property liens, a PACE program provides virtually no risk to the capital provider.

For homeowners, a PACE program offers many advantages including a long repayment period, potentially a lower interest rate, tax-deductible interest payments, and an easier application process than applying for a second mortgage or home equity line. Unlike most other financing options, the repayment obligation transfers when the property is sold, allowing homeowners to invest in improvements that will pay back over a longer timeframe than the owner intends to remain in the house.

For local government, a PACE program supports residents' efforts to reduce energy consumption and carbon emissions at low or no cost to itself and strengthens the local economy through job creation.

PACE requires enabling legislation at the state level. Many states have adopted PACE enabling legislation including Colorado, California, Illinois, Louisiana, Maryland, Nevada, New Mexico, Ohio, Oklahoma, Oregon, Texas, Vermont, Virginia and Wisconsin. Legislation is pending in Arizona, New York, and more recently, Maine.

For more information see www.pacenow.org.

One example of an existing program is Long Island Green Homes in Babylon NY <http://www.ligreenhomes.com/page.php?Page=home>

The Town of Babylon's Long Island Green Homes (LIGH) is a self-financing residential retrofit program for upgrading the energy efficiency of existing homes at little or no out-of-pocket cost to the homeowner. The Town will pay the licensed contractor once the work has been completed. The homeowner, who is not obliged to take on debt, will then repay the Town on a monthly basis for an amount and term agreed upon in advance. Once the obligation is satisfied, typically in six to ten years, all of the savings go directly to the homeowner. Should the homeowner move before the obligation is satisfied, it is assigned to the home.



The Town (Babylon) will subsidize up to \$12,000 of efficiencies per home, obliging the homeowner to pay a monthly benefit assessment fee. In year one, the amount of the monthly fee is structured to be less than the monthly savings on a resident's energy bills. The Town will levy a 3% administrative fee incorporated into the monthly payments. For homes that are already energy-efficient, the Town may help fund the installation of renewable energy systems like solar, and potentially, vertical wind turbines.

Another example is Cambridge Energy Alliance (CEA) in Cambridge MA:

A city-sponsored non-profit organization, the Cambridge Energy Alliance (CEA) is investing over \$100 million over the next five to six years to enable energy-efficiency retrofits of half of all city buildings, and reduce electricity demand by 15% and annual GHG emissions by 150,000 tons (10% of city's total). CEA estimates that the value of the energy savings is expected to be roughly \$160 million over the next 10 years.

Under the program, CEA participants (residents and businesses) will pay for efficiency and clean energy projects directly or through CEA-arranged financing for a term of up to ten years such that loan repayments are matched or exceeded by annual energy bill savings. No



upfront costs will be required for such installations, and there will be no cost to Cambridge or state taxpayers.

A homeowner investing in a cost-effective package of measures addressing heating, cooling, insulation, water use, and lighting can typically save 20-30% of his or her current utility bills. For a homeowner spending \$3,000 annually for electricity, gas, oil and water, the annual savings would be \$600-1,000.

For more information, see www.cambridgeenergyalliance.org.

Recommendation:

Implement a PACE program for residential energy efficiency upgrades and renewable energy installations.

Requested budget: \$0.

5. COOL AND VEGETATED ROOFS

A cool roof reflects and emits the sun's heat back to the sky instead of transferring it to the building below. "Coolness" is measured by two properties, solar reflectance and thermal emittance. Both properties are measured from 0 to 1 and the higher the value, the "cooler" the roof." Studies have shown that the benefits of cool roofs are true in cold climates not just the sunny south.

Cool roofs directly reduce green house gas emissions by conserving electricity for air conditioning therefore emitting less CO₂ from power plants. Cool roofs also cool the world by reflecting the sun's energy as light back to space, and by avoiding what is known as "heat island" effect. A Lawrence Berkeley National Laboratory study found that world-wide reflective roofing will produce a global cooling effect equivalent to offsetting 24 gigatons of CO₂ over the lifetime of the roofs. This equates to \$600 billion in savings from CO₂ emissions reduction (www.coolroofs.org).

Energy Secretary Stephen Chu has stated that if all the buildings in the world had white roofs, and all the roads in the world were light colored, it would be the equivalent of taking all the cars in the world off the road for 11 years.

White roofs have been required for all commercial buildings in California since 2005.

Additional Cool Roof Resources:

<http://www.consumerenergycenter.org/coolroof/>

<http://www.facilitiesnet.com/roofing/article/Beyond-Myths-To-Solutions--7052>

<http://www.ornl.gov/sci/roofs+walls/facts/CoolCalcEnergy.htm>

<http://www.epa.gov/heatisland/mitigation/coolroofs.htm>

Vegetated roofs also have environmental benefits, and should be considered as desirable roofing material.

Recommendation:

Adopt a “Cool and Vegetated Roof” ordinance which encourages or requires all new commercial roofs be white and/or vegetated, and which encourages or requires all existing commercial roofs greater than 40,000 square feet to be retrofitted as a white and/or vegetated cool roof within 10 years.



FOREST AVENUE HANNAFORD SHOPPING CENTER WITH WHITE "COOL" ROOF

Requested budget: \$0.

6. HIGH PERFORMANCE, ENERGY EFFICIENT PUBLIC BUILDINGS

Well-designed, high-performance "green" buildings provide substantial economic and social benefits at minimal or no additional first cost. In these buildings, operating expenses can be dramatically reduced; commercial buildings command higher rents and result in higher productivity and reduced sick time; attendance and test scores are higher in schools. The primary obstacle to accessing these benefits today is limited expertise and experience in the design and construction of such buildings. Construction of high performance, energy efficient public buildings provides visible examples to the community and accelerates adoption of high performance building standards at the same time that the Town benefits from these advanced buildings.

The town now has experience with the LEED rating system through the new public safety building. LEED is a standardized system of the United States Green Building Council.

Another standard is provided by the American Institute of Architects, through its "2030 Challenge". The 2030 Challenge requires all new buildings, developments and major renovations meet a fossil fuel, emissions, energy consumption performance standard of 50% of the regional (or country) average for that building type, towards a goal of carbon-neutrality by the year 2030 (www.architecture2030.org/2030_challenge).

Recommendation:

Adopt an ordinance that requires all new municipal buildings, including schools, be built to meet the highest feasible LEED standard and/or meet the "2030 Challenge" energy performance standards.

Requested budget: \$0.

6. WATER HEATERS

Hot water is a year-round need for homes and many businesses. The annual energy required to provide hot water in residences is typically exceeded only by that required for home heating and cooling. Energy requirements for producing domestic hot water in residences account for roughly 15 percent of all household energy use.

Traditional home water heaters keep a large volume of water (typically 40+ gallons) hot all the time. Maintaining the temperature of this quantity of water can represent a substantial waste of energy when actual usage may be for only a few minutes a day. The wasted energy for hot water storage, termed standby losses, include heat losses from the hot water tank. There are alternatives, including:

- Solar Water Heaters: These systems will usually have the highest initial installed cost but result in low operating costs and the greatest emission reduction. A backup energy source is required for times when solar energy is not available. However, it is often feasible to provide greater than 50% of annual hot water needs using solar heaters. Not all homes will be suitable for solar installations.
- On-Demand Water Heaters: On demand (or just demand) water heaters can be fueled by propane or natural gas (while they can be powered by electricity, in most cases this is a poor choice). On-demand water heaters operate only when there is a demand for hot water. This eliminates the "standby" losses of storage water heaters. However, long runs of water piping can result in having to fill those pipes each time before you get hot water out of the faucet, at the shower head, etc. Locating a demand water heater at or very close to the point of use is desirable.

- Heat Pump Water Heaters: Electric heat pump water heaters can provide more than twice the water heating effect per kilowatt hour as conventional resistance type water heaters. Such water heaters are more common outside the United States, particularly in Japan, for cultural as well as technological reasons. One major US equipment manufacturer is beginning to promote electric heat pump water heaters (inherently “storage” units) as part of an appliance line for household energy management / demand response usage (think smart grid). The manufacturer cites benefits for the US as a whole in the range of 15 billion kwh annual energy savings. Water heating can also be combined with space heating. Further evaluation is warranted.

While upfront costs for energy efficient systems are typically greater than for traditional “storage” water heaters, the sum of the initial capital cost plus ongoing operating costs over the life of the equipment will typically be lower, while significantly reducing emissions resulting from water heating activity.

The town of Falmouth can encourage the transition to higher performance water heating systems by educating residents and property owners. New construction should be required to use solar hot water heating, on-demand water heaters, or other energy efficient, preferably Energy Star compliant water heating equipment.

In addition, we recommend an educational campaign directed to both homeowners and realtors about the benefits of energy efficient water heating. Educational programs on energy efficient water heating should also include conservation suggestions such as:

- Reducing hot water usage: low flow shower heads, energy efficient clothes washers, dishwashers, etc.
- Set water heating temperature to the lowest appropriate temperature.
- Insulate any existing storage water heater, particularly an older unit.
- Insulate hot water distribution pipes.
- Install heat traps on storage type water heater tanks.
- Install a timer and use off peak power for an electric water heater.
- Consider installation of a drain-water recovery system.

Domestic water heating has sufficient impact on energy and emissions as to warrant inclusion in any PACE program energy efficiency measures.

Recommendation:

Adopt an ordinance with respect to codes for water heaters in new construction.

Educate the general public and the building community on cost efficient ways to provide hot water.

Requested budget: \$0.

8. STREETLIGHTS & PARKING LOT LIGHTS

Falmouth has 614 active streetlights and 37 Streetlight Special Facilities. As most streetlights are on an average of 10 to 11 hours per day, 365 days per year, the energy consumption is significant. Jaffrey and Rindge, NH have recently decided to turn off up to 30% of streetlights, saving approximately \$30,000/year. Ann Arbor, MI, is in the process of installing LED bulbs in their street lights.



FIGURE 1 PHOTO BY MICHAEL MORRISON, © 2010, OPSINIMAGING.COM

Reducing energy used by streetlights is complicated. Many lights are necessary for safety or are necessary for a feeling of safety. The lights are actually owned by Central Maine Power (CMP), and the town is limited to the options offered by CMP. Ideally streetlights would be “smart”; individual lights could go on and off at different times, some lights could go dark and others stay on, etc.

Parking lot lights have many of the same attributes as streetlights, except that they are owned by the property owner. New parking lot lights should also use the most efficient lighting available, and new fixtures should be installed with the necessary controls to enable “smart lighting”, rather than just lighting sensors. Parking lot lights should be minimized after closing hours to just those lights required for security.

Recommendations:

Require that any new street lights be powered by the most efficient lighting available.

Remove streetlights that are not needed for public safety.

Work with CMP to replace existing lamps with more efficient and less intensive lighting. Monitor the “pay back” schedule for LED lamps. Invest in LED lighting conversion when the operating cost savings can pay for the capital investment, using a reasonable depreciation schedule.

Adopt an ordinance which requires that new parking lot lights use the most efficient lighting available and have controls which enable more control than just sensors.

Property owners should be encouraged to retrofit existing lights with the most efficient lighting available, and install smart lighting controls wherever financially reasonable to do so.

Requested budget: \$0, but there may be a request for funding in future.

F. RECOMMENDATIONS: RENEWABLE ENERGY & FUEL SWITCHING

1. TAP EXISTING GAS PIPELINE

Most of the United States has access to natural gas, and a cost-effective distribution infrastructure supplies most major cities. Although natural gas is still a fossil fuel, it is much lighter in the carbon chain and emits 25% less CO₂e than burning fuel oil. Natural gas is generally a less expensive fuel source than either propane or oil. The State energy office encourages the expansion of natural gas in Maine because it is a cleaner fuel. Maine is more heavily dependent on heating oil than the rest of the country, and it would be beneficial to bring natural gas to our community and surrounding communities. Fuel oil in Maine comes predominantly from the Middle East, while much of the natural gas we would use originates in North America, and is therefore a more secure energy source.

At the time of the construction of this distribution system, gas was being moved from south to north, and it was not economic to extend the service beyond Portland. As a result, Falmouth and other communities north of Portland grew with a fuel-oil based energy supply. Fuel oil is easier to store than other fuels and does not require a fixed pipeline. It is also rich in carbon and can be expensive. Fuel oil is unregulated and prices can change quickly, as we saw in 2008.

Power plants also grew with fuel oil, including Wyman Station in Yarmouth. Wyman was built in 1958, and at the time was the biggest power generator in Maine. Wyman still receives 100% of its fuel for electrical generation via water-borne fuel oil tankers, although it currently functions as a peaking plant.

In the late 1990's, two new mainline natural gas systems were constructed through Portland, moving gas from north to south. The first, Maritimes & Northeast Gas (M&NE), is a high-pressure, 36-in diameter line from the Sable Island gas field, offshore Nova Scotia to Dracut, Massachusetts – servicing Boston. The second, known as Portland Gas Transmission (PGT), is a similar high-pressure system extending from near Montreal (the Canadian Border) to Westbrook, Maine. PGT and M&NE combined their systems from Westbrook southward to Dracut.

In 2004, Trans Canada and ConocoPhillips sought to build a Liquefied Natural Gas (LNG) terminal in Harpswell, with a pipeline extending to Yarmouth and Cumberland, which would have enabled the Wyman plant to convert to natural gas. The LNG terminal was vetoed by local voters in Harpswell. Wyman can still be converted to natural gas service by using the existing electrical corridors to connect the Wyman station to the existing gas pipelines:

- The M&NE line passes through Western Falmouth (east of Highland Lake). PGT intersects with M&NE from the northwest at a point just below Falmouth. Flows from both lines move, at the moment, from south to north and are operating at high pressures in the 1100 psig range.
- The Wyman Plant maintains a right-of-way for its electrical output that passes just south of Yarmouth, through Cumberland to the Falmouth Country Club. The right-of-way then bisects Falmouth Country Club proceeding to the southwest where it intersects the main power grid just adjacent to the M&NE gas line.

In addition to Wyman Station producing fewer emissions (and the stack could get lowered), we might find that other lateral lines become feasible once the line is opened; for example, supplying natural gas to the commercial area at former Exit 10 in west Falmouth (Hannaford / TD Bank complex). We estimate that the 3.5 mile line to connect the Maritimes and Northeast high pressure gas system to the Hannaford/TD Bank complex would cost approximately \$5 million.

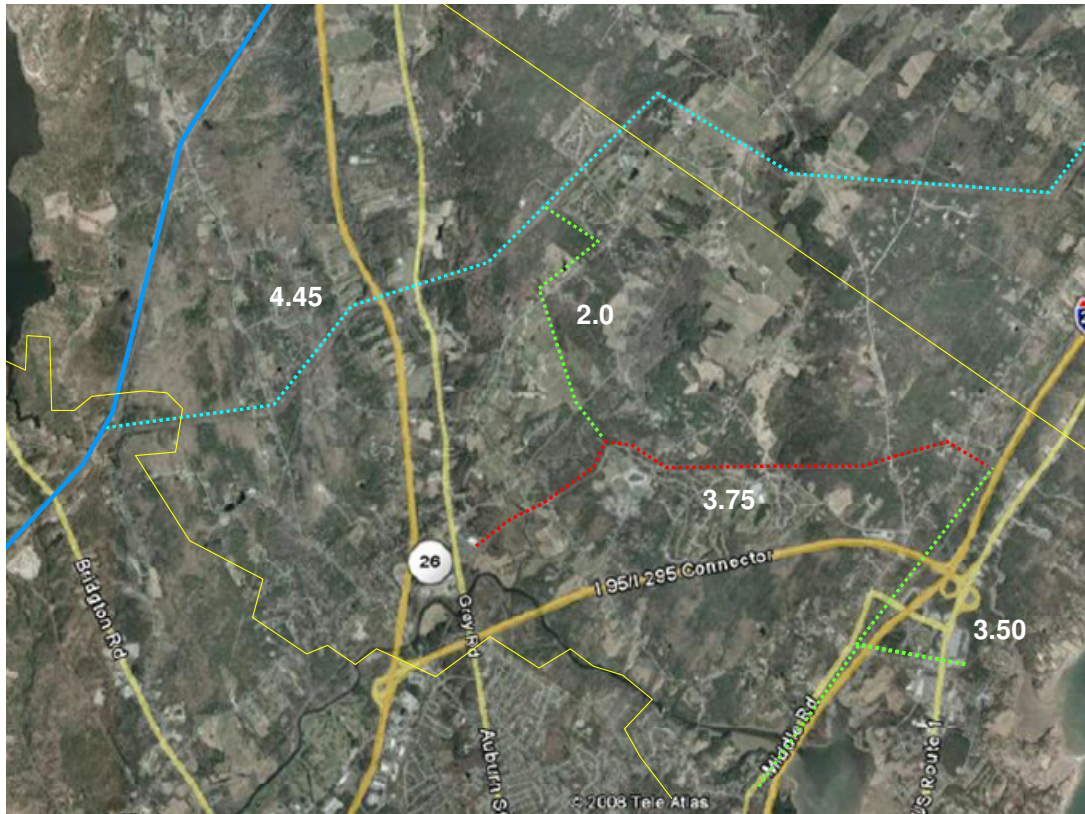


FIGURE 2 POSSIBLE GAS LATERALS

Some new laterals could then be dropped down to service Falmouth’s commercial and school areas, as well as to parts of Cumberland and into the main part of Yarmouth. Some residential areas could be served by natural gas, and we could possibly provide natural gas fueling stations for vehicles.

Natural gas franchises for Westbrook, Gorham, and Brunswick have already been bid and awarded. There have been no applicants (and thus no award) for a gas franchise for the Falmouth/Cumberland/Yarmouth area because of their geography and minimal load. In Kennebunk, the town holds the franchise. That would be a possibility for Falmouth and/or the three towns together.

Since natural gas is predominately methane, it will be important that pipeline leaks are prevented.

Recommendation: Establish a tri-town ad hoc committee to study and work with the PUC and the owner of the Wyman Plant to determine if it is feasible to convert the plant to natural gas, and the feasibility of expanding natural gas within the three towns.

2. WIND POWER GENERATION IN FALMOUTH – LAND

Wind power generation is being developed at different scales throughout the state. Falmouth has always taken the position that what is not specifically allowed under our ordinance is prohibited. Therefore, in order to allow wind energy to be developed in town, Falmouth needs to address it in its ordinances.

The State of Maine has put together a model Wind Energy Facility Ordinance, which classifies wind facilities according to height and aggregate capacity. The model ordinance can be found online at www.maine.gov/spo/landuse/docs/ModelWindEnergyFacilityOrdinance.pdf.

Cumberland is also discussing a wind energy system ordinance. Saco has adopted a small wind power ordinance.

Recommendation: Adopt an ordinance to allow responsibly sited, land based wind power installations.

Requested budget: \$0.

3. WIND POWER GENERATION IN FALMOUTH – OFF SHORE

The state is giving serious consideration to siting deep water wind turbines. There is movement forward on this. It appears that there will be a need for shore access for underwater transmission lines.

Recommendation: Monitor the State’s plans for off shore wind turbines. Be prepared to work with other coastal communities to push for local access to off shore generated electricity.

Requested budget: \$0.

4. MUNICIPAL RENEWABLE ENERGY SUPPLY

Some towns have installed municipally owned renewable energy operations. Hull MA, for example, has successfully erected several wind turbines. Other towns have installed solar arrays on municipal buildings.

Three technologies—wind, solar, and biomass—may have significant promise for Falmouth. The High School has recently obtained a grant to install photovoltaics, and the new Elementary School will be installing a biomass boiler.

Recommendation:

Monitor the results from the high school and elementary school installations, with an eye to expanding these kinds of power facilities at other municipal buildings.

Requested budget: \$0.

G. RECOMMENDATIONS: TRANSPORTATION & LAND USE

“Suburbanization and rising wealth following World War II dramatically transformed American living and driving patterns. The country saw a ubiquitous increase not only in daily travel distances, but also in the frequency with which households used their vehicles to get to work, to shop, and to carry out a variety of personal business trips. Between 1970 and 2005, the average annual vehicle miles traveled (VMT) per household increased almost 50 percent, from 16,400 to 24,300. At the same time, vehicle ownership per household increased even as average household size fell.”⁷

The Transportation Sector accounts for approximately 43% of total Falmouth community emissions, or ~70,000 tons of CO₂e. Not only is Transportation a big contributor to greenhouse gasses, it also has a large economic impact on household budgets. Transportation is the second largest expense for American households, costing more than food, clothing, and health care. Even before the recent run-up in gasoline prices, Americans spent an average of 18 cents of every household dollar on transportation, with the poorest fifth of families spending more than double that figure.⁸ Reducing dependence on vehicles will save families money, as well as reducing emissions and increasing energy security.

1. CHARGE TO THE LPAC | COMPREHENSIVE PLAN COMMITTEE

Transportation is integrally related to land use and land use planning. The town is in the process of updating its comprehensive plan. The Council has the opportunity to “charge” the Comprehensive Plan Committee.

⁷ Metropolitan Policy Program at Brookings, “Shrinking the Carbon Footprint of Metropolitan America”, May 2008.

⁸ “Transportation Costs and the American Dream: Why a Lack of Transportation Choices Strains the Family Budget and Hinders Home Ownership: A Special Report from the Surface Transportation Policy Project July 2003” www.transact.org

A Comprehensive Plan (“Comp Plan”) is the basic foundation for local planning; it lays out a community’s vision and priorities. The adopted plan is used by citizens, elected officials, town committees, business investors and others to make daily decisions about the issues and opportunities that shape the town’s physical, social and economic development. It is used to develop the legal foundation for land use regulations and other activities. It is not a zoning ordinance, but ordinances must be in compliance with the Comp Plan. A Comp Plan is generally updated every five years. Falmouth’s last Comp Plan update was in 2000.

Make the Connection between Land Use and Climate Change and Energy

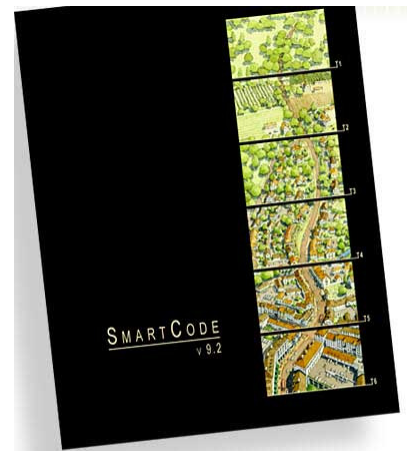
This time, the Comp Plan update should be informed by an awareness of the connection between land use and transportation, and how land use and transportation needs impact energy efficiency and emissions. Some examples of making the connections:

- Large minimum lot sizes spread housing out, and increase distance travelled. It can also reduce the efficacy of public transportation.
- Long dead end roads increase miles travelled from Point A to Point B.
- Increasing suburbanization and subdivisions may compromise land suitable for agriculture.

Smart Code

As excerpted from the website smartcodecentral.org:

*“The Smart Code is an alternative to traditional zoning and regulates land uses and density based on a concept known as a transect. The SmartCode is an integrated land development ordinance. It folds zoning, subdivision regulations, urban design, public works standards and basic architectural controls into one compact document. It is also a unified ordinance, spanning scales from the region to the community to the building. The SmartCode is open source, available for use without charges or licensing fees. The SmartCode enables the implementation of a community’s vision by coding the specific outcomes desired in particular places. It allows for distinctly different approaches in different areas within the community, unlike a one-size-fits-all conventional code....**The SmartCode supports these outcomes: walkable and mixed-use neighborhoods, transportation options, conservation of open lands, local character, housing diversity, and vibrant downtown. The SmartCode discourages these outcomes: sprawl development, automobile dependency, loss of open lands, monotonous subdivision...**”*



We strongly urge that the Smart Code be carefully considered during this Comprehensive Plan process.

Deal with Density

For a number of years, the town has wrestled with the question of density. Where is it appropriate? What does density mean? Should we use transfer of development rights? Vancouver has made the connection between density and environmental responsibility. Vancouver has adopted an “Eco Density Charter” in its town charter (<http://www.vancouver.ca/ecodensity>). According to the Vancouver web site:

EcoDensity is an acknowledgement that high quality and strategically located density can make Vancouver more sustainable, livable and affordable. It has been illustrated as a tricycle, where the driving wheel is environmental sustainability, while the side wheels that keep it up and allow movement, are livability and affordability. The right kind of quality density in the right places can help lower our ecological footprint.

There are a number of Q and A's on the Vancouver web site Example:

Q: How does density help the environment?

A: Two key contributors to climate change are transportation and building energy use. EcoDensity can help reduce both. Well-located density puts people close to shops, jobs, amenities and services, meaning more trips are made by walking, biking and transit, instead of by car. This also creates a larger customer base for local shopping areas, supporting a wider array of shops and services, which in turn, means that even more needs can be fulfilled close to home. Similarly, putting people close to transit means more trips are made using transit, and makes better transit service more feasible.

Density also reduces building energy use. Housing with shared walls uses less energy. Density also makes renewable energy sources more feasible and affordable. Systems like neighborhood energy utilities generate energy with little or no greenhouse gasses. And, density combined with green building features, will go even further to reduce greenhouse gases, as well as to conserve water, reduce waste, and provide other environmental benefits.

Containing sprawl also minimizes the regional impacts on vital agricultural and conservation lands.

Adopt Smart Growth Practices

Smart Growth refers to development practices that result in more compact, accessible, multi-modal communities where travel distances are shorter, people have more travel options, and it is possible to walk and bicycle to more destinations. Smart growth policies typically reduce per capita vehicle travel

10-30%⁹. Although these land use changes take many years to be achieved, they provide diverse and durable benefits.

There are existing Smart Growth checklists, which could be required to be filled out during the Planning Board permitting process, and points are assigned. Categories include:

1. Near existing development and infrastructure
2. Range of housing options
3. Protection of open space, farmland and critical environmental areas
4. Mix of uses
5. Choices for getting around
6. Walkable, designed for personal interaction
7. Respectful of community character, design and historic features

For example, such a checklist could be used to guide the discussion around the proposed expansion of the Falmouth Shopping Center.

Plan for Changing Climate: “Climate Adaptation”

Published federal government reports are now showing where changes in traditional climate patterns likely to affect specific geographic areas including coastal areas of Maine. Land use planning should look forward to what these changes are likely to be and consider these changes when looking at public and private investments (wastewater treatment plants, bridges, parks, etc). This is now being referred to as



are

⁹ Victoria Transport Policy Institute, “Win-Win Emission Reduction Strategies”. Todd Litman.

“adaptation”. The Casco Bay Estuary Partnership has recently completed a study that examines climate change impacts within the Casco Bay watershed and may inform the planning discussion within the town. Taking climate adaptation into account in the Comprehensive Plan update will increase the resiliency of our community and will ultimately allow the town to save money, make better policy decisions, and create a sustainable community. The Comprehensive Plan Committee should take forecasted impacts of climate change and changing weather patterns into account during its discussions and plan update.

Recommendation: The Council should include in its charge to the Comprehensive Plan Committee the following:

The Comp Plan should address **connection between land use & transportation and energy and climate change.**

Adopt the **Smart Code** in place of the traditional zoning, and use the transect methodology of the Smart Code in planning for future land development, densities, and uses in town.

Recommend to the Committee that it investigate the “**eco density**” charter of Vancouver and introduce the concept to the community.

Embed “**smart growth**” policies and recommendations in the Comprehensive Plan.

Take **projected climate change impacts** into account in updating the Comp Plan.

2. DISTANCE TRAVELLED

“Between 1970 and 2005, the average annual vehicle miles traveled (VMT) per household increased almost 50 percent, from 16,400 to 24,300. At the same time, vehicle ownership per household increased even as average household size fell.”

- Brooking Institutes, Metropolitan Policy Program, May 2008 “Shrinking the Carbon Footprint of Metropolitan America”

“The transportation sector is the fastest growing carbon dioxide source in the United States with emission rates rising 2% per year. Projections show that more efficient fuels and ‘clean’ vehicles won’t be enough to offset the projected 59 percent increase in driving between now and 2030. Even with expected improvements in vehicle and fuel economy, carbon emissions from transportation would be 41 percent above today’s levels by 2030 if driving is not curbed .”

- National Complete Streets Coalition

As a suburban, car-centric community, with 43% of its emissions and energy use in the transportation sector, we need to address how much we drive. The first way to attack this is to make driving less necessary.

In recent years, Falmouth has tracked the national interest in walking and biking for recreation and we appear poised to transition to again thinking of walking and biking for transportation. Falmouth is well-suited for biking and walking as its terrain is gentle, commuting distances are limited, its population is not large and vehicular traffic is not heavy. In spite of significant winters, walking and biking remain viable mobility options for eight months a year. The town continues to make progress on the Bike/Ped master plan which was created in the first part of this decade. The town has installed sidewalks along Brook and Leighton roads, Route 1, Depot Road and most recently Johnson Road.

Mix of Uses

Residents on the Foreside enjoy being able to walk to Town Landing Market, to places of worship, to Skillins, preschool, and some can walk to work in the few small commercial buildings on Route 88. This same ability to walk to destinations should be enjoyed by more parts of town. There has been discussion of allowing a greater mix of uses in Pleasant Hill. Our conventional zoning has resulted in separating residential from other uses, necessitating driving to cover most distances.

Smart Growth as a Transportation Strategy

Smart growth policies would help us to understand the advantages of mixing uses and the resulting decrease in necessary vehicle transit. Smart Growth refers to development practices that result in more compact, accessible, multi-modal communities where travel distances are shorter, people have more travel options, and it is possible to walk and bicycle to more destinations. Smart growth policies typically reduce per capita vehicle travel 10-30%. Although these land use changes take many years to be achieved, they provide diverse and durable benefits.

Smart growth policy also prioritizes locally oriented retail, as opposed to regional retailing. Large scale retail development encourages reliance on driving and discourages walking and biking; our present culture of development emphasizes our reliance on private passenger cars.

Additionally, large scale retail development at one location will make local retail development in other locations (yes, even other towns) less likely. Regional shopping, big box development should be neither encouraged nor allowed except under the most strenuous conditions. For example: sufficient population within walking distance to support the retail development, or sufficient customers arriving via public transportation; maximum parking; evidence the development or its tenants will not endanger the economic well being of local shopping within its projected catchment area.

Connectivity

Beginning in the 1960's roadway design practices favored a poorly connected *hierarchical* network, with numerous cul-de-sacs that connect to a few major arterials. Falmouth has grown significantly since then and our road system reflects the predominant thinking of this time. Connectivity includes street connectivity, and also walking and biking connections.

Victoria Transport Policy Institute describes some of the benefits of connectivity:

“By improving accessibility, increasing route options, improving walkability and reducing vehicle travel, improved roadway connectivity can provide a variety of benefits. Improved connectivity tends to increase transportation system resilience by increasing route options, reducing problems when a particular link is closed. It improves emergency response by allowing emergency vehicles more direct access, and reduces the risk that an area will become inaccessible if a particular part of the roadway is blocked by a traffic accident or fallen tree. A more connected street system allows a fire station to serve about three times as much area as in an area with unconnected streets, increases the efficiency and safety of services such as garbage collection and street sweeping (crash rates and insurance costs for such vehicles tend to increase if they are frequently required to back up)....These can result in substantial government cost savings or service quality improvements.”

Other benefits of connected streets include more efficient public transportation routing, and increased walking and bicycling. According to the Victoria Transport Policy Institute, people drive 5-15% fewer miles in communities with good street connectivity.

For example, providing a connection between high school and Community Park would allow students to safely walk/bike/run/ski from the school campus to community park for practices and athletic events and conversely would allow students in nearby neighborhoods to safely walk/bike/run/ski to school.

Recommendation: The Council should provide leadership to engender a culture within town of minimizing travel distances, and should adopt appropriate changes to ordinances. Examples of actions include:

Permit small scale, locally oriented commercial and civic uses in residential districts (corner stores, coffee shops, churches, cemeteries, garden centers). Permit and encourage home-based businesses. Encourage local agriculture.

Make walkability a criteria for locating community buildings (schools, town hall, library). Provide for smaller lot sizes. Require all developments to connect to a trail system that can be used for transportation not just recreation.

Shorten length of dead end roads and require through roads, and particularly pedestrian connections. Delete the provision in the ordinance which allows the Planning Board to make an exception for street connections. Educate residents about the benefits and importance of connected streets.

Change how we plan streets to a “platting system” such as is done in Colorado.

Provide for “pocket parks”.

3. RELIANCE ON VEHICLES

"The potential to reduce carbon emissions by shifting trips to lower-carbon modes is undeniable. The 2001 National Household Transportation Survey found 50% of all trips in metropolitan areas are three miles or less and 28% of all metropolitan trips are one mile or less – distances easy to walk, bike, or hop a bus or train. Yet 65% of the shortest trips are now made by automobile, in part because of incomplete streets that make it dangerous or unpleasant for other modes of travel. Complete streets would help convert many of these short automobile trips to multi-modal travel. Simply increasing bicycling from 1% to 1.5% of all trips in the U.S. would save 462 million gallons of gasoline each year. "

– National Complete Streets Coalition.

Looking at shifting just 20 trips per day (avg. within Falmouth trip 4 miles, roundtrip) from single occupant automobiles to bicycles could reduce up to 16,320 pounds of CO₂e a year and save \$1,516. Co-benefits from more biking and walking include less vehicle traffic, healthier citizens, a greater feeling of community with increased social interaction and the projection of a town which is friendly and livable.

There is a national coalition which has formulated a global approach called Complete Streets. A Complete Street is designed to accommodate and operate to enable safe access for all users. Pedestrians, motorists, bicyclists and transit riders of all ages and abilities must be able to move safely along a complete street. Instituting a Complete Streets Policy ensures that the town and the state, when designing roads within the town (example Woodville Road) routinely design and operate the entire right of way to enable safe access for all users. See www.completestreets.org.

In addition, the town should adopt a Complete Streets policy so that when roads in town are proposed by developers or are under review for upgrades or redesign, the designers and consultants will have to address the question of how non-motorized transport can use that right-of-way for transportation.

We need not only the infrastructure for non-vehicle modes of transit, but people need to feel safe when using them. Cars which pass on the right on Route 88, using the bike lane as a passing lane, are not making bikers and walkers feel very safe, nor are they safe. Lawn maintenance companies which use

bike lanes as parking areas force bicyclists and walkers out into the travel lane; again this doesn't give non-motorists a feeling of safety. Motorists should be educated on sharing the road, and laws and rules should be enforced.

There is a planned train from Portland to Freeport and on to Brunswick. We should lobby for a train stop in Falmouth, with not only a park and ride but also bike and walking trails leading to the train.

We should stop looking at trails as something just for a "walk in the woods" or as a place to get exercise but as infrastructure for transportation. Trails should allow a user to get to a friend's house, a store, a school, work. We know of at least one person who uses the trails behind Underwood Park to commute to work on Route 1. Envision a trail system which is so embedded in town that every home is no more than a short walk from the town trail system, and what a valuable asset that would be to our community.

Recommendations:

The Town should put in place the infrastructure that provides for transportation for all modes of transit; it should adopt a "Complete Streets" policy.

Town should encourage a train stop in town for the line that is planned for Freeport/Brunswick.

Make roads safe for all forms of transit. Example: Prohibit vehicles from parking or passing in/on shoulders which are designated bike lanes. Clearly sign bike lanes. Give police mandate to ticket and enforce, and give police towing authority for violators. Police should educate the public about sharing the road with other modes (horses, bikes, people).

Falmouth Trails Committee should look at trails as a form of transportation and strive to put together a master trail plan which allows people to get to destinations via the trail network.

4. SHARE THE RIDE

One of the easiest ways to increase energy efficiency and reduce emissions is to share the vehicle. This applies to all of us, whether we are commuting, running errands, going to and from school and sports. Sharing the ride requires both private choices and supporting those choices with transportation alternatives and through the design of our built environment.

School Traffic

We have heard a lot about traffic around the schools, and residents wondering why all students don't ride the bus to school. According to Safe Routes to School (www.saferoutestoschool.org) a recent study in Marin County CA found that 21% of morning traffic is from private vehicles on their way to school. Some of this is high school students driving themselves, some are parents taking their children to school. A study in Vancouver corroborates this, finding that 25% of their morning traffic was to and from school.

One way to address this is to model the behavior we want to see. If students and parents see other students and parents sharing the ride, it's more likely to catch on. The School Community should educate and encourage parents to encourage ridership via school bus and to combine school drop-offs to reduce "single child" autos going to school. It could also provide reserved parking spaces for carpools.

Busses and Town Trolley



The recently expanded Metro Route 7 brings the bus within a reasonable distance of much of the Foreside, Tidewater, and the Flats. The Metro route to and from West Falmouth Crossing brings the bus within an easy distance of west Falmouth neighborhoods. It takes time for people to adjust their habits and schedules to fit the bus into their regular routes. Ridership has steadily increased since its inception. We should continue to support Metro.

We used to have an electric trolley in Falmouth that came out from Portland. We should remember our history when thinking about the future. We should look very hard at the economics and usefulness of a town "trolley" that would be either in addition to or in place of Metro, and in place of or in addition to school bus transportation. If there is a plan for an alternative to the conventional school bus system that has the support of the community, then we should lobby for any necessary change in state law.

Parking lots & Bus Shelters

One way to change the culture of one person per car is to make parking a little less front and center. There are excess parking spaces in Falmouth parking lots most of the time. Our ordinances require a minimum number of parking spaces for commercial establishments. Excess parking is expensive to maintain, creates heat islands and an unnecessarily large impervious area which contributes to polluted storm water run-off. Turn that around; provide for a maximum number, not a minimum number, of parking spaces.

Make it more comfortable to ride the bus (both school bus and other busses). Private benches and bus shelters make it more comfortable in all climates. When designing streets and intersections, plan now for how we can accommodate bus stops and where bus shelters can go.

Recommendations:

School parking areas should give preference for car pools; make parking for students a little less convenient; encourage carpooling and ridesharing. Set up a ride board for going places after school, and look at an on-line ride board.

Continue to support Metro. Investigate a town trolley in addition to or in place of Metro and school bus transportation.

Change land use ordinances to set maximum, not minimum, parking requirements. Plan for bus stops and shelters when designing roads and intersections.

Budget: unclear.

5. WATCH YOUR TAILPIPE

We have discussed minimizing the distances between uses and destination points, transporting via non-motorized vehicles, and sharing vehicles to reduce emissions and energy use by our transportation sector. When we are using our cars and trucks, we should seek to minimize emissions and gasoline consumption.

Minimize Idling

Idling vehicle engines contribute to greenhouse emissions. Idling a vehicle for 5 minutes a day wastes about 13 gallons of gas a year and produces 247 pounds of CO₂e. According to the Brookings Institute, most gasoline and diesel fueled vehicles use only 15 to 35 percent of the fuel's energy to move the vehicle down the road. The rest is lost to engine inefficiencies and idling. It is known that vehicle emissions also contribute to air pollution generally and aggravate lung ailments such as asthma. In Maine, 9.3% of children currently suffer from asthma, the highest rate in New England according to a 2004 study report.

Idling takes place at traffic intersections, drive-throughs, while waiting for people, and when people are “warming up” their vehicles. Over the last twenty years, the town has seen an increase in “idling infrastructure”: traffic signals have been added at the intersection of Route 1 and Johnson Road and the intersection of Woodville Road and Route 9; drive throughs have been added at both West Falmouth Crossing and on Route 1. We know that the population has increased and traffic has increased, but it is not necessary to see a commensurate increase in idling.

Ways to reduce idling include getting people to voluntarily change their habits (education and outreach, policies); rule making (“No idling ordinance”); designing a physical environment which minimizes idling

(banning drive-throughs (as Yarmouth has done) or prohibiting new drive throughs; using roundabouts at intersections in place of stop signs and traffic signals):

a. Idling Ordinance: “Idling Gets You NoWhere”

Towns, cities and states around the country are adopting “no-idling” ordinances or policies for all vehicles. In 2008 Maine passed a no-idling law which pertains solely to commercial vehicles.

Private companies are finding that attention to idling pays benefits both in money and environmentally. Green Mountain Coffee Roasters equipped their trucks with Engine Control Modules, and found that their truck engines were idling 30% of their run time. Over two years, with an annual driver safety training and idling awareness program, and quarterly tracking of engine use, GMCR reduced idling to 10% of run time, resulting in a fuel cost savings of 4% annually, and a reduction in consumption of 5,000 gallons annually.

Adopting ordinances and/or regulations against idling is “low hanging fruit”: it requires very little investment and is beneficial to our air, health and wallets immediately. Both policies and ordinances are more effective when combined with an education/signage program, and in both cases there are exceptions for traffic, public safety, and weather conditions.

Portland (Maine) and Minneapolis, Minnesota have adopted no-idling ordinances. Kennebunk adopted a clean air, no idling policy for non-commercial, private passenger vehicles on public ways and public parking areas, and encourages businesses and individuals to adopt the same policies on their property, including asking businesses to post “clean air | no idling signs” at convenience stores, drive-throughs, banks, etc. In both Kennebunk and Minneapolis, police are provided with a “user friendly” informational educational piece to give to the idler.



b. Roundabouts

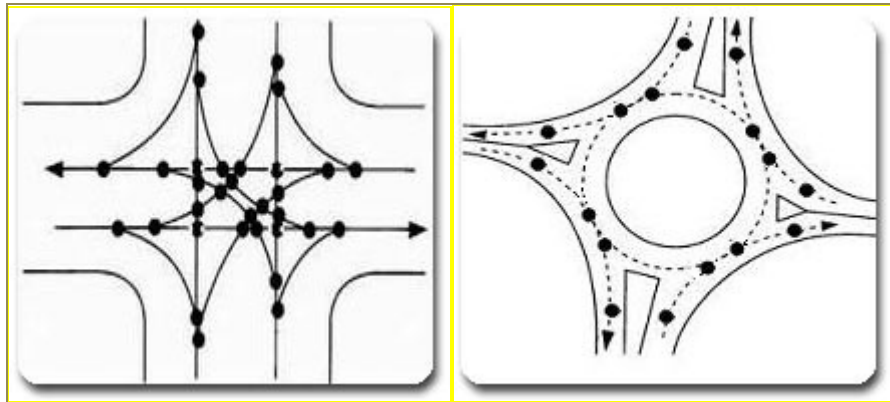
A roundabout is a type of circular intersection that eliminates left turn movements (Maine DOT). In terms of emissions and energy saving, roundabouts cut hydrocarbon emissions at intersections by as much as 42%. Ten roundabouts in Virginia save 200,000 gallons of gas a year. Carmel, Indiana has studied their roundabouts and has seen a 78% drop in accidents involving injuries, and an estimated savings of 24,000 gallons of gasoline per year, per roundabout. This does not measure the savings from the electricity of traffic signals that are displaced.

A roundabout reduces potential conflicts between vehicles and improves the efficiency of the intersection. In terms of safety, roundabouts provide traffic calming, reduce angle and head on crashes,

reduce crash severity, and improve intersection capacity. One study looked at 24 intersections that had been converted from traffic lights to roundabouts and found that total crashes dropped nearly 40% while injury crashes dropped 76% and fatal crashes by about 90%.

Drivers must slow down to enter a roundabout. Roundabouts are specifically designed to keep traffic flows at 15 to 25 miles per hour.

Because there are no traffic signals, drivers are not encouraged to speed up to beat the yellow signal. In the event of a power outage, no police are required to man the intersection, and there is almost no maintenance on a roundabout.



In a roundabout, there are half as many potential conflict points as compared to a traditional four-legged intersection.

Pedestrian Safety: All available research (there is a lack of good research in this area) shows roundabouts are safer or similar to conventional intersections for pedestrians. Single-lane roundabouts are safer than multi-lane roundabouts for pedestrians, because pedestrians have less width to cross.



The intersection between Route 1 and Route 88 would have benefited from a roundabout in terms of safety for both vehicles and bicyclists. The intersection at Route 9 and Woods Road would have benefited from a roundabout.

Infrastructure for Low Emission Vehicles

For alternative fuels to become accepted, we need the infrastructure to fuel them, whether that is the ability to fill up a natural gas vehicle or recharge an electric vehicle. Natural gas is the cleanest of all fossil fuels. Most of gas is methane, but the main product of the combustion of natural gas are carbon dioxide and water. Companies like UPS are moving more of their vehicle fleet towards natural gas. As noted earlier in this report, we recommend pursuing extension of the natural gas line that currently runs through Falmouth but is not accessed with a lateral. In the context of accessing the gas line, plans should be laid for natural gas filling stations, which would also allow school buses and other town vehicles to run on natural gas.



Formalize Town Policy

The Town Manager has been working to purchase gasoline efficient vehicles, and he has done away with reimbursement for employees' use of personal vehicles in favor of their using a Town-owned hybrid gas-electric Prius, one of the most fuel-efficient vehicles available today. To institutionalize these policy changes, the Commission recommends that the Town Manager develop written policies for purchase and use of Town-owned vehicles.

Inform Vehicle Owners of their Emissions

What is not measured is not controlled. Many residents may not focus on how many miles they drive their vehicles per year, as we tend to speak in terms of minutes per drive ("It takes me 10 minutes to get to work; I live 15 minutes from school"). We also don't focus on what those miles mean in terms of emissions. Currently the odometer reading of each vehicle is provided at the time the vehicle is registered. It should be relatively easy for software to calculate the emissions from that vehicle for the past year, as the town/state has the year, make, model and mileage of the vehicle. It could be very informative and behavior changing if the emissions were to be printed on the receipt and/or registration form each year which is given to the vehicle owner. Vehicle users need to rapidly increase their awareness of their vehicles carbon emissions, and providing this information to them could be a very powerful tool.

Recommendations:

Adopt a “no-idling” ordinance or policy, complete with associated signs and public education.

Adopt a policy that all intersections should be considered for a roundabout prior to consideration of installing a stop sign or traffic signal.

Look for opportunities to provide infrastructure for natural gas filling stations.

Formalize the current town policy of using energy efficient low-emission vehicles.

Vehicle owners should be given a print out showing the vehicle carbon emissions at the time they register / renew their vehicle registration.

Budget: immediate budget \$0. At some point there may be a cost for software for the last recommendation.

6. INTEGRATED TRANSPORTATION PLANNING

Transportation is the movement of people and goods from one location to another. This implies movement by varied modes such as bike, car, bus, feet, etc. As recommendations above describe, we recommend planning for varied transport modes.

Coordinated transportation planning is important in order to realize reductions in gasoline consumption and related emissions, to allow for efficient transportation resources, and to safely and efficiently integrate different transportation modes.

We understand that town departments are presently working on a master transportation plan for Falmouth. We hope that this planning includes the integration of varied transportation modes and infrastructure, whether the infrastructure is as informal as a trail or as involved as a transportation hub. As the plan takes shape, we ask that it be informed by our Commission’s report.

Recommendation: That town staff take the discussion and recommendations of this report into consideration during any transportation planning.

Budget: \$0

7. TREES: THE ELEGANT GREEN CARBON MACHINE



While our inventory does not address the CO₂ costs of cutting trees or the benefits of trees as carbon sinks, it is well-known that each tree, during its lifetime, can sequester several tons of carbon dioxide. Globally, while about 70% of total historic increase in greenhouse gas levels is attributed to the burning of fossil fuels, **about 30% is attributed to deforestation.**¹⁰ Of course, trees provide other important benefits, including wildlife habitat, improvement of water quality, reduction of soil erosion, production of oxygen and minimizing the heat island effect of parking lots and roofs. The tree canopy of Maine and Falmouth provides an important role in mitigating the effects of climate change.

Tree City USA is a national movement to get local governments to value their vegetated areas and to allocate resources for preserving and maintaining them. Benefits of becoming a Tree City include increased public awareness of the many social, economic and environmental benefits of urban forestry practices; education to improve current urban forestry practices; cooperation between public and private sectors to effectively manage urban forests; community pride; a blueprint for planting and maintaining a community's trees; putting people in touch with other communities and resources that can help them improve their program; bringing solid benefits to a community such as helping to gain financial support for tree projects and contributing to safer and healthier urban forests; and sometimes giving preference over other communities when allocations of grant money are made for trees or forestry programs. Yarmouth, Westbrook, Bath, Portland, and South Portland are nearby Tree Cities.

A recently developed integrated land management approach called the Sustainable Sites Initiative (SITES™) looks at landscape management from a whole ecosystem perspective. It links natural and built systems to achieve balanced environmental, social and economic outcomes and improves quality of life and the long term health of communities and the environment. Sustainable landscapes balance the needs of people and the environment and benefit both. An interdisciplinary effort by the American Society of Landscape Architects, the Lady Bird Johnson Wildflower Center and the United States Botanic Garden, it seeks to create “voluntary national guidelines and performance benchmarks for sustainable land design, construction and maintenance practices”.¹¹ SITES was created to “promote sustainable land development and management practices with and without buildings including but not limited to...open spaces such as local, state and national parks, conservation easements and buffer zones and transportation rights of way....SITES will provide tools for those who influence land development and management practices and can address increasingly urgent global concerns such as climate change, loss of biodiversity, and resource depletion. They can be used by those who design, construct, operate and maintain landscapes, including but not limited to planners, landscape architects, engineers, developers, builders, maintenance crews, horticulturists, governments, land stewards, and organizations offering building standards.”

¹⁰ International Journal of Wilderness, August 2009, Volume 15, number 2, page 8.

¹¹ Sustainable Sites Initiative www.sustainablesites.org home page.

We recommend that SITES standards, guidelines and benchmarks be incorporated into town ordinances and permitting requirements.

For many years we have required that trees be included in parking lots as part of planning board approval. The emphasis has been primarily aesthetic. We now understand that a full tree canopy over a parking area and properly located deciduous trees can reduce the heat from the parking area and reduce the air conditioning needs of nearby structures, and allow for solar gain in the winter. We should shift the goal of our planting requirements to provide for a full tree canopy over paved commercial parking lots.

Developers often will cut trees in advance of developing land. This destroys the tree canopy well in advance of what may be required once the land is developed or sold. We should have a tree cutting ordinance which provides for tree management but not clear cutting in advance of development.

Recommendations:

When a mechanism for evaluating and valuing the carbon sequestration of vegetated areas becomes available, the Town should incorporate that into its emissions inventory and climate action plan, and its subdivision and development ordinances.

Require that any future reports on management of town owned lands, easements and rights of way refer to and incorporate the standards and benchmarks of SITES. Add a provision to town permitting standards that developments must reference and explain how the proposed development meets the benchmarks and criteria of SITES. (www.sustainablesites.org)

Change the land use ordinance to provide for true tree canopy over paved parking areas (find a suitable ordinance from another community and adopt it).

Plant roadside trees, particularly along Route 1; create a “boulevard” with a tree canopy.

Prohibit clear cutting of lands in anticipation of development.

Budget: \$0.

8. ELEPHANT IN THE ROOM



Although the topic of a gas tax is beyond the obvious scope of our task, our discussions brought us back to the price of gasoline time and again. That is the elephant in the room.

To increase our energy security, to reduce our emissions and to prepare for a cleaner energy future, we need to reduce our consumption. A price of gas which is artificially low relative to its costs makes it much more difficult to make investments and decisions which will lower our reliance on gasoline.

The capital investment and maintenance costs associated with driving are not covered by the gas tax, nor are the environmental costs associated with the refining, transportation and emissions of gasoline.

How can we even imagine “raising” the gas tax? Americans appear to hate the gas tax almost as much as they love their cars. The Federal gas tax of \$.18 per gallon has not changed since 1993, when the federal gas tax represented 17.3% of the average cost of a gallon of gasoline. Today the federal gas tax represents 6.5% of the cost of a gallon of gasoline. It is so politically unlikely that the gas tax will be raised that one might question why we should even address this.

In Europe, where gas taxes are high relative to the US, they organize their towns, appliances, building methods assuming high energy costs, and thus their economies face a much lower disruption when prices show the kind of volatility that we saw in 2008.

If we were to recognize the true costs of driving in the gas tax, we would have more connected feedback between our decisions and the costs of those decisions, and we would have a more energy secure future.

Recommendation: All future state transportation bonding should be funded through an increase in the gas tax, which is voted on by the voters as part of the vote for the transportation bond.

H. RECOMMENDATIONS: WASTE AND RECYCLING

1. CURBSIDE RECYCLING PICKUP

Recycling (including composting) means “separating, collecting, processing, marketing, and ultimately using a material that would have been thrown away”.¹² The many environmental benefits of recycling are well documented. Recycling significantly lowers greenhouse gas emissions associated with virgin materials extraction, product manufacture and waste disposal. More and more products can be made with a percentage of recycled content.

Falmouth has a dynamic and active recycling program led by the Recycling Committee of the Town. We applaud and support all their efforts, and the commitment of the Town Council and the greater community to recycling.

Single sort recycling was introduced in May 2006. Curbside collection of trash is on a weekly basis and curbside recycling collections, introduced in June 2007, are every second week. Further recycling options are available at three recycling stations located at the Transfer station, Bucknam Road and at Falmouth Crossing. Ecomaine processes both the recyclable trash and incinerated trash. By December 2007 54% of residential waste was recycled.

Benefits of curbside pickup of recyclable trash are both economic and environmental and include increased participation in recycling and fewer individual trips to the town recycling locations.

As stated in the Emissions Inventory, “through recycling Falmouth has avoided a significant percentage (43%) of the emissions that would have been created in the Waste Sector had the recycled materials been incinerated.”

As tonnage of recycled trash approaches the tonnage of incinerated trash, the town should institute weekly pickup for recyclable trash as well as weekly pickup for incinerated trash.

Recommendation:

Maintain current curbside pickup of recycled trash, and increase to weekly pickup as tonnage of recycled trash approaches tonnage of incinerated trash.

2. BUSINESS RECYCLING

¹² Definition comes from US EPA website www.epa.gov/region/waste/solid/reduce.

Maine state law (Statute Title 38, Section 2138) requires businesses employing 15 or more people to recycle office paper and corrugated cardboard. We are not sure how many employers are aware of this law. Ecomaine produces a guide for small business recycling, but we see no mention of the law in this guide. We have no information on how many employers comply with this law.

We feel that this law needs to be publicized, and be extended to have an impact on the recycling rate by businesses. Retailers should be included, and the required recycling should be expanded to include a general recycling program, rather than limiting it just to office paper.

Lacking a change in state law, Falmouth should implement a local ordinance with this requirement.

Recommendation:

Communicate to the Legislative Policy Committee of the Maine Municipal Association that the business recycling law should be expanded to cover all employers, and other materials than just office paper.

Adopt an ordinance requiring all employers with more than fifteen employees, and/or buildings larger than 20,000 square feet, to put in place a recycling program.

3. PUBLIC RECYCLING CONTAINERS

Following on with the topic of business recycling, we observe that it is still easier to incinerate trash than it is to recycle trash in public areas. More and more states and localities are requiring that when there is a container for incinerated trash, there must be a matching container for recycled trash. Fenway Park and the New Jersey Turnpike provide containers for recycled trash. This should also be the rule at events open to the public (think soccer tournaments or community festivals).



Recommendation:

Adopt an ordinance which requires that all outside trash containers in public places (whether on private or public property) be accompanied by a recycling container of equal or greater size.

4. SOURCE REDUCTION

According to the US EPA, the United States waste (commonly referred to as trash or garbage) increased 146.5% from 1960 – 1997. Per capita waste generation increased almost 63%, from 2.7 to 4.4 pounds

per person PER DAY. This rate is higher than many European countries such as Spain, Switzerland, Germany and the United Kingdom and the Netherlands, which each average 2-3 pounds per person per day.

Reducing waste preserves natural resources, and reduces energy usage in the production and transportation of packaging materials. The high school recently converted to reusable table ware rather than plastic goods.

A lot can be accomplished with individual decisions. For instance, businesses can minimize disposable containers for take out foods, and favor products with minimal packaging. Consumers can bring their own shopping bags, embrace backyard composting, use mugs rather than disposable cups, donate clothing rather than tossing items in the trash, deconstruct building materials rather than putting everything in a construction dumpster, etc. These are only a few ways to practice source reduction in our community.

Recommendation:

Educate the community and businesses on the importance of source reduction, and involve the schools in this effort.

PART III: CONCLUSION

We would like to thank the Town Council for making a commitment to reduce CO2 emissions and do our part to address the challenge of global climate change. We all learned quite a bit along the way and clearly there is more to be done. This report represents a point in time and the recommendations for which there was strong support among the members.

The problem of global warming can be overwhelming, but the Commission has come to understand that there are many actions, some small, some big, that all of us can take to not only reduce energy waste but also to reap the many benefits of a cleaner energy economy. We feel optimistic that, working together, our community can make a real difference for our town, our world and future generations.



APPENDIX I: US MAYORS CLIMATE CHANGE AGREEMENT

US Mayors Climate Change Agreement

[Falmouth Town Council approved signing the Agreement by unanimous vote in May 2007]

ENDORISING THE U.S. MAYORS CLIMATE PROTECTION AGREEMENT

WHEREAS, the U.S. Conference of Mayors has previously adopted strong policy resolutions calling for cities, communities and the federal government to take actions to reduce global warming pollution; and

WHEREAS, the Inter-Governmental Panel on Climate Change (IPCC), the international community's most respected assemblage of scientists, has found that climate disruption is a reality and that human activities are largely responsible for increasing concentrations of global warming pollution; and

WHEREAS, recent, well-documented impacts of climate disruption include average global sea level increases of four to eight inches during the 20th century; a 40 percent decline in Arctic sea-ice thickness; and nine of the ten hottest years on record occurring in the past decade; and

WHEREAS, climate disruption of the magnitude now predicted by the scientific community will cause extremely costly disruption of human and natural systems throughout the world including: increased risk of floods or droughts; sea-level rises that interact with coastal storms to erode beaches, inundate land, and damage structures; more frequent and extreme heat waves; more frequent and greater concentrations of smog; and

WHEREAS, on February 16, 2005, the Kyoto Protocol, an international agreement to address climate disruption, went into effect in the 141 countries that have ratified it to date; 38 of those countries are now legally required to reduce greenhouse gas emissions on average 5.2 percent below 1990 levels by 2012; and

WHEREAS, the United States of America, with less than five percent of the world's population, is responsible for producing approximately 25 percent of the world's global warming pollutants; and

WHEREAS, the Kyoto Protocol emissions reduction target for the U.S. would have been 7 percent below 1990 levels by 2012; and

WHEREAS, many leading US companies that have adopted greenhouse gas reduction programs to demonstrate corporate social responsibility have also publicly expressed preference for the US to adopt precise and mandatory emissions targets and timetables as a means by which to remain competitive in the inter/national marketplace, to mitigate financial risk and to promote sound investment decisions; and

WHEREAS, state and local governments throughout the United States are adopting emission reduction targets and programs and that this leadership is bipartisan, coming from Republican and Democratic governors and mayors alike; and

WHEREAS, many cities throughout the nation, both large and small, are reducing global warming pollutants through programs that provide economic and quality of life benefits such as reduced energy bills, green space preservation, air quality improvements, reduced traffic congestion, improved transportation choices, and economic development and job creation through energy conservation and new energy technologies; and

WHEREAS, mayors from around the nation have signed the U.S. Mayors Climate Protection Agreement which, as amended at the 73rd Annual U.S. Conference of Mayors meeting, reads:

The U.S. Mayors Climate Protection Agreement

A. We urge the federal government and state governments to enact policies and programs to meet or beat the target of reducing global warming pollution levels to 7 percent below 1990 levels by 2012, including efforts to: reduce the United States' dependence on fossil fuels and accelerate the development of clean, economical energy resources and fuel-efficient technologies such as conservation, methane recovery for energy generation, waste to energy, wind and solar energy, fuel cells, efficient motor vehicles, and biofuels;

B. We urge the U.S. Congress to pass bipartisan greenhouse gas reduction legislation that includes 1) clear timetables and emissions limits and 2) a flexible, market-based system of tradable allowances among emitting industries; and

C. We will strive to meet or exceed Kyoto Protocol targets for reducing global warming pollution by taking actions in our own operations and communities such as:

1. Inventory global warming emissions in City operations and in the community, set reduction targets and create an action plan.

2. Adopt and enforce land-use policies that reduce sprawl, preserve open space, and create compact, walkable urban communities;
3. Promote transportation options such as bicycle trails, commute trip reduction programs, incentives for car pooling and public transit;
4. Increase the use of clean, alternative energy by, for example, investing in "green tags", advocating for the development of renewable energy resources, recovering landfill methane for energy production, and supporting the use of waste to energy technology;
5. Make energy efficiency a priority through building code improvements, retrofitting city facilities with energy efficient lighting and urging employees to conserve energy and save money;
6. Purchase only Energy Star equipment and appliances for City use;
7. Practice and promote sustainable building practices using the U.S. Green Building Council's LEED program or a similar system;
8. Increase the average fuel efficiency of municipal fleet vehicles; reduce the number of vehicles; launch an employee education program including anti-idling messages; convert diesel vehicles to bio-diesel;
9. Evaluate opportunities to increase pump efficiency in water and wastewater systems; recover wastewater treatment methane for energy production;
10. Increase recycling rates in City operations and in the community;
11. Maintain healthy urban forests; promote tree planting to increase shading and to absorb CO₂; and
12. Help educate the public, schools, other jurisdictions, professional associations, business and industry about reducing global warming pollution.

NOW, THEREFORE, BE IT RESOLVED that The U.S. Conference of Mayors endorses the U.S. Mayors Climate Protection Agreement as amended by the 73rd annual U.S. Conference of Mayors meeting and urges mayors from around the nation to join this effort.

BE IT FURTHER RESOLVED, The U.S. Conference of Mayors will work in conjunction with ICLEI Local Governments for Sustainability and other appropriate organizations to track progress and

implementation of the U.S. Mayors Climate Protection Agreement as amended by the 73rd annual U.S. Conference of Mayors meeting.

APPENDIX II: CHARGE TO COMMISSION

AN ORDER ESTABLISHING AN AD HOC COMMITTEE ON ENERGY AND SUSTAINABILITY

[Excerpt from Minutes of Town Council Meeting March 24, 2008]

WHEREAS, the Town of Falmouth has signed the U.S. Mayor’s Climate Protection Agreement (USMCPA) committing to reductions of carbon dioxide emissions to 7% below 1990 levels by 2012; and

WHEREAS, the Town of Falmouth desires to meet – and exceed –the USMCPA’s targets; reduce our use of fossil fuels; improve our local economy and quality of life; and advance the preservation of Falmouth and our natural world; its beauty, and its bounty for ourselves, our children and all that follow; and

WHEREAS, the continued production of carbon dioxide from fossil fuel combustion is causing an accelerating series of climate changes with substantial and costly impacts and, if unchecked, will soon have significant impacts on Falmouth, our children and human civilization; and

WHEREAS, sound investments in improved energy performance and renewable energy supply provide significant benefits to our environment and quality of life, our local economy, and our energy security; offer a sustainable and prosperous future for us and our descendants; and are the fastest, cleanest and most profitable way to reduce fossil fuel use and emissions of carbon dioxide; and

WHEREAS, the Town of Falmouth desires to take a leadership position in these regards; and

WHEREAS, the Town of Falmouth will realize these goals is a well researched, integrated, broadly supported plan is developed drawing on the wide range of interests and expertise in the town and is implemented by Town Council.

WHEREAS, it is believed that at this time an Ad Hoc committee structure will be more flexible than that of a standing committee, and will, the Council believes and intends, create a sense of urgency and importance of this mission, and

WHEREAS, it is the intention that the Ad Hoc Committee shall be replaced by a standing committee to assist in the implementation of the Ad Hoc Committee's recommendations.

NOW THEREFORE, we, the Town Council of Falmouth, Maine, hereby Order the creation of an Ad Hoc Committee, to be known as the Falmouth Green Ribbon Commission on Climate Protection. The Committee shall:

1. Recommend climate protection actions to the Town Council and Town Manager, for the Falmouth community to meet or beat the Kyoto target.
2. The Commission shall draw on the work of other communities, resources within the citizenry of the town, town staff, and others to put together its recommendations.
3. The Commission shall interpret this charge broadly.
4. The Commission shall self organize itself as follows:
 - a. Initial members shall include members of the group informally known as the citizens' working group. The initial co-chairs for the purpose of organizing shall be Susan Howe and Michael Morrison.
 - b. The chair or co-chairs shall be schedule, set agendas for, and preside over Commission meetings.
 - c. Membership is not expected to exceed twenty people.
 - d. The interim co-chairs shall report back to the Council Nominating Committee no later than thirty days from the date of this order with its recommendations for permanent chairs, and nominations for membership.
 - e. The Commission shall give consideration in nominating its members to balance background (business leaders, school administrators, members of the faith community, community organizations, energy suppliers, facility managers, and energy performance/renewable energy experts), gender, and age.
 - f. The Town Clerk shall advertise that the Commission is seeking volunteers for service on the Commission.
5. The Commission shall report back to the Town Council and Town Manager no later than one year from the date of this order. The Commission shall present annually a report and a work plan to the Town Council.

Be it Hereby Ordered, this 24th day of March, 2008, by the Town Council of the Town of Falmouth, Maine.

APPENDIX III: ENERGY EFFICIENCY AND CLIMATE PROTECTION ACTIVITIES IN FALMOUTH TO DATE

The following is a select list of actions taken to date by the Town of Falmouth (both municipal departments and school department) and the Falmouth Memorial Library to lessen the town's carbon footprint, promote energy efficiency and realize cost savings. We applaud these efforts and look forward to continued emissions reduction and energy efficiencies:

MUNICIPAL

General:

- Town Hall
 - Improved light quality at Town hall, switched from incandescent to fluorescent bulbs, installed T-8s lamps with electronic ballasts and occupancy sensors
 - Exterior lights are high pressure sodium efficient fixtures using photocell timers
 - All kitchen appliances Energy Star registered
 - Implemented new Energy Management System.
 - Upgraded boiler to high efficiency Viessmann Vitodens condensing unit and hot water to small staged gas fired heater. This propane unit has cascade controls and outside temperature setback.
 - Stimulus funds grant is being pursued to remove asbestos siding and increase insulation.
- Other Facilities & Equipment
 - Personal CRTs computer monitors changed to LCD computer monitors.
 - Installed software driven town wide security system.
 - All buildings going through Energy Star benchmarking process.
- Operations
 - Upgraded vehicle fleet to Toyota Prius autos (Codes, Central Fire, General Use)
 - Instituted an employee commute policy to prioritize hybrid use (\$10,500 annual savings).
 - Part-time position of Energy and Sustainability Coordinator (2008).
 - Joined EPA's Energy Star Challenge.
 - LED Christmas Lights – utilizing more each year.
 - Increased recycling rates within town via single sort curbside pick up.

- Spring of 2009 town hall moved to 4-day week and enhanced town's online services.
- Developing a comprehensive Energy Management Plan for the town with the goal of reducing municipal energy costs by 40% of 2007 figures by 2017.

Information Technology:

- Data Center moved to Police Station to share uninterruptible power supply (UPS) device.
- Converted town council meeting materials to paperless with online availability for all.
- Installed VOIP phone system.
- Converted to thin client servers.
- Instituted Online Process for Community Programs Brochure & Registration and for Vehicle Registration.

Police & Public Safety:

- Police Station achieved LEED Silver status in 2009.
- Green Cleaning Products used town wide due to requirement at new station.
- Chief's primary vehicle is a Hybrid 4 Cylinder Toyota Camry.
- Downsized two patrol car engines to six-cylinders, from eight-cylinders.
- Maintained police motorcycle patrol.
- EPA Energy Star Benchmarking being completed in summer 2009.
- Converted most traffic signals to LED.
- LED light bars on Police vehicle.

Fire and EMS Services:

- Heating System Upgrades: upgraded bay area heating system at Central Station upgraded to two high efficiency propane Viessmann Vitodens condensing boilers with cascade controls and outside temperature setback. High efficiency 60 gallon propane fired hot water heater installed at Central Station
- Overhead Doors: Central Station doors replaced with 2" high R value panels, brush style weather stripping and fully insulated glass.
- Lighting upgrades at Central Station:
 - All office and bay lighting replaced with T-8 lamps and electronic ballasts
 - Exterior lighting replaced with HID full cutoff fixtures on photocell control
- Windows: All windows replaced with low E insulated glass or storefront style glazing with insulated glass.
- Insulation: SIP panels used in exterior walls of building addition at Central Station; Insulation added to existing walls.
- Stimulus Grant being pursued:
 - to install solar thermal hot water system at Central Station .

- to upgrade and expand Winn Road fire station. Several sustainability criteria are to be met during construction. Solar thermal hot water system is being recommended.

Public Works:

- All diesel vehicles using B-10 or B-20 mix
- Heating system upgraded to high efficiency propane Viessmann Vitodens condensing boiler with cascade controls and outside temperature setback. Waste oil is fuel source for heating hot water and bay area.
- All lighting upgraded to high efficiency T-8 and T-5 lamps with electronic ballast.
- Increased recycling rates within administrative areas.
- DEP voluntarily called in to do audit of building runoff and air quality.

Wastewater:

- Major upgrade to plant completed in 2008. Upgrade of motors, fans and variable speed drive pumps and use of biologic agents in treatment process. Projected to save over \$50,000/year in electrical costs.
- Installation of deeper aeration tanks and fine bubble aeration will result in major reduction in use of chemicals and energy.
- Wastewater administration building renovation included use of energy efficient materials, such as energy star windows, radiant heat, 2'X6' construction, 16" of insulation and fluorescent lighting. Project took advantage of Efficiency Maine rebate program for businesses.
- Ongoing plans to evaluate administrative and technical opportunities for reduction of energy waste and greenhouse gas emissions.

SCHOOL DEPARTMENT

The Department's focus in recent years has been targeted lighting upgrades and controls management, with next steps looking at building envelopes and heating systems (upgrades/alternatives).

Department-wide:

- Facilities
 - All schools have automated room controls for heat/air (temperature & air quality). Lower temp settings at night and during day. Temperature sensitive and activation dependent.
 - Upgraded HVAC, ductwork, controls, and propane heating system in Superintendent's Building.
 - Exit signs in all buildings converted to LED lighting.

- All incandescent light bulbs converted to compact fluorescent (attics, crawl spaces, night lights on stage, HVAC areas, entrances to portables, etc.).
- Bus fleet block heating system – electrical system now computerized (air temperature sensitive for activation).
- Operations
 - All buses observe a “No Idling” policy.
 - All buses run on B20 diesel fuel.
 - Recycling is practiced to some extent at all schools.

Falmouth High School:

- Facilities
 - Lighting
 - Upgrade gym lights (replaced 100 lights with 50 high intensity fluorescents, motion sensors; estimated payback of 2.8 years).
 - Upgraded parking lot lighting controls ; allowing school to reduce by half the number of lights on during normal night times.
 - Shut off 24 fixtures that ran 24/7, leaving nine “always on” fixtures in first floor hallways. Reduced “always on” fixtures to 18 in second floor hallway.
 - Theater balcony step lights replaced from (12) 20-watt quartz to (12) 1-watt fixtures, activated by motion sensors.
 - Motion sensors installed in classrooms, bathrooms, locker rooms, etc.; 96 devices total.
 - Heating, Ventilating and Air Conditioning (HVAC)
 - Gym HVAC 50 hp motor upgraded to a variable speed drive motor.
 - Programming Boilers and pumps programmed to work only as needed, based on occupancy levels.
 - Insulation added to cafeteria and library ceilings.
- Operations
 - School garden supplies some fresh food to cafeteria
- Student Initiatives
 - Policy to turn-off computers overnight
 - Environmental Action Committee accomplished action to replace plastic cafeteria utensils with metal utensils. They continue recycling efforts. Initiated repair of drinking water fountains

Falmouth Middle School:

- Facilities

- Lighting upgrades to library, cafeteria, gym, and wings (fixtures, occupancy and motion sensors)
- Insulation added to roof, exterior wall of gym and locker room
- Operations
 - Recycling
 - Cafeteria uses re-usable trays
 - Encouraging staff to reduce paper use and keep documents in electronic form. Providing forms and paper work electronically and information via the web.
- Curriculum
 - Initiating long term planning for a grades 5-8 environmental awareness strand
- Student Initiatives
 - Student Environmental Club established for 2008-2009. The Girl Scouts did a Vending Machine Energy use project with a trial energy miser on one machine and submitted recommendations to the business office of the School Department.

Elementary Schools – Plummer-Motz and Lunt:

Although Lunt and Plummer-Motz schools have completed energy savings projects in the past 5 years (lighting upgrades/building controls/roof insulation), future projects are not ear-marked for those schools due to the probability that neither facility will be used as a school as of the Fall 2011.

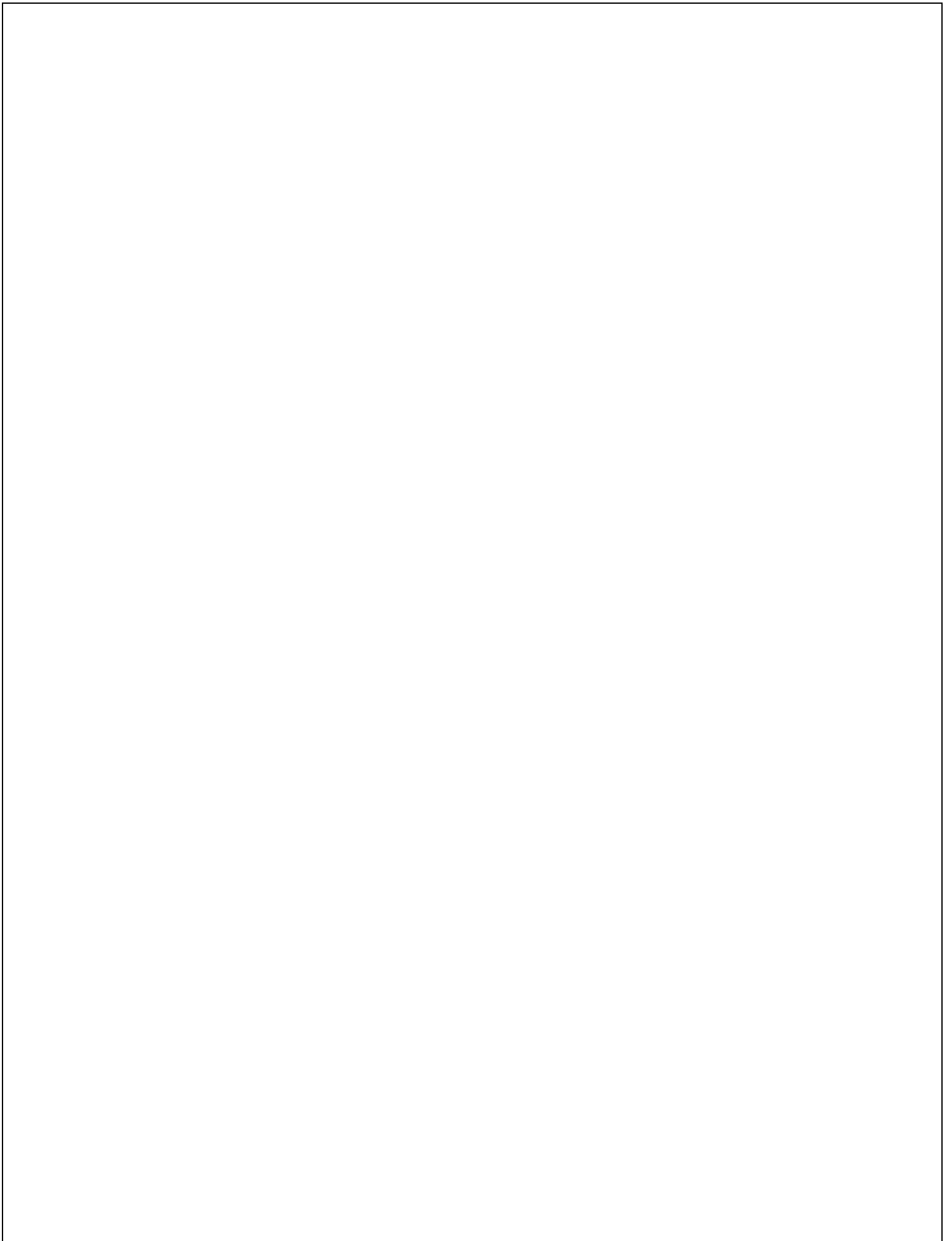
- Lighting fixtures retrofitted with new ballasts and super-saver energy lamps
- Plummer - Motz roofs insulated
- Thermopane windows installed at Motz wing; storm windows installed at Lunt
- Recycling in the cafeteria.

FALMOUTH MEMORIAL LIBRARY

As a valued community educational resource, the Library has become a center for education and outreach about climate change and related issues. It has partnered with various groups to provide a number of programs over the last two and a half years.

The Library has had an energy audit done and has begun implementing several of their recommendations. These include the following:

- Lighting upgrades
- Boiler upgrades



APPENDIX V: EMISSIONS INVENTORY

**2007 Greenhouse Gas
Emissions Inventory
Falmouth, Maine**

Prepared by

Emissions Subcommittee

of the

Falmouth Green Ribbon Commission

On Energy and Climate Protection

Fall 2008

Credits and Acknowledgements

The following individuals, organizations and departments are gratefully acknowledged for their contributions toward the preparation and production of this community wide emissions inventory for the Town of Falmouth:

Volunteers

Claudia King, Co-chair, Cool Falmouth & Emissions Subcommittee	Deirdre Conroy- Vella, Emissions Subcommittee
Bruce Henning, Emissions Subcommittee	Gary Glick, Teacher, Falmouth High School
Cathy Van der Kloot, Cool Falmouth	Ben Tweed, Student, Falmouth High School
Denise Dyck, Cool Falmouth	Simone Egidi, Student, Falmouth High School
Robert Welch, Cool Falmouth & Emissions Subcommittee	Lasse Skaarup Anderson, Student, Falmouth High School
Ellen Klain, Volunteer	

Town of Falmouth

Nathan Poore, Town Manager	Chief Edward Tolan, Police Dept
Anne Gregory, Assessor	Doug Patey, Fire and EMS Dept
John McNaughton, Finance Dept	Pete Clark, Waste Water

Randy Davis, Finance Dept

Diane Moore, Wastewater

Ellen Planer, Finance Dept

Dan O'Shea, School Dept

Peter Lund, Finance Dept

Topper West, School Dept

Skip Varney, Public Works

Jennifer Phinney, Information Technologies Dept

Ryann Stevens, Public Works

Al Ferris, Code Enforcement Dept

Mike Susbury, Public Works

Barbara DiBiase, Energy & Sustainability
Coordinator

Lucky D'Ascanio, Community Programs

Lyn Sudlow, Falmouth Memorial Library

Sierra Club

Joan Saxe, Partnership for Cool Communities

Glen Brand, National Director, Cool Cities Program

Stephanie Cutts, Policy Analyst, Cool Cities Program

ICLEI - Local Governments for Sustainability

Missy Stultz, Senior Program Manager

Jonathan Knauer, Program Associate

Courtney Forrester, Program Associate

And

Maine Dept of Transportation

METRO - Greater Portland Transit District

Greater Portland Council of Governments

Natural Resources Council of Maine

ECO Maine

Pine Tree Waste

INTRODUCTION

Climate change, caused by an increase in the concentration of greenhouse gases (GHG) in the atmosphere, may be one of the greatest challenges facing human society today. The Intergovernmental Panel on Climate Change (IPCC) has concluded that climate disruption is real, and that human activities are primarily responsible for increasing concentrations of greenhouse gases.

What is a greenhouse gas? To quote the National Oceanic and Atmospheric Administration (NOAA):

Many chemical compounds present in Earth's atmosphere behave as 'greenhouse gases'. These are gases which allow direct sunlight (relative shortwave energy) to reach the Earth's surface unimpeded. As the shortwave energy (that in the visible and ultraviolet portion of the spectra) heats the surface, longer-wave (infrared) energy (heat) is reradiated to the atmosphere. Greenhouse gases absorb this energy, thereby allowing less heat to escape back to space, and 'trapping' it in the lower atmosphere. Many greenhouse gases occur naturally in the atmosphere, such as carbon dioxide, methane, water vapor, and nitrous oxide, while others are synthetic. Those that are man-made include the chlorofluorocarbons (CFCs), hydrofluorocarbons (HFCs) and Perfluorocarbons (PFCs), as well as sulfur hexafluoride (SF6). Atmospheric concentrations of both the natural and man-made gases have been rising over the last few centuries due to the industrial revolution. As the global population has increased and our reliance on fossil fuels (such as coal, oil and natural gas) has been firmly solidified, so emissions of these gases have risen. While gases such as carbon dioxide occur naturally in the atmosphere, through our interference with the carbon cycle (through burning forest lands, or mining and burning coal), we artificially move carbon from solid storage to its gaseous state, thereby increasing atmospheric concentrations.¹³

“What you can measure, you can manage.” Ergo, the first milestone in creating a climate action plan is to create an emissions inventory. The main objectives of the Greenhouse Gas Emissions Inventory are:

¹³ <http://www.ncdc.noaa.gov/oa/climate/gases.html>

- 1) to establish a baseline, against which to measure future progress;
- 2) to identify the largest sources of emissions and the greatest opportunities for emissions reductions; and
- 3) to serve as an educational tool that will help motivate change.

The Falmouth Green Ribbon Commission (FGRC) Emissions Subcommittee prepared this Greenhouse Gas Emissions Inventory (the “Inventory”) in 2008 using data for the year 2007. The total community emissions will sometimes be referred as the town’s “carbon footprint.”¹⁴

INVENTORY METHODS

For the purpose of this Inventory, we have limited our scope to emissions directly attributable to activities within the boundaries of the town of Falmouth. Not included in this Inventory are many indirect emissions, which include such things as air travel by residents, consumption of goods by residents produced elsewhere, etc.

The Inventory employs data collected for the calendar year 2007. After consultation with ICLEI Northeast, the Commission selected 2007 as the baseline year, because this was the year with the most complete and reliable data.

The Subcommittee used software called Clean Air and Climate Protection Software (CACP) purchased from ICLEI Local Governments for Sustainability, a leading non-profit dedicated to assisting state and local government in addressing climate change.

The CACP software addresses the most commonly found gases and converts them to carbon dioxide equivalents (CO₂e) as a common language for emissions. The version of CACP that was used tracks emissions and reductions of greenhouse gases associated with electricity, fuel use, and incineration of Falmouth’s solid waste (trash).

¹⁴ “carbon footprint” is a measurement of the amount of carbon dioxide or carbon dioxide equivalents produced by a person or entity.

The CACP software determines emissions using specific factors (or coefficients) according to the type of fuel used. CACP aggregates and reports the three main GHG emissions (CO₂, CH₄, and N₂O) in terms of equivalent carbon dioxide units (CO₂e). Converting all emissions to equivalent carbon dioxide units allows for consideration of different greenhouse gases in comparable terms. For example, on a per-weight basis, methane (CH₄) is 21 times more potent than carbon dioxide in its capacity to trap heat. Therefore, the CACP software converts one metric ton of methane emissions to 21 metric tons of carbon dioxide equivalents. The potency of a given gas in heating the atmosphere is defined as its Global Warming Potential (GWP). Emissions coefficient factors used in the software are based on USEPA's (2007) Inventory of Greenhouse Gas Emissions and Sinks: 1990-2005. The emissions coefficients and quantification method employed by the CACP software are consistent with national and international inventory standards established by the Intergovernmental Panel on Climate Change and the U.S. Voluntary Greenhouse Gas Reporting Guidelines (EIA form1605). Coefficients are updated by ICLEI as new scientific research results become available.

The CACP software reports input and output data in several formats, including detailed, aggregate, source-based and time-series reports. Once a target reduction year has been agreed upon by the FGRC, the CACP software will be used to forecast future GHG emissions, based on growth rate indicator data inputs. This feature can be used in conjunction with the CACP measures selector and ICLEI's CAPP tool to craft a pragmatic and achievable GHG reduction plan.

The emissions calculations for the analysis are based on complete data when available, and modeling calculations, assumptions and estimations when the data did not exist.

EMISSIONS RESULTS

The Inventory results presented in this section are segregated into two main sectors: Community and Government. The Community Sector refers to greenhouse gas emissions associated with all sectors of the town, including the municipality and schools, within the geopolitical boundary of Falmouth. However, we have called out Government as a specific section in this report because in the Government section we use a different methodology (Community data is based on best available estimations and Government data is based upon actual figures) and we have more detail. In both cases, results are limited by the quantity and quality of available data. However, it is important for the Falmouth community to recognize that emissions from municipal activities is a very small part of our total emissions.

COMMUNITY SECTOR EMISSIONS

The software separates emissions into Residential, Commercial, Transportation and Waste.

The results for the Community were startling (See Table 1). The Transportation Sector contributed 68% of our total emissions (198,000 CO₂e tons). In comparison with other towns' emissions inventory results, Falmouth's Transportation Sector was disproportionately high. Falmouth has many through-roads and highways which contribute to emissions which are not attributable to Falmouth-based travel. As our Climate Plan is local in scope and is based on the Inventory results, we made the decision to break with the software methodology and to create a "local" picture by evaluating the data without the emissions from highway travel (we define this as the Maine Turnpike and Interstate 295). This adjustment changed the emissions from Transportation to 43% of total emissions.

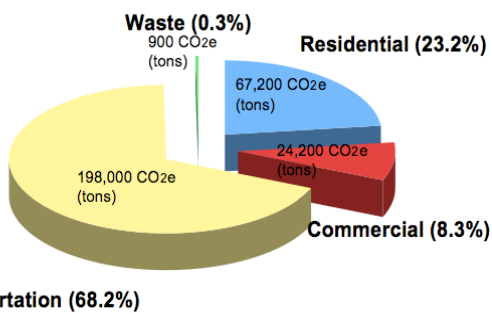


FIGURE 3 INCLUDING STATE HIGHWAY EMISSIONS

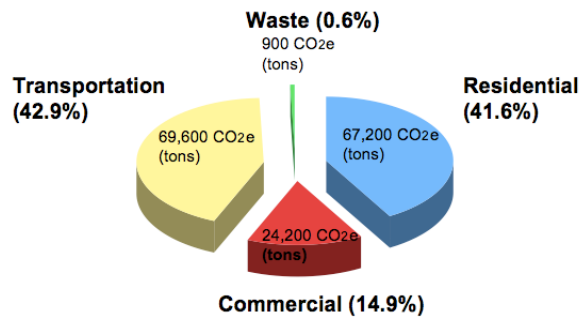


FIGURE 4 EXCLUDING STATE HIGHWAYS

	CO ₂ e Tons	CO ₂ e %	CO ₂ e Tons	CO ₂ e %
	W/Highways	W/Highways	W/o Highways	W/o Highways
Residential	67,200	23.2 %	67,200	41.6%
Commercial	24,200	8.3%	24,200	14.9%
Transportation	198,000	68.2%	69,600	42.9%
Waste	900	.3%	900	.6%
Total	290,300	100%	161,900	100%

TABLE 1 GREENHOUSE GAS EMISSIONS BY SECTOR, WITH AND WITHOUT HIGHWAYS

The largest contributing Sectors in the Community Inventory remain **Transportation** (43 %, 69,600 CO₂e tons) and **Residential** (42%, 67,200 CO₂e tons). This data and its depiction allows us to see that our Plan should consider these two Sectors equally. Transportation no longer dwarfs the other Sectors.

From this point forward, the percentage of emissions will refer to emissions without the Maine Turnpike and I-295.

A. RESIDENTIAL SECTOR EMISSIONS

Falmouth's housing stock is primarily single-family homes whose mean age of construction is 1958. There are approximately 4,200 homes in town, and average size single family home contains a 2,280 square feet of livable space.¹⁵ⁱ The average low temperature in January is 12.5degrees F; and the average high is 30.9 degrees F. The average low temperature in July is 58.6 degrees F; the average high in July is 78.8 degrees F.

The Residential Sector emissions include those which are created at a home and emissions from electricity which are generated elsewhere but which result from consumption within the home; these emissions data account for all energy use within the residence. The data was gathered in the form of energy use (gallons, kilowatts, etc.) from varied sources. The electrical data is actual kilowatts as measured by Central Maine Power. Consistent with the methodology used in other communities, propane, light fuel oil and wood consumption were calculated using energy data from the Energy Information Administration and Falmouth Town Assessor's records. The ICLEI software was used to calculate the emissions of those fuels.

The Residential Sector accounts for 42% (67,200 tons) of the total emissions, a significant portion of total emissions in our community. Of this 67,200 tons of residential emissions, the largest contributor is **heating oil: 50,000 tons, or 74% of all residential emissions**. The high contribution of emissions from heating oil is consistent with media reports that Maine is one of the most oil dependent states in the country.

Electricity accounts for 15,400 tons CO₂e, or 23% of the total. Electricity use includes both heat and light. Wood fuel contributes 60 tons CO₂e and represents just 0.1% of total residential emissions. Data for wood heat was calculated using residences' primary source heat as listed on the Town Assessor's records. Fireplaces and woodstoves which are not listed as primary heating sources are not taken into account. Propane produces 2,000 tons CO₂e and represents 3% of the total residential emissions.

¹⁵ Provided by Town Assessor's office, 2008.

Although there is a natural gas line which runs through the geographic boundary of Falmouth, natural gas is currently not available to resident of Falmouth.

	CO2e Tons	CO2e %
Electricity	15,400	23 %
Fuel Wood (Air Dry)	60	.1%
Light Fuel Oil	50,000	74%
Propane	2,000	3%
Total	67,460	100%

TABLE 2 RESIDENTIAL EMISSIONS BY SOURCE

The above table shows what we all know: the heating season dominates our residential energy consumption, as opposed to warmer parts of the country, where air conditioning (and thus electricity) is much more important.

B. COMMERCIAL SECTOR EMISSIONS

The Commercial Sector Inventory includes the emissions connected with the energy use of retail businesses and government buildings. Falmouth’s commercial buildings are largely located in two service centers on Route 1 and Route 100. The buildings’ mean age of construction is 1969 and they are, for the most part, one-story structures. Many of the government structures are also free-standing and single story. Falmouth has no significant quantity of industrial activity, and thus no Industrial Emissions to report.

It is important to note that a distinct government sector inventory follows the Community Inventory. The methodology for the Commercial Sector of the Community Inventory does not allow one to separate government emissions from commercial emissions.

Energy consumption calculations were carried out based on the Assessor’s records of primary heat sources and building square footage, and CMP electrical records. Commercial buildings typically rely on more than one source of heat. Energy information was obtained through the Energy Information Administration. The emissions were calculated by the Town’s ICLEI software.

Unlike the Residential Sector whose largest source of emissions, by far, comes from home heating oil, the **Commercial Sector’s largest source of emission is electricity, which constitutes 63% of total emissions (15,200 tons CO2e)**. Commercial buildings use electricity for lighting, air conditioning and heating, and office equipment. . Focusing on improving commercial electricity efficiency will likely yield substantial reductions in greenhouse gas emissions, as well as cost-savings for the commercial building owners. Although our Inventory does not address construction issues, it is reasonable to surmise that a lot of energy is lost from older HVAC units, inefficient lighting fixtures, lack of modern controls, inadequate insulation, traditional “black” (rather than white) roofs, and the large building envelope which accompanies spread out, single-story structures.

After electricity, light fuel accounts for the next largest percentage of total commercial sector emissions, representing 24%, (5,800 CO2e tons). Propane produces 13% of total commercial emissions, equivalent to 3,200 tons CO2e.

	CO2e Tons	CO2e %
Electricity	15,200	63%
Light Fuel Oil	5,800	24%
Propane	3,200	13%
Total	23,200	100%

TABLE 3 COMMERCIAL SECTOR EMISSIONS BY SOURCE

C. TRANSPORTATION SECTOR EMISSIONS

The Transportation Sector is a significant contributor to Falmouth’s carbon footprint: 69,600 CO2e tons, or 43% of the community’s total emissions. Thus the climate action plan recommendations need to address Transportation. (Remember, as noted above, that if we followed the strict ICLEI methodology, and included emissions from the sections of Maine Turnpike and I-295 that fall within Falmouth’s geography, transportation emissions would be much higher, and thus an even more significant part of the emissions within town borders.)

It is helpful to provide some Transportation context. A coastal town of ~11,000, Falmouth is mostly suburban and travel is, for the most part, by private vehicle. METRO provides public service to/from Portland and there is a town-operated school bus system. Two freight train lines pass through Falmouth. The passenger rail line planned to connect Portland to Brunswick, with a stop in Freeport,

passes through Falmouth, parallel to Route 1. The town also has one the largest anchorages north of Boston, which includes both sail and power vessels.

Falmouth, which is adjacent to the state's largest city, has a number of roads (Falmouth Road, Rte 1, Rte 100, Rte 88, Rte 9) that provide a transportation corridor for through traffic. Falmouth is now a "service center" community. Approximately the same number of people travel to work in Falmouth as commute from Falmouth to work in other communities.

The emissions calculation for Transportation was based on data provided by the Maine Department of Transportation. This data includes Vehicle Miles Travelled ("VMT")_on roads in Falmouth in 2007. Further calculations are done using ICLEI software. Local data was difficult or impossible to collect (e.g., types of vehicles registered in Falmouth and mileage travelled by Falmouth vehicles) as data collection systems were not completely accessible and/or were not designed to collect this increasingly important data. This situation has limited the Commission's potential recommendations. Data from off-road vehicles, lawnmowers, boats and planes was not available and not included. It would be helpful in terms of managing emissions to have better data available at the local level, particularly vehicle miles travelled by vehicles registered in town, and data that includes emissions from such activities as aviation, lawn maintenance vehicles, boats, etc. Hopefully, as citizens and governments recognize the utility and importance this of data, changes will be made in the data collection system.

D. WASTE SECTOR EMISSIONS

Waste sector means solid waste what might be referred to as "trash", whether that trash is incinerated or trash that is recycled. "Waste" is not human solid waste (sewage), or wastewater at the Sewage Treatment plant.

Falmouth's waste stream consists of residential solid waste collected by several methods:

- weekly pickup of trash to be incinerated, and bi-weekly pickup of trash to be recycled;
- drop off of recyclable trash at the "silver bullets" - at Hannaford and the Central Fire Station on Bucknam Rd (24/7);
- drop off of trash (trash both for incineration and recycling) at the Transfer Station) (limited hours); and
- drop off of brush, metals, petroleum and other products c at the Transfer Station.

Commercial waste is handled privately by commercial waste handlers.

The Waste Sector Emissions Inventory accounts ONLY for residential waste which was incinerated after curb-side collection or drop off at the transfer station. It does not include waste from businesses as that data is not currently available (although we estimate based on conversations with commercial haulers that this figure might be approximately 1,500 tons of waste annually), nor does it include other wastes handled at the Transfer Station. The emissions from the trucks used for curbside pickup and from the Transfer Station is accounted for under Transportation.

Total waste-related emissions are ~ 600 CO2e tons, which represents less than 1% of total community emissions. Because this is an incomplete picture of emissions from waste in the community, and because recycling represents to some extent avoided emissions, we caution the reader from concluding that managing emissions from waste is not important. Better data would be very helpful relative to emissions from the waste sector.

Data concerning “waste characterization,” can be helpful in identifying categories of trash to target for reduction. The Subcommittee characterized the town’s waste stream according to an EPA tool which characterizes “typical” American residential trash. Whether Falmouth’s waste stream is typical due to our waste reduction efforts such as recycling and brush collection is difficult to say. Although much of the waste in the table is uncharacterized, areas for potential further waste reduction might be plant debris, brush and paper products. Given the magnitude of the “all other waste” category (73% of total), refined characterization of waste composition may yield more accurate estimates of emissions.

	CO2e Tons	CO2e %
Collected brush	27	4.5%
Paper products	79	13.2%
Food waste	27	4.5%
Plant debris	21	3.5%
Wood / textiles	8	1.3%
All other waste	437	73%
Total	599	100%

TABLE 4 RESIDENTIAL WASTE BY CATEGORY – “WASTE CHARACTERIZATION”

The role of recycling in this Inventory deserves comments. Although the emissions from the total Waste Sector are small relative to the total Community emissions number, it should be made plain that through recycling Falmouth has avoided a significant percentage (43%) of the emissions that would have been created in the Waste Sector had the recycled materials been incinerated. Additionally as this

Inventory only tracks waste which is incinerated, the indirect emissions (emissions created in the producing of materials for manufacture and in the manufacturing of products) avoided by collecting materials for recycling is not included. These are important considerations in a town whose recycling rate has passed 50% of residential waste. It is important to note that reduced emissions is just one of many environmental benefits of recycling.

	Weight (tons)	CO2e (tons)	CO2e (tons) as a %
Incinerated waste	2,908	599	60.3%
Recycled waste (avoided)	1,781	395	39.7%
Total	4,689	994	100%

TABLE 5 COMPARISON OF RESIDENTIAL WASTE AND RECYCLING

According to this Inventory emissions from the Waste Sector are small relative to Transportation and Residential sectors. However, the Waste Sector is one in which reduction efforts have been instituted and have changed the “business as usual” emissions. In summary, inventorying Waste in our town provides an incomplete picture of emissions or avoided emissions from this Sector.

GOVERNMENT SECTOR EMISSIONS

The Government Sector Emissions Inventory includes the energy consumed through all operations and facilities of the Town of Falmouth. This Inventory is distinctive from the Community Inventory in that the data is from actual utility invoices and data gathered from Town departments. This inventory will allow the government sector to track its individual facilities and vehicles and to evaluate the effectiveness of its emissions reduction efforts at a more detailed level. The results of both sectors are limited by the quantity and quality of available data.

Facilities included in government sector include town hall, three active fire stations, a recently completed (2008) LEED certified police and public safety building, public works building, recently renovated water sewage treatment plant and building, two elementary schools, one middle school, one high school and one school superintendent’s buildings. Town vehicles include police vehicles, public works vehicles and machinery and school busses (over 100 vehicles). Of course Falmouth is in a four season environment (snow plowing in the winter, mowing in the summer; heating and air conditioning).

The town’s buildings account for the greatest portion of the total emissions, 49%, equivalent to 3,000 tons CO2e emitted. The vehicle fleet accounts 21% of the total, equal to 1,300 tons CO2e. Employees’ commutes account for 17%, or 1,000 tons CO2e, while water/sewage (treatment, pump stations and

wastewater treatment) accounts for 11%, or 700 tons CO₂e. **Buildings are emitting nearly half of the government sector emissions.**

	CO ₂ e (tons)	CO ₂ e (%)	Energy (MMBtu)
Buildings	3,000	49	33,000
Vehicle fleet	1,300	21	17,000
Employee commute	1,000	17	12,000
Streetlights	100	2	1,200
Water/sewer	700	11	6,600
Total	6,100	100%	69,800

TABLE 6 GOVERNMENT EMISSION SUMMARY BY SECTOR

When looked at by fuel type, electricity, fuel oil (heat) and vehicle consumption are nearly equivalent in their impact and importance for reduction strategies.

	CO ₂ e (tons)	CO ₂ e (%)
Electricity	1,889	30.8%
Light Fuel Oil	1,937	31.5%
Propane	11	.2%
Biodiesel (B-20)	840	13.6%
Diesel	4	.1%
Gasoline	1,462	23.8%
Total	6,143	100%

TABLE 7 GOVERNMENT EMISSIONS BY FUEL TYPE

COMPARISON OF COMMUNITY AND GOVERNMENT EMISSIONS

Although comparing the Community CO₂e Emissions and the Government CO₂e is not an “apples to apples” comparison (please read how the data is gathered for each Sector), looking at them together allows us to make a couple of statements. First, we can see that it is non-governmental entities make the vast majority of measured emissions. It can be deduced that, although businesses and through-traffic contribute substantially to the overall emissions, Falmouth residents and their residences contribute the largest percentage.

	CO2e (tons)	CO2e (%)
Entire Community	161,900	
Less Government	(6,143)	
Community w/o Govt	155,757	96.2%
Government	6,143	3.8%
Total	161,900	100%

TABLE 8 COMPARISON OF TOTAL EMISSIONS FROM COMMUNITY AND GOVERNMENT

Second, although the government’s emissions as a percentage of the emissions by the total community may be relatively small (~4%), the government has a special role in town. The government can take a leadership role in implementing reductions and in demonstrating their efficacy. Developing programs at the government level may help define which reduction measures make the most environmental, economic and social sense for application in the commercial and residential sectors. And finally, the Government Sector may yield CO2e reductions more readily than the rest of the town. Such success may encourage others to make the necessary changes.

SUMMARY OF INVENTORY AND IMPLICATIONS FOR STRATEGIES

1. The Inventory understates the direct emissions taking place within town borders. Except for electricity consumption, the Inventory does not include indirect emissions.
2. Emissions from Residential activities and Transportation are nearly equal and constitute over 80% of inventoried emissions.
3. Heating oil is overwhelmingly the largest source of residential emissions. This implies reducing consumption of heating oil (think weatherization, passive solar designs, on-demand water heaters, etc.) and switching to cleaner fuels for heating (natural gas, propane, photo voltaics).
4. Commercial activity should focus on reducing electricity consumption (day lighting in large retail stores; light colored roofs; energy star HVAC equipment; insulating exterior walls and roofs) and specifying renewables for the source of their electricity.
5. Transportation represents 43% of the town’s measured emissions. Strategy implications for reducing the total tonnage of emissions from Transportation include reducing idling (traffic lights, drive-throughs, vehicle waiting); reducing vehicles miles travelled; increasing gasoline

efficiency in vehicles; and reducing reliance on single occupancy vehicles (car pooling, biking, walking, METRO) etc.

6. While the Government sector is a tiny portion of total measured emissions, its decisions affect other sectors (support for public transportation, building codes, land use planning, transportation infrastructure, provision of curbside recycling, etc). Government can lead by example, and it can facilitate actions by others. Thus the government sector is important well beyond the measured emission figure for this sector.

The Commission's Climate Action Plan includes recommendations which address the findings and implications of this Inventory.
