

Renewable Energies & Carbon Reduction Strategies in Washington County

Summer 2011

**Prepared by:
Nathan Legere and Enock Zenda
Acadian Internship Program
For the Washington County Counsel of Governments**

Biography of Interns

Nathan Legere: I am a student from New Hampshire. I am currently attending Plymouth State University pursuing a degree in Environmental Science. Post Graduation I would like to seek a career in alternative energies.

Enock Zenda: Currently studying a Masters in Environment and Society at the University of Pretoria in South Africa. Having come from a social sciences background my key interests lie in the social components of environmental development and conservation.

Foreword

This paper sums up the research we were able to cover over our four week period in the field as Acadian Interns working under the supervision of Judy East at the Washington County Council of Governments. This project was made possible through the collaborative work of many stakeholders whose efforts and contributions were invaluable. Thank-you to everyone who was able to be a part of this project making it the exciting, educational and eye-opening initiative it turned out to be. May the Acadian Internship Program continue to reach out not only to young university students such as ourselves, but the communities in which our work was based for many years to come.

Nathan & Enock

Contents

ACRONYMS	4
ABSTRACT	5
INTRODUCTION	5
THE OBJECTIVE OF THIS PROJECT	5
<i>PRACTICALITY;</i>	5
<i>SUITABILITY;</i>	5
<i>AFFORDABILITY;</i>	6
<i>SUSTAINABILITY;</i>	6
METHODOLOGY	6
<i>DATA SOURCING:</i>	6
<i>TIME FRAME</i>	6
<i>THE SCOPE OF THE RESEARCH</i>	6
<i>LIMITATIONS</i>	7
WASHINGTON COUNTY BACKGORUND	7
RENEWABLE SOURCES OF ENERGY	7
<i>HYDROELECTRIC ENERGY</i>	7
<i>WIND ENERGY</i>	9
<i>TIDAL ENERGY</i>	9
<i>SOLAR ENERGY</i>	9
<i>BIOMASS ENERGY</i>	9
<i>ALGAE FOR THE FUTURE</i>	10
<i>BIOFUEL</i>	10
ELECTRIC VEHICLES	13
<i>LIQUEFIED NATURAL GAS</i>	14
LEGISLATION AND INCENTIVES FOR ALTERNATIVE VEHICLES	15
<i>FEDERAL LEVEL LEGISLATION AND INCENTIVES AFFECTING ALTERNATIVE VEHICLES</i>	15
<i>STATE LEVEL LEGISLATION AND INCENTIVES FOR ALTERNATIVE ENERGY VEHICLES: MAINE</i>	16
IMPORTANT FACTORS TOWARDS THE SUCCESS OF ALTERNATIVE ENERGY PROGRAMS	17
<i>CREATING PARTNERSHIPS AND COALITIONS</i>	17
<i>POOLING RESOURCES (KNOWLEDGE, EXPERTISE)</i>	17
<i>RESEARCHING ON ALTERNATIVE ENERGY AND VEHICLES</i>	17
<i>PUBLIC INVOLVEMENT AND PARTICIPATION</i>	18
<i>CLEAN CITIES INITIATIVE</i>	18
SUMMARY	19
CONCLUSION	20
REFERENCES	20

Acronyms

MC²- Maine Clean Communities

PACTS-Portland Area Comprehensive Transportation System

GHG- Green House Gas

LNG- Liquefied Natural Gas

EV- Electric Vehicle

B20- the percentage of BioFuel used in either Diesel or Heating oil.

DOE-Department of Energy

DOT- Department of Transportation

EPA- Environmental Protection Agency

CNG- Compressed Natural Gas

MCAA-Maine Community Action Association

Abstract

Fossil fuel prices have seen extreme highs over the past decade. This is because of the dwindling resources which the earth has to offer. These resources are finite and quickly depleting with our ever-expanding use of them. The realm of this project is to find other ways of increasing energy efficiency within the county, as well as to find other viable alternative sources of energy. The report should be used as a tool for future decision making in the area of energy production and usage.

Introduction

Renewable energies are going to continue to be an important component to the prolonged sustainability of our global environment. Through the internship, ways were found which could help in the reduction of green house gas (GHG) emissions. GHG's are the pollution emitted that is proactive in increasing the heat budget of the earth. This report entails all of the information and research, which was compiled over the duration of the Acadian internship program, which will help in curtailing our current rates of GHG emissions both in the present and future.

The Objective of this Project

To investigate energy efficiency in Washington County and offer possible solutions. This project looks at current areas that are least energy efficient with a special focus on electric vehicles and examines realistic and achievable alternatives that meet the following criteria:

Practicality;

This means looking at the actual application of alternative energies to Washington County scenarios, be they buildings, vehicles or parks. We want to consider more than just theoretical possibilities but achievable alternatives both now and in the future. This involves being able to identify opportunities where decisions between modifying or upgrading infrastructure come into play.

Suitability;

This means applying practical judgment into the environment upon which the proposed alternative energy is proposed. The questions will be asked: Will any alternative proposed within Washington County perform as well as what is already in place? Will it be up to standard or perhaps better in terms of design and functionality? Will it be able to perform all that is required of it as an alternative option?

Affordability;

A major factor within the decision making process of whether or not to adapt alternative energy solutions is what they will cost to acquire, install and maintain. Because Washington County Council of Governments is a government agency, there is a need to consider the funding options available to management as well as the incentives by means of tax deductions associated with alternative energy.

Sustainability;

This aspect considers the durability of alternative energies, are the solutions of consideration long lasting or temporary? What will be the impacts on the environment, communities and economy be during production, installation, and the operational phase? What will need to be considered for possible decommissioning and rehabilitation? There is a need to consider whether the overall outcome is for the better development of Washington County's natural environment. Will management be able to maintain the alternative energy solution viably and will the people whose daily lives are affected by its existence be able to tolerate it.

These four aspects are closely considered within any alternative energy initiative; be it as small as installing a catalytic converter on a vehicle, or purchasing electric vehicles, all the way up to projects as big as the establishment of a Wood Pellet facility in Washington County. These four aspects will better equip management and decision makers within Washington County on which decision path to take.

Methodology

Data Sourcing:

Most all of the research was done online, as secondary research. Consultations were also performed with alternative energy professionals in the area as well as community members who use alternative energies. . Also phone interviews were preformed in order to reach out to other locations that may have been otherwise inaccessible.

Time Frame

Four weeks starting July 18th spanning until august 10th in the summer of 2011.

The scope of the research

Washington County illustrated overleaf, Maine with a case study of Calais.

Limitations

- Vastly dispersed first hand resources
- Non-cooperative resources in the form of local companies and corporations
- Short time span

Viability of growing alternative energy is one that needs to be assessed. All alternative energies are still in their infancy. When looking back in our past with how long we have had the access to energy, most all of it has been produced in non-sustainable ways in that they sources which have been used are not infinite.

Washington County Background

Washington County Maine is home to an estimated population of 32 856 residents. The County has an area of approximately 3,254.91 square miles giving it a density of 13 people per square mile. This County is mostly rural with 20.1% of its population classified poor (MCAA, 2009). This County was the focus of our project and will be referred throughout this document. The map overleaf illustrates.

Renewable Sources of Energy

Hydroelectric Energy

Hydroelectric has been a renewable resource that has been use for a very long time, but at the same time has had many drawbacks, many of which have been ignored or not fully understood. Hydroelectric requires the building of massive dams across the entirety of rivers which harnesses the vast amount of potential energy which they have. At the same time it blocks them from their natural flow and changes the ecosystem. They also create large reservoirs that have negative impacts on the local biota in the immediate area. These reservoirs also have been proven to harbor bacteria that decompose the land submerged by the water. The process the bacteria complete has an end product that consists of carbon dioxide. This is another factor that needs to be assessed when the possibility of hydroelectric power is considered.



(Jeremy Gabrielson, 2011)

Wind Energy

Wind has been a very good resource that has been utilized for quite some time now. Not enough research has been done in its effects on the local inhabitants which live close to them and there is some concern for negative health impacts on both the people and the animals. It has been shown that birds are killed in the process of making wind energy and depending on their location can have more or less of an effect on the population. Overall this is a very small impact and when compared to the thousands of birds killed in recent oil spills in our dependence on fossil fuel energy, wind still proves to be a more eco-friendly source. More studies still need to be done to research the possible negative impacts that wind turbines may have on other local species, including humans. Washington County.

Tidal Energy

Tidal energy is new in its commercial application. It can be related to hydroelectric production, but is different in that it harnesses the energy from daily changing tides. It is less invasive because it does not encompass large areas and because of this its environmental impacts are very minimal. Effects that it has on the local biota have also proven to be minimal because of the limited amount of space that the substations require. Fish and other aquatic life can easily coexist with the large propellers that are used to harness the tidal energy. This is still a new and unchanged technology, which will soon see modifications that can only improve on the efficiency.

Solar Energy

Solar energy for the production of electricity is a very costly endeavor. This is because the crystalline silicon materials within the solar panels remain very expensive to produce. Until the price of this product is reduced or a different element can be found to replace it, the price of Photovoltaic Solar panels will remain quite high and will continue to not be economically viable. Through grants and other sources of outside funding, it may become more feasible.

Biomass Energy

The most feasible form of alternative energy is through biomass. Governor Baldacci recognized this opportunity in 2008 and assembled the wood to energy task force. This task force brought together many people from many backgrounds consisting of the Maine Department of Conservation, land owners, loggers, pulp and paper mill industry representatives, economists and representatives from the American Lung Association of Maine. During the time spent with the task force, they came to the conclusion that Maine has a huge potential for the use of biomass for the production of electricity as well as for residential heating through wood pellet production.

Recently there has been an explosion of this type of heating on the market. Now, in addition to wood pellet stoves, a new company called ReVision Energy is bringing wood pellet boilers to the U.S market which could potentially utilize the states vast forestry resource in order to reduce the amount of residential oil use. They are a company that manufactures, installs and services the boilers as well as delivers the wood pellets that they require. This is completely automated system that does not require daily attention. All that the homeowner needs to do is empty the ashtray where the boiler compresses the ash which is created in the combustion process. This only needs to be done once or twice a heating season and these ash pellets can then be used as fertilizer or dumped in a compost bin. The company based out of Bethel, Maine, manufactures boilers for heating applications of up to 25,000 sq ft, which covers most any heating needs, either residential or commercial.

On average, it was found that these pellet boilers could cost about \$6,000 more than oil counterparts. The price for the pellets is around \$235 a ton. That translates to paying about \$2.00 a gallon if it were oil for the equivalent output of BTU's. At that rate it would not be long before the boiler pays itself off and with the price of oil only going up, it can be secured as a safe investment. Currently there is a tax credit available for installation of a wood pellet heating system for 10% of the cost up to \$300. Although small, it is a bit of extra incentive to help with the cost of a new boiler system.

While you are paying off the investment of the boiler, you will also be carbon neutral. That is, you will not be putting carbon into the air which was stored as fossil fuel thousand of years ago. The carbon that you will be emitting will only be that that the tree retained to go through the process of photosynthesis in order to grow. This is a much more sustainable practice than the normal practice of burning fossil fuel. Another benefit from burning wood pellets as opposed to fuel oil is that the wood pellet industry is fixed and does not fluctuate as much as the oil market does because of foreign conflict or depleting oil reserves.

Algae for the Future

One other source of energy that is on the horizon is in the form of algae. Algae are a quick growing organism that only requires water and CO₂ to grow. Depending on the amount of these two factors, it can grow quite rapidly. After the algae are grown, they are then dried and can be compressed into pellets, which can then be burned. This is not a science yet and is still in the developmental stages but shows great promise for the future of pellet energy in places where they may not be a forestry resource as abundant as here in Maine.

BioFuel

BioDiesel and BioHeat are one other way to offset carbon emissions. They are the same compound, but are named differently depending on their

application Currently only 5% BioHeat can be used in place of the fossil fuels but by using just 5% BioHeat, 3% of the total GHG's can be reduced. There are no adverse effects on the boiler when BioHeat is used and it can in fact increase the overall efficiency of the boiler. The analysis of the CO₂ reduction and the costs can be found in Table 1

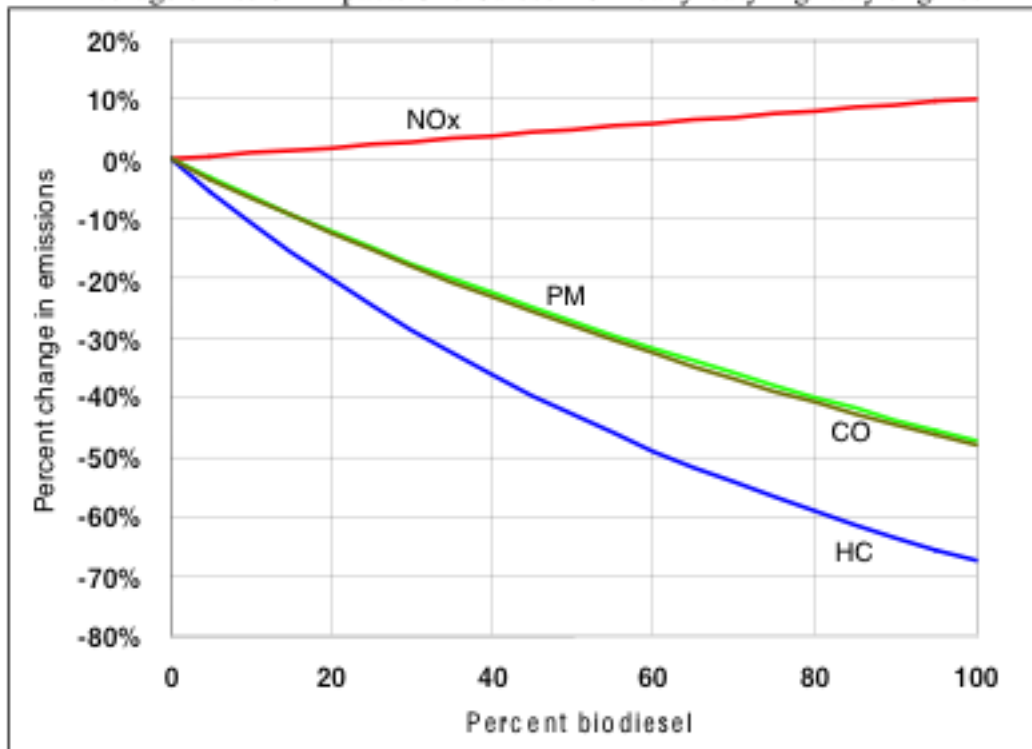
Table 1:

Fuel Type	Business	Cost	Gallons	Metric tons of CO ₂ produced	CO ₂ sequestered with BioFuel
Fuel Oil	City of Calais	\$66,383	27,095	304	9.12
Gasoline	City of Calais	\$51,000	17,000	151	
Diesel	City of Calais	\$73,500	30,000	337	37.07
Fuel Oil	WCCC	\$165,816	67,680	761	22.83
Gasoline	WCCC	\$4,557	1,519	13.5	
Fuel Oil	Calais Public School	\$147,000	60,000	675	20.25
Diesel	Calsis Public School	\$29,400	12,000	135	15.07
Fuel Oil	Calais Elementary	\$49,000	20,000	225	6.75
Total		\$584,000	234,000	2,601	111

BioDiesel can be used in Diesel engines with no modification to the engine whatsoever. Concentrations of 20% (B20) can be used legally in on-road vehicles. This is only after extensive testing was done by the EPA on the effects on the environment along with the effects on the vehicles that are utilizing it. B20 has been found to be the optimal percentage because higher percentages have been proven to break down the elastomers in the vehicles engine parts over

time. Higher percentages do have less GHG emissions associated with them as shown in Table 2 produced by the EPA.

Table :2
Average emission impacts of biodiesel for heavy-duty highway engines



In a case study found within our research, a school district in New Jersey has been using B20 in their bus fleet for about a decade. Within this time they have traveled 4 million miles, consumed 615,000 gallons of BioDiesel and reduced their carbon dioxide emissions by 1,377 tons. In the process they have abstained from using 123,000 gallons of diesel fuel and have thus reduced their need for foreign fossil fuels. It has been proven that emissions associated with the use of fossil fuels is linked to Asthma in children and Maine especially has one of the highest rates of asthma developing in children. The New Jersey case study has shown that by using BioDiesel in their bus fleet they have increased the air quality both inside and outside of the bus.

One of the first hand resources which was used in the research was the Washington Academy in East Machias. There, professor Don Sprangers gave use a first hand experience with the production of BioDiesel and he showed us that it is in fact a very simple process. The process of transesterification is the process by which animal or food fat is combined with alcohol. The by-product, which is glycerin, can be used to make soap, or can be put into a compost bin. He also showed us how the school is able to make large amounts of BioDiesel

and where they plan to implement this technology by heating their green house over the coming winter.

BioDiesel is just one way which carbon outputs can be reduced in both heating and transportation. Transportation accounts for one third of the total GHG emissions in the US. The best source of alternative transportation on the market to reduce this statistic is in the electric vehicle (EV) market. These are vehicles that can be plugged in and charged just like your cell phone or computer. There are quite a few options on the market today.

Electric Vehicles

Ford has two different EV models. The Ford transit is a multi-use vehicle that is more suited for commercial applications. It features the new lithium ion battery that is liquid cooler to prevent overheating and improves efficiency overall. Their Focus EV model has not been put on the market yet and is presumed to come out at the end of this year and when it does, the price tag is going to be less than the Nissan Leaf. The Nissan Leaf is going to be able to seat 4 people. It will have about a 100 miles range as well and will cost about 25,000 after the tax reductions.

The Chevy Volt is a bit different than the other EV's. It has a range of only about 35 miles on the charge from the wall. When this 35-mile charge has run out, it then has a small 1.4L engine which turns on and then creates electricity for the electric engines which then put power to the wheels. For this reason it still is considered an EV, but does still use petroleum. The Volt is also going to cost more than the others at about \$40,000.

Smart Car also has an EV on the market. This vehicle features their electric drive technology. What sets the Smart Car apart from the others is its relatively short charge time of only about 3-4 hours. This is due to the small battery capacity, which is limited because of the size of the vehicle. Even lacking in its battery size, it still can travel about the same distance on a charge as the others; about 100 miles.

CODA cars is a company based out of California. They only produce EV's and have been in business for only a couple of years. Their vehicles share most of the same statistics as the others: it takes about 8 hours to charge, can fit 4 people comfortably, can travel about 100 miles on a charge, has a top speed of 80 mph and costs about \$37,000 after tax credits. CODA cars do feature a regenerative braking system, which is the same technology which can be found on the Toyota Prius.

One last option for the EV technology can be found in the Vantage vehicles. These are much smaller vehicles with a very short range of only about 60 miles. Also it has a top speed of only about 25 mph, making it a certified slow

speed vehicle. There are many models available ranging in function. There are trucks available with all types of bed options as well as a van that can seat up to 7 people. All of the standard options that can be found on any other cars can also be found on a vantage. It has a short charge time of only 5 hours.

All of the EV's listed above can be charged on the standard outlet but all of the charge times are based off of a stage 2 charging unit which uses a 220 outlet. Charge times can be substantially longer with the standard 110 outlet. It is also important to note where the electricity is coming from. In many cases if the electricity that is being used is coming from a fossil fuel production plant, then the vehicle is not really carbon free. The cost of running one of these vehicles was found to be about \$300 annually, which is a much smaller chunk of money than that of a fossil fuel vehicle.

The batteries that are used in these vehicles are in many cases acid lead batteries which are very heavy and can pose an environmental hazard when they need to be replaced. The newest and best technology that will soon replace these acid lead batteries is in the form of lithium ion batteries. These are batteries which are already in use in most cell phones as well as laptops. They have had trouble in the past with over heating and bursting into flames but the problem has been remedied in the form of liquid cooling systems to keep the batteries heat in check.

Liquefied Natural Gas

The last pathway for reducing carbon is in the form of a different type of fossil fuel. Liquefied natural gas (LNG) is a milder fossil fuel and can be explained as the lesser of two evils. It does have GHG emissions but it has much less than that of conventional fossil fuels. It has three main applications in the form of transportation, electricity generation and space and water heating. Currently in Maine, about a third of the electricity that is produced comes in the form of LNG.

LNG as a form of transportation has lots of potential in down east Maine. Any vehicle can be converted to LNG, either diesel or gasoline. The conversions can be very costly though, and with the price of propane often being more than 40% more the conventional fossil fuels, it is proven to be very cost ineffective. Also there is no tax incentive whatsoever to make the switch. There was a time when propane vehicles were made OEM, but they were only mixed fuel in that they used regular gasoline to start and then switched over to propane. The last time one of these vehicles was made was in 2004. At that time, Texas made a huge investment in these vehicles. To go along with these vehicles, Texas also has the best propane infrastructure in the country to go with it.

The only propane infrastructure in the state of Maine is a large LNG pipeline that runs from Nova Scotia, Canada 635 miles down to Methuen, Massachusetts. There is a large LNG reserve found in Nova Scotia, which is the

primary contributors to the mass amount of LNG which flows through the pipeline. There are some Negative impacts that are attributed to this; one of which is the large swath of land that needs to be clear cut in order to install the pipelines. Also there are large roads which need to be constructed in order to access these sites which also requires clear cutting. There is also a mass amount of energy that is required to ship the LNG through the pipes as well as the refining which is attributed to the LNG in order to obtain the propane that is found within the LNG. If the LNG needs to be shipped, then the question becomes, is it really that carbon neutral?

Legislation and Incentives for Alternative Vehicles

These two factors are highly essential towards achieving goals in terms of reducing GHG emissions, introducing alternative energy and ensuring the sustainability of our most important assets which include our natural environment and the communities that revolve around it. Legislation, policies and incentives within the United States energy sector exist at four main levels which are federal, regional, state and local levels. Therefore when considering which paths to take or technologies to adopt with regards to alternative energy it is important to consider all of these and ensure that there is no conflict of interests between the governing bodies concerned. Worth noting at this point are the three key U.S. departments directly involved with alternative energy development: Department of Energy (DOE), Department of Transportation (DOT), and the Environmental Protection Agency (EPA).

Federal Level Legislation and Incentives affecting Alternative Vehicles

Legislation and incentives at this level affect the entire nation and are in that sense uniform regardless of the State in which alternative energy initiatives are being addressed. Federal Law and policies are made by the Congress and are considered highest ranking laws by the “Supremacy Clause” of the U.S. constitution. Therefore any laws and policies regarding alternative energy passed at this level will dominate any other laws at state and local levels. Within the alternative energy sector the following are some of the most significant laws affecting alternative energies across the nation;

- Aftermarket Alternative Fuel Vehicle (AFV) Conversions
- Alternative Fuel and Vehicle Labeling Requirements
- Clean Air Act Amendments of 1990
- Greenhouse Gas Reporting Requirement
- Procurement Preference for Electric and Hybrid Electric Vehicles
- Renewable Fuel Standard (RFS) Program
- Renewable Fuels Assessment
- Updated Fuel Economy Test Procedures and Labeling
- Vehicle Acquisition and Fuel Use Requirements for Federal Fleets

- Vehicle Acquisition and Fuel Use Requirements for Private and Local Government Fleets
- Vehicle Acquisition and Fuel Use Requirements for State and Alternative Fuel Provider Fleets
- Vehicle Fuel Economy and Greenhouse Gas Emissions Standards

The incentives that are in place at this level to encourage the use of vehicles that run on alternative fuels include:

- Advanced Biofuel Production Grants and Loan Guarantees
- Advanced Energy Research Project Grants
- Advanced Technology Vehicle (ATV) Manufacturing Incentives
- Alternative Fuel Infrastructure Tax Credit
- Alternative Fuel Mixture Excise Tax Credit
- Alternative Fuel Tax Exemption
- Biobased Transportation Research Funding
- Biodiesel Education Grants
- Biodiesel Income Tax Credit
- Biomass Research and Development Initiative
- Cellulosic Biofuel Producer Tax Credit
- Ethanol Infrastructure Grants and Loan Guarantees
- Fuel Cell Motor Vehicle Tax Credit
- Idle Reduction Equipment Excise Tax Exemption
- Improved Energy Technology Loans
- Qualified Plug-In Electric Drive Motor Vehicle Tax Credit
- Small Agri-Biodiesel Producer Tax Credit
- Volumetric Ethanol Excise Tax Credit (VEETC)

State Level Legislation and Incentives for Alternative Energy Vehicles: Maine

The States Legislation includes;

- State Plan to Reduce Petroleum Consumption
- Plug-In Electric Vehicle Infrastructure Development
- Ethanol Fuel Handling Outreach and Education
- Idle Reduction Requirement
- Low Emission Vehicle (LEV) Standards
- Alternative Fuel Tax Rates
- Low-Speed Vehicle Access to Roadways
- Fuel-Efficient Vehicle Acquisition Requirements
- Transportation Efficiency Fund
- Provision for Establishment of Clean Fuel Vehicle Insurance Incentives

The state incentives include;

- Biofuels Production Tax Credit
- Biodiesel Fuel Tax Exemption
- Alternative Fuel Vehicle (AFV) and Fueling Infrastructure Loans

- Idle Reduction Weight Exemption
- Low-Speed Vehicle Inspection Exemption

Federal and State laws and incentives pertinent to alternative energy in the state of Maine alone are numerous, for more information on these please refer to the following sites;

- www.afdc.energy.gov/afdc/laws/
- www.eia.gov/cneaf/solar.renewables/page/rea_data/appendix.htm
- <http://www.eere.energy.gov/topics/government.html>
- www.dsireusa.org

Important factors towards the Success of Alternative Energy Programs

There are a number of critical factors detrimental towards the success of alternative energy projects that this project was able to identify. These factors when combined increase the likelihood that people and organizations within Washington County will adopt alternative energy solutions on offer and available to them. These factors may be summarized as follows;

Creating Partnerships and Coalitions

There is a need to establish strategic partnerships between diverse sectors within the field of alternative energy. This allows the manufacturers of renewable energy products, and other groups and individuals to work together. People with expertise need to be partnered with people who need alternative energy solutions.

Pooling resources (knowledge, expertise)

This aspect involves considering the resources available within Washington County in order to develop alternative energy which is affordable, available and sustainable. This county is deprived in terms of a lack of opportunities especially for young people, the result being widespread poverty. Bringing in resources such as funds to provide alternative energy infrastructure would possibly stimulate employment too.

Researching on alternative energy and vehicles

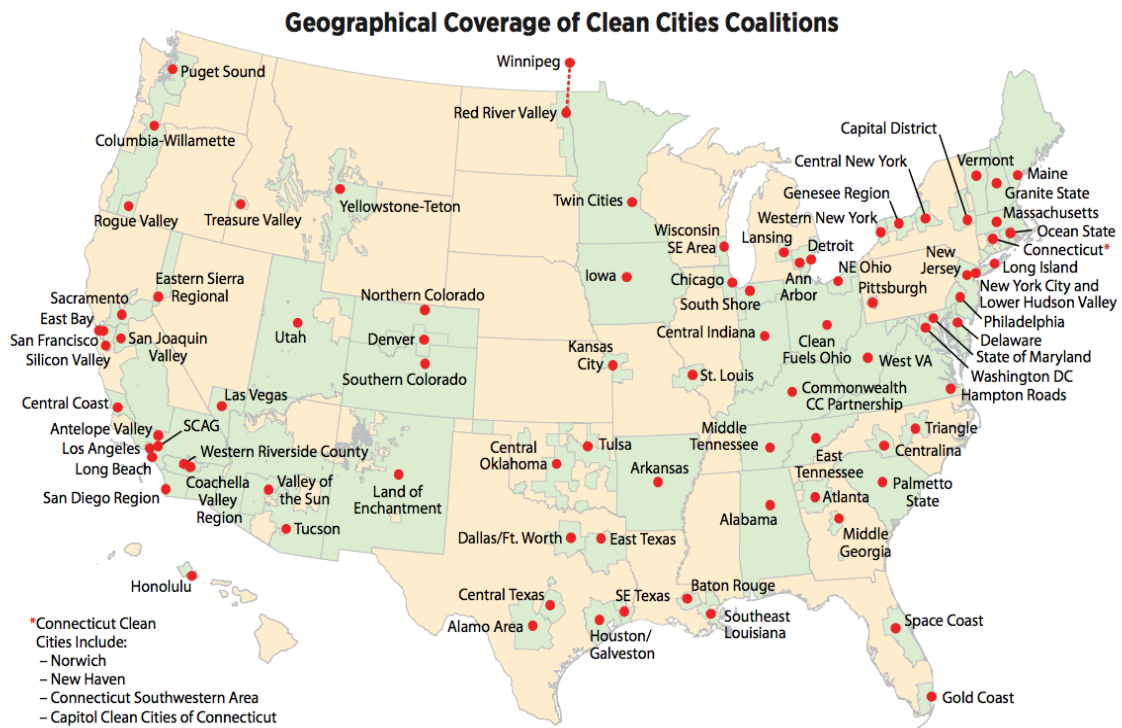
There are constantly new developments on alternative energy and one way to keep abreast is through continuous research both inside and outside Washington County, this project being a product of such work.

Public involvement and participation

Continued consultation with stakeholders such as the public, is important towards the success of major renewable energy projects for example tidal, wind and biomass. The outcomes of these projects affect local communities including farmers and fisherman and their input is just as vital. There is also the need to educate the public on the alternative energies available to them.

Clean Cities Initiative

This program was set up by the U.S. Department of Energy in 1993 and focuses on Energy Efficiency and Renewable Energy (EERE). Programs like this one are vital towards the successful adoption and implementation of alternative energies within regions such as Washington County; especially given its demographic characteristics. This program has nearly 100 Clean Cities coalitions across the United States and over 8400 stakeholders who all contribute towards its goals and accomplishments. These stakeholders include private companies, fuel suppliers, local governments, vehicle manufacturers, national laboratories, state and federal government agencies, and other organizations. These institutions collaborate to create partnerships within alternative transportation in their communities.



Looking at the map above one would be misled to conclude that most of the coalitions are based within the larger cities of the United States. However this is not the case, the red points represent the head office within each city and

sometimes state and the sphere of influence of any coalition would normally cover surrounding towns under the Clean Communities program. A local example of one of these coalitions is Maine Clean Communities (MC²). This coalition is based in Portland under the Greater Portland Council of Governments and services the entire state of Maine. This organization receives the majority of its funding from the U.S. (DOE), the Federal Transit Administration and the Portland Area Comprehensive Transportation System (PACTS). Their partners include fleet managers, state and local officials, clean fuel providers, and other groups and individuals interested in promoting the use of clean fuels and clean fuel vehicles.

A few of MC²'s accomplishments include creating Maine's first propane fueling facility and Maine's first compressed natural gas (CNG) fueling facility, and helping to acquire 13 CNG transit buses and three CNG school buses. In addition, MC² has broadened its focus to include no-idling efforts and has received recognition for developing Clean Fuel Vehicle Incentives through the state legislative process.

As part of this project, a membership proposal for the City of Calais to become a member of MC² was drafted and submitted for approval which is currently pending. This step would hopefully bring Calais one step closer to achieving its alternative transportation goals with the assistance of MC².

Summary

There are a number of alternative energy options which may be deemed applicable within Washington County. These options include;

- BioDiesel for vehicles and BioHeat as a source of energy for buildings
- Propane for within the transportation sector, with the future possibility to tap into and benefit from surrounding LNG pipelines
- Tidal energy for electricity generation
- Wind for electricity generation
- Solar at both domestic and industrial scale; with the ability to feed the local grid
- Biomass; wood chips and wood pellets; with the option to build a wood pellet facility in the County for local consumption as well as export

These different types of energy vary in their status from those still in their conceptual phase such as the development of a wood pellet facility through to those already functional such as the wind projects on Kibby Mountain. There is also a need to combine these alternative energies with proactive steps towards reducing carbon footprints within Washington County such as;

- Electric vehicles for a variety of uses such as maintenance and personnel transportation
- Alternative energy powered equipment in sectors such as public works
- The creation of partnerships and alliances that are fundamental towards the overall goal of adopting alternative energies. (Clean Cities Initiative.)

Conclusion

This paper is a clear indication that there is no single solution towards reducing emissions or Washington County's high level of dependence of fossil fuels, most specifically oil. A region such as this one should take advantage of its abundant resources such as its forestry and shoreline to develop cleaner and alternative energy sources in a sustainable manner. There is vast potential to implement many of the alternative energies examined throughout this project and mentioned in this paper. It is important to keep in mind that these technologies are constantly changing and some of the information mentioned within this paper may not still be accurate in the following years. The best path for Washington County to take would be to adopt an energy mix comprising of the various types of energy being utilized in areas they are most suitable.

References

Maine Community Action Association,(2009). Poverty In Maine Update Volume 2, Issue 2 October 2009.

www.afdc.energy.gov/afdc/laws/

www.eia.gov/cneaf/solar.renewables/page/rea_data/appendix.htm

www.eere.energy.gov/topics/government.html

www.dsireusa.org

www.eia.gov/cneaf/solar.renewables/page/state_profiles/maine.html

<http://www.afdc.energy.gov/afdc/>

<http://www.me-pelletheating.com/de/company.html>

http://www.gagnongeothermal.com/tax_credits.htm

<http://www.emec.com/factsfigures.aspx>

<http://www.epa.gov/aboutepa/states/me.html>

<http://www.vantagevehicle.com/electric/index2.html>

<http://www.omnitekcorp.com/altfuel.htm>

<http://www.codaautomotive.com/all-electric-car/>

<http://www.smartusa.com/models/electric-drive/overview.aspx>

<http://www.chevrolet.com/volt/features-specs/>

<http://www.nissanusa.com/leaf-electric-car/tags/show/buy#/leaf-electric-car/tags/show/charging>

<http://www.ford.com/electric/focuselectric/2012/?intcmp=fv-fv-a2b07c04d000680e00f00g10h35j12k07m3n0p20110126>

<http://www.vwdealer.com/Maine>

<http://www.keystonebiofuels.com/bioheat.html>

<http://www.eere.energy.gov/>

<http://www.oceanrenewablepower.com/home.htm>

http://www.nrcm.org/kibby_mountain.asp

<http://www.frontierenergy.org/consulting.htm>