FINAL REPORT

ENVIRONMENTAL AND RENEWABLE INDUSTRIES COMMITTEE (ERIC)

Submission To:

The Honourable Richard Brown
Minister of Development and Technology

January 31, 2008

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EXECUTIVE SUMMARY

A growing crisis in the agricultural and forestry sectors, rising fuel prices, concerns about the security and supply of energy resources, and growing awareness of the impact of traditional energy resources on the environment (e.g. climate change) have greatly increased interest in renewable and sustainable energy technologies, and in particular, biofuels. Biofuels represent a potential opportunity to transition to a sustainable bio-economy in which agricultural and forestry products, co-products and waste materials are used to produce energy. An aggressive biofuels portfolio, incorporating less carbon intensive fuels into the current energy mix, could complement Prince Edward Island's efforts to further renewable energy development, reduce greenhouse gas emissions, and provide an additional revenue source for the agricultural and forestry sectors.

In September 2007, Executive Council established and directed the Environmental and Renewable Industries Committee (ERIC) to examine the potential for local biofuels development. With members from eight government departments and agencies, ERIC was mandated to collect relevant data on the quantity and quality of available feedstocks from primary resource sectors and submit policy recommendations regarding the sustainable development of these resources.

In Prince Edward Island local feedstocks are readily available or could reasonably be developed in support of biofuels initiatives. Biomass feedstocks (e.g. wood, cereals, straw, grasses, crop residues), in particular, offer significant potential for space and water heating applications and electrical generation. Recent downturns in pulp and log wood markets have made biocombustible feedstocks readily available for biofuel initiatives. Other biocombustible feedstocks could be developed to ensure an adequate supply or contribute to future development of cellulosic ethanol.

Pure plant oils, already part of an on-farm pilot project, could be enhanced through their use as a biofuel. These oils may be of use in modified diesel engines and as a blend in heating oils. Pure plant oils can also be used as a feedstock for bio-diesel production, and thus development of this resource could contribute to the success of other biofuel initiatives.

Feedstocks for bio-diesel and ethanol, while not readily available locally, could be developed to support small to large-scale production. Local demand for biodiesel (space heating and transportation) is likely sufficient to support commercial production. Ethanol production, not as scalable as bio-diesel, would require additional markets, well beyond the transportation fuel needs of Prince Edward Island. A regional renewable fuel mandate would create a larger market for ethanol blends and potentially enable viable ethanol production on the Island.

The sustainable development of biofuels may diversify Prince Edward Island's energy mix, strengthen the Island economy, and help meet regional greenhouse gas emission reduction targets. With PEI's annual expenditure of $334 million on imported, petroleum-based energy products, the advancement of made-in-PEI biofuels should clearly be encouraged in the overall public interest of Prince Edward Islanders.
In particular, the development of biofuels could significantly add to income opportunities for Island farmers, and, given the challenges facing the agricultural sector, is a worthy socio-economic objective to pursue. As a result of this logic, a project evaluation framework which places farm incomes and farmer support for projects at the forefront is attached as Appendix V to this report.

ERIC recommends government pursue measures that encourage the development of economically viable

biofuels projects that are consistent with our energy goals, respective of our environment, and return maximum benefits to Islanders. This report completes the work of ERIC as an information gathering and analysis structure, and sets the stage for new structures and processes that Government should create and pursue for specific assessment and implementation of biofuels projects and prioriites.

ERIC recommends that Executive Council:

1. Establish an Inter-Departmental Biofuels Committee (IDBC) to be composed of representatives from each of Agriculture, PEI Business Development Inc., Development & Technology, Environment, Energy and Forestry (EEF), the Forestry Division of EEF, Fisheries & Aquaculture, the Office of Bioscience and Economic Innovation, and Provincial Treasury.

2. Designate Agriculture as Chair of IDBC.

3. Confirm the Terms of Reference for IDBC with the following 5 key areas of responsibility.

   i) Evaluate proposals for biofuels projects and studies with a view to making recommendations to Executive Council on their potential economic, environmental, and social benefits to Prince Edward Island.

   ii) Work with biofuels proponents to identify applicable federal and provincial government assistance programs, as well as sources of private sector investment.

   iii) Make recommendations to Executive Council by September 2008 on the feasibility of mandated renewable fuel standards for transportation and/or heating fuels (with and without a requirement for locally produced fuels), and the economic implications of road tax exemptions, rebates, and related policies and measures.

   iv) Identify potential biofuels demonstration projects that can be implemented at government facilities and in government vehicle fleets, thus enabling government to lead by example in the advancement of biofuels.

   v) Require that the committee's activities be linked conceptually and strategically with the economic innovation strategy being developed by the Office of Bioscience and Economic Innovation.

4. Direct EEF to take an active leadership role in regional collaborative initiatives (e.g Council of Atlantic Premiers, the Atlantic Energy Framework and New England Governors Eastern Canadian Premiers) regarding biofuels development. Specifically, EEF will solicit interest for the establishment of mandated regional renewable fuel standards for biofuels, and in particular, ethanol.

5. Direct Agriculture to develop an agricultural policy regarding the development of an agriculture-based biofuels industry.

6. Direct EEF to develop a forestry policy regarding the development of a forestry-based biofuels industry.

7. Approve, in principle, the expenditure of funds from the *Trust Fund for Clean Air and Climate*

Change for potential studies, demonstration projects and pilot projects.

8. Identify and consider other sources of funds for the work of IDBC.

BACKGROUND

On September 5, 2007, Executive Council Memorandum Number 2007-16.3 advised Brooke MacMillan, Deputy Minister of Development & Technology that Cabinet approved the establishment of an inter-departmental / agency working group to be known as the Environmental and Renewable Industries Committee (ERIC).

The Department of Development and Technology, under the direction of Deputy Minister Brooke MacMillan, established ERIC with Gordon Cobb, Director of Special Projects, acting as Secretary. ERIC was composed of representatives from the Department of Development & Technology, PEI Business Development Inc., the Office of Bioscience and Economic Innovation, the PEI Energy Corporation, the Department of Environment, Energy and Forestry, the Department of Agriculture, the Department of Fisheries & Aquaculture, and the Provincial Treasury.

Mandate

Executive Council Memorandum Number 2007-16.3 provides the following mandate:

> *The working group shall collect relevant data on the quantity and quality of available feedstocks from primary, processing and agricultural (bio-crops) sources and make recommendations to Executive Council on policy initiatives for how these resources can best be utilized in the support of renewable energy (ethanol, bio-diesel, electric, etc.) and environmental industries for the benefit of Prince Edward Island.*

Committee Membership

ERIC was established as an inter-departmental committee and consisted of the following members:

Brooke MacMillan	Chair	Department of Development and Technology
Gordon Cobb	Secretary	Department of Development and Technology
Wayne MacQuarrie		PEI Energy Corporation
Erin Taylor		Department of Environment, Energy and Forestry
Michael Mayne		Office of BioSciences and Economic Innovation
Gailene Tobin		Office of BioSciences and Economic Innovation
John Hughes		PEI Business Development Inc.
George W. Mason		Provincial Treasury
Chris Mills		Department of Fisheries and Aquaculture
Peter Boswall		Department of Agriculture
Deborah Hagen		Department of Agriculture

Methodology and Resource Material

ERIC held its first meeting on Friday, October 5th and agreed to meet each succeeding Friday up to, and including, November 30th. A total of ten (10) full committee meetings were held, as well as several sub-committee meetings. The Committee prepared a draft report by December 10th. After a thorough review by relevant departments in December 2007, an additional ERIC meeting and related discussions, and a Deputies final approval meeting in January 2008, the final report was delivered to the Minister of Development & Technology on January 31, 2008.

A web portal was developed for ERIC to serve as a central repository for resource material (e.g. studies and publications) and presentations made to the committee (see Appendix II for a complete listing of materials and presentations). Paul Stewart, Abiogen Development Services, was hired to develop an inventory of feedstocks for bio-energy applications derived from forestry, agriculture, fisheries and aquaculture industries, and waste management. His report, *PEI Biofuels Overview: Seeking the Pathway to Sustainability* was submitted in December 2007.

POLICY CONTEXT

A growing crisis in the agricultural and forest sectors, rising fuel prices, concerns about the security and supply of energy resources, and growing awareness of the impact of traditional energy resources on the environment (e.g. climate change) have greatly increased interest in renewable and sustainable energy technologies, and in particular, biofuels. Biofuels represent a potential opportunity to transition to a sustainable bio-economy in which agricultural and forestry products, co-products and waste materials are used to produce energy. An aggressive biofuels portfolio, incorporating less carbon intensive fuels into the current energy mix, will complement Prince Edward Island's efforts to further renewable energy development and reduce greenhouse gas emissions.

Biofuels

Fuels made from renewable resources are referred to as biofuels or renewable fuels. Primary sources of biofuels include: agricultural crops and crop residues, residues from food processing industries, livestock and deadstock, trees, logging and forestry products, industry residues, organic portion of municipal solid waste, sewage sludge, and industrial, commercial and institutional waste.

Common biofuels include wood, crop by-products like cereal straw or perennial grasses, pure plant oils, ethanol, biodiesel, waste cooking oil, and methane. Biofuels can be used for space heating, electricity generation, and transportation. Pure plant oils are processed from biomass or field crops (e.g. canola). Biodiesel can be made from seeds or animal fat, while ethanol can be made from high starch crops, such as corn, wheat, sugar cane or sugar beets. Many liquid biofuels can be blended with fossil fuels and used in traditional applications to reduce our reliance on petroleum products and reduce greenhouse gas emissions. Common blends include an E10 (10 per cent ethanol blended with gasoline) and B20 (20 per cent biodiesel blended with diesel or furnace oil). Higher blends or pure liquid biofuels can be used in specialized applications and in flex-fuel vehicles[1].

Ethanol can also be made by converting cellulose from agricultural and forest feedstocks. Rather than using potential foodstuffs such as sugar cane or corn kernels, cellulosic ethanol can be made from a range of materials, including corn stalks, wood, leaves, and grasses. While not yet commercially viable, research into this technology is advancing rapidly. When this technology becomes cost effective, cellulosic ethanol could rapidly replace traditional ethanol production methods.

Methane gas, or biogas, is another common biofuel generated by anaerobic (i.e. without oxygen) digestion of organic material. The resulting gas has properties similar to natural gas and can be burned to produce heat and electricity.

Compared to petroleum products, biofuels reduce greenhouse gas (GHG) emissions. Feedstocks used to make biofuels absorb carbon dioxide during growth and release this same carbon dioxide during combustion, essentially recycling these greenhouse gas emissions. Although conversion of feedstocks to biofuel can generate emissions, typically, the net effect is a reduction in overall GHG emissions. The extent of the reduction depends on the feedstock and the production process. Much debate has occurred in recent years concerning the ultimate benefit of major biofuel production systems. Brazil's sugar cane ethanol and US's corn ethanol productions systems are considered, by some, significant carbon users, threats to natural land and water ecosystems, and major forces for reducing the amount of overall available farmland available for food production.

[1] Flex-fuel vehicles are currently sold by all major vehicle manufacturers and can use blends of up to 85 per cent ethanol.

Key Local Drivers for Biofuel Development

Rising Energy Prices

Energy is expensive. Crude oil prices have increased dramatically in recent years, reaching an historic $100 per barrel in January 2008. In the last 10 years, gasoline and diesel prices have increased by over 70 per cent while the cost of home heating fuel has doubled. Islanders have traditionally paid one of the highest electricity rates in Canada, at over 11 ¢ per kilowatt-hour. With rate increases of up to 9 per cent for residential and 19 per cent for businesses forecast by Maritime Electric for next year, electricity will continue to represent a significant expense for Islanders. Energy prices will undoubtedly increase in the coming years as oil demand continues with no sign of abatement.

Economic analysts have suggested that crude oil prices of $70 USD per barrel sustained for one to two years would represent an economic tipping point, favouring the development of traditionally more expensive biofuels. Crude oil prices have now exceeded $70 USD per barrel since July 2007 (6 months).

Dependence on Fossil Fuels

Prince Edward Island is the only province in Canada without substantial indigenous energy reserves. We have no significant sources of hydroelectric power and no coal or oil resources. Prince Edward Island's energy mix is dominated by imported oil. Each year, Prince Edward Island spends over $440 million on imported energy, 76 per cent, or $334 million, specifically on petroleum products. Imported electricity represents 12 per cent our energy mix with much of this electricity generated by the combustion of fossil fuels in New Brunswick.

Since the mid-1980's, the Province of Prince Edward Island, through the PEI Energy Corporation, has made significant efforts to reduce our dependence on fossil fuels through the development and implementation of renewable energy. Biomass, once a common fuel for space heating in Prince Edward Island, has, once again, become a significant portion of our energy mix (10 per cent). The Charlottetown District Heating System (fired by municipal and wood waste at PEI Energy Systems), institutional wood chip heating installations, and a growing number of Islanders heating their homes with wood and wood pellets[2] have all contributed to the growth in this sector.

Over the past decade, PEI has been a leader in the development of wind energy. In 2001, the PEI Energy Corporation established Atlantic Canada's first utility grade wind farm at North Cape. In 2004, the Department of Environment, Energy and Forestry oversaw the development and implementation of the Renewable Energy Act, which provided a number of policy instruments (e.g. net metering, feed-in tariffs, designated development zones, and a renewable portfolio standard) to increase the development of renewable energy. A Renewable Portfolio Standard (RPS), requiring utilities to acquire at least 15 per cent of electrical energy from renewable sources by 2010, was satisfied in 2007. Wind currently generates over 18 per cent of our electrical generation.

Other private and government-supported projects to increase the use of biomass, ethanol, biodiesel, and pure plant oils are currently underway or in development stages.

[2] Provincial sales tax rebates and the *Alternative Heating Loan Program* have played an important role in increasing the prevalence of wood heat in Island homes.

Climate Change

Environment, and specifically climate change, is now a major driver influencing energy policy and stimulating renewable energy development. Climate change is particularly relevant to Prince Edward Island, both as an island province with vulnerable coastlines and due to the important role of natural resources in our economy.

Climate change is caused by rising greenhouse gas emissions, mainly from the combustion of fossil fuels. Currently, almost 70 per cent of greenhouse gas emissions in Prince Edward Island result from the use of gasoline, diesel, furnace oil and heavy oil that light and heat our homes, businesses, and industries and fuel our vehicles. In 2001, Prince Edward Island along with the eastern Canadian Provinces and the New England States adopted North America's first multi-jurisdictional Climate Change Action Plan to reverse the trend of rising greenhouse gas emissions and begin to mitigate the harmful consequences of climate change. The Action Plan established regional reduction targets including a 10 per cent reduction below 1990 levels by 2020. As part of our efforts to meet our GHG emission target, Premiers and Governors recently agreed to focus on the development of environmentally friendly biofuels that address greenhouse gases and other air emissions using local feedstocks and technologies.

Contributing to regional emission reduction targets will undoubtedly require efforts to reduce our consumption of petroleum products, and biofuels will likely play an important role.

Agricultural Industry Challenges

Many sectors of PEI's agricultural industry are facing serious challenges from declining revenues. These challenges are linked to the appreciation of the Canadian dollar, a prolonged period of market crisis in the beef and hog sectors, and the globalization of food product sourcing.

The potato industry has faced a supply and demand imbalance, issues with soil erosion and environmental degradation as a result of increased nitrate level in ground and surface water. Because the agriculture industry on PEI is largely based on a commodity production and sales model, these realities have placed the agriculture sector in a precarious situation.

Over the same time frame agriculture has been facing increased scrutiny from a society that is no longer content to leave the countryside as the domain of agriculture. This increased scrutiny has led to some changes and will cause more change in agricultural production practices in the future. However, in the short-term, changes in production practices to lower nitrate infiltration in groundwater, reduce soil erosion and improve the storage and handling of manure have come at a cost to the producer.

Out-standing farm debt has increased by over 85 per cent since 1996, while over the same time net farm income declined by 40 per cent. And while farm cash receipts have increased by almost 30 per cent in the last 10 years, much of that increase is attributable to a 70 per cent increase in government program payments[3].

Arguably, P.E.I. needs to explore new methods to revitalize rural communities by finding alternative sources of income for producers. Rising oil prices and climate change provide an opportunity for Islanders to both address the downturn in the agricultural industry and tackle the environmental issues that threaten the province's economic survival.

[3] 2007 Farm Income Statistics – Prince Edward Island Department of Agriculture

Biofuel Policies and Initiatives

Federal / National Context

In 2006, the Government of Canada issued a Canada Gazette Notice of Intent to develop regulations requiring an average of 5 per cent renewable content in gasoline by 2010 and 2 per cent renewable content in diesel fuel and heating oil by 2012. It is still unclear how this proposale will be implemented across Canada, specifically whether the targets will apply broadly to the oil refining industry at the corporate-level or to specific refineries. A corporate-level average renewable content mandate can be achieved by selling slightly higher renewable blends in jurisdictions with existing renewable fuel infrastructure and larger markets (i.e. Western Canada, Ontario and Quebec) while excluding Atlantic Canada. In essence, a federal renewable fuel standard may not result in renewable fuels being sold in Prince Edward Island, or elsewhere in Atlantic Canada.

Under the proposed Clean Air Act, the Government of Canada is developing national greenhouse gas regulations for all major industrial sectors (e.g. electricity, mining, manufacturing, oil and gas). Compliance with the regulation will likely be achieved by either reducing greenhouse gas emissions at each facility, contributing to a technology development fund, or by trading emission reduction credits (i.e. carbon credits) from regulated or non-regulated entities. A domestic carbon trading system will likely create opportunities for biofuel developers and could provide further financial incentives.

The Government of Canada has committed to further developing a Canadian renewable fuel industry though incentives for renewable energy technology research and development. Some programs, limited in scope to only transportation fuels, are specifically focused on the agricultural sector and aim to allow farmers to actively participate in biofuels development and accelerate the commercialization of new technologies. Federal funding is available through Sustainable Development Technology Canada (SDTC), Natural Resources Canada (NRCan), Agriculture and Agri-food Canada (AAFC), Environment Canada, and The Canadian Foundation for Innovation (see Appendix III). Overall most of these programs are directed at large scale production systems requiring thousands of acres of production and seem to be relevant to large jurisdictions such as those in Central and Western Canada. In short, for the Island's economy and the nature of its agricultural sector, current federal programming is generally problematic.

Funding for biofuel initiatives is also available through the federal Trust Fund for Clean Air and Climate Change, a $4.5 billion fund to support provincial and territorial projects to reduce greenhouse gas emissions and air pollutants. Prince Edward Island has received $15 million from the Trust Fund and has used a portion to launch and fund programs in the PEI Office of Energy Efficiency, as well as energy efficient lighting, hydrogen, hazard mapping, and small-scale renewable initiatives. The Trust Fund could also be an appropriate source to promote and develop biofuels.

Central and Western Canada

Biofuel policies and programs have developed more rapidly in central and western Canada, where feedstocks for ethanol and biodiesel production are more prevalent. Saskatchewan has been an early leader in ethanol production and was the first province to introduce an ethanol content requirement in gasoline (7.5 per cent). Manitoba (E8.5) and Ontario (E5) have subsequently established renewable fuel standards that require biofuel content in transportation fuels. British Columbia, Alberta, Manitoba, Ontario and Quebec all have introduced road tax exemptions for ethanol and / or biodiesel fuel. In addition, most central and western provinces have developed programs and incentives for producers, some which is being funded through the federal Trust Fund for Clean Air and Climate Change[4].

New England

A strategy to reduce greenhouse emissions is being pursued in the US northeast and could create a market for carbon credits in the region. The Regional Greenhouse Gas Initiative (RGGI) is a joint initiative by 10 Northeastern and Mid-Atlantic States to reduce greenhouse gas emissions through a cap-and-trade program. Beginning in 2009, emissions from electricity generators in member states will be capped at 2000 levels and reduced to 10 per cent below 2000 by 2019. Initially, trading of emission allowances will be restricted to the electricity sector. However, the program is expected to expand to include offsets (i.e., carbon credits outside the power sector) that may be used to achieve compliance. Biofuel initiatives, particularly those that generate electricity, could be eligible in the future to participate in RGGI. Some Eastern Canadian provinces have expressed interest in joining RGGI and a workshop is planned for February 2008.

Other market mechanisms to reduce greenhouse gas emissions include the adoption of renewable portfolio standards (RPS), a policy that requires electricity providers to obtain a minimum percentage of their power from renewable energy resources. Renewable portfolio standards in the US northeast have created markets for environmental attributes, the environmental benefits associated with renewable energy generation. Environmental attributes, in the form of renewable energy certificates (RECs), are being actively traded in the US (e.g. $40 to $50 / MWh). Renewable electricity generators in Prince Edward Island (i.e. Ventus) are currently participating in this market.

At their most recent meeting held in Summer 2007 in Prince Edward Island, the New England Governors Eastern Canadian Premiers (NEG ECP) agreed to work more closely together on renewable energy, including the sustainable development of biofuels.

Atlantic Canada

Governments in neighbouring Atlantic Provinces have yet to legislate renewable fuel standards or develop specific policies addressing biofuels development. However, there is considerable interest in the region to develop renewable fuels such as biodiesel and ethanol, while supporting the agricultural and forest industry and meeting commitments to reduce greenhouse gas emissions under the NEG ECP Climate Change Action Plan.

Nova Scotia is currently developing a new Energy Strategy and Climate Change Action Plan (anticipated in 2008). Opportunities for expanded biodiesel development[5] from the cultivation of canola are being considered for use in transportation and home heating fuel blends. As an incentive, the province has exempted biodiesel produced in Nova Scotia from the 15.4 ¢ per litre Motive Fuel Tax.

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[4] See Appendix IV for a listing of Canadian renewable fuel standards, tax incentives, and funding programs.

[5] Wilson Fuel Company Ltd. of Nova Scotia is currently the only large distributor of biodiesel (produced from fish oil) in the region

New Brunswick has legislated under the Renewable Resources Regulation of the Electricity Act a 10 per cent renewable portfolio standard for electricity from new renewable resources by 2016. Earlier this year, New Brunswick released a new Climate Change Action Plan that encourages research and development of biofuels produced from agricultural products or wood waste. A forest biomass policy is also being considered.

In New Brunswick, the development and implementation of renewable fuel technologies will be funded through the Trust Fund for Clean Air and Climate Change. New Brunswick is supportive of federal renewable fuel mandates, and they have expressed interest in a higher biodiesel blend (5 per cent) in transportation and home heating oil. New Brunswick has recently made a number of project announcements in regard to bio-diesel production. With its share of $30 million, New Brunswick was also the first province to sign on to the Government of Canada's newly announced $1 billion Community Development Trust. Priorities included biofuels development and forestry value added.

On January 18, 2008, a meeting of the Atlantic Cabinet (the four provincial governments) featured the signing of the Atlantic Energy Framework for Collaboration, which included joint efforts on measures such as maximizing renewable energy development, enhancing energy efficiency programming, and assessing biofuel potential. New Brunswick is the lead province for producing framework documents. The Government of Prince Edward Island will be represented under the Framework by the Department of Environment, Energy and Forestry.

PRINCE EDWARD ISLAND FEEDSTOCKS

An inventory of available feedstocks suitable for the development of renewable energy on Prince Edward Island was comissioned by PEI Business Development Inc. Feedstocks for bio-energy applications can be derived from forestry, agriculture, fisheries and aquaculture industries, and waste management. This section provides data on volumes, potential energy contributions, and broad linkages to potential areas of biofuel production.

Forestry Resources

Forested land on Prince Edward Island covers approximately 650,000 acres (263,000 ha). Of these lands, approximately 86 per cent is held by private land owners and 12 per cent is provincial woodlands. Total forested land decreased by 6 per cent or 42,000 acres between 1990 and 2000, primarily due to conversion to agriculture[6].

Prince Edward Island forests are relatively young with good growth rates. Despite extensive harvesting of mature softwood in the last decade, significant opportunities for biofuel production from biomass could be sourced from sustainable wood harvest diverted from the pulp and log markets, post-harvest residues, plantation thinning (red pine, black spruce, white spruce and larch), roadside material, the Confederation Trail, harvest from specific stands (e.g. red maple, white birch, poplar, softwood pulp and larch[7]), mill products (e.g. bark, sawdust and trim ends from wood processing industry), and short rotation forestry (e.g. willow and poplar plantations).

The largest source of biomass is likely to be the former pulp wood market, which has deteriorated in recent years to the point where provincial foresters predict there will be no sale of pulpwood from PEI this year. The log (stud wood, etc.) market has also diminished, due to the decline in the US housing market. Wood from these markets, particularly pulp, could be diverted to wood chip and pellet production. Should traditional wood markets recover they will have to compete for wood that is destined for the fuel market.

Post-harvest residues represent over 40 per cent of the total wood biomass in a woodlot. Post-harvest material (i.e. tree tops, foliage and branches, and unmerchantable and unmarketable trees) is typically left behind to replenish the soil with nutrients. Provincial foresters estimate that 20 per cent of this material could be removed at harvest without harming the soil and fertility structure and impacting wildlife habitats[8]. Removing this material from the forest could be challenging and may require changes to current forest harvesting practices.

The quantity of available feedstock and its energy content, in terms of giagajoules (GJ) - almost one million BTUs-and the equivalent number of homes heated is summarized below. ODT means oven-dried tonne.

Source	Total Acres	Feedstock Available for Biofuel Initiatives		Energy Content	
		Acres	ODT	GJ	Homes
Pulpwood – Softwood	-	-	166,000	3,000,000	27,000
Pulpwood – Hardwood	-	-	112,000	3,011,000	27,000
Logs – Softwood	-	-	63,000	1,130,000	10,300
Logs – Hardwood	-	-	7,000	182,000	1,700

[6] State of the Forest, 1990, p. 10
[7] Jon Hutchison, PEI Department of Environment, Energy and Forestry
[8] Study would be necessary to determine accurately the amount of material that could be sustainably harvested.

Post-Harvest Material	**-**	**-**	**16,000**	**310,000**	**2,800**
Plantation Thinnings	**10,000**	**10,000**	**7,000**	**126,000**	**1,100**
Roadside Material	**1,300**	**1,300**	**1,000**	**21,000**	**200**
Confederation Trail Thinning	**-**	**-**	**300**	**4,600**	**40**
				7,784,600	**70,140**

[9]

Agriculture Resources

Prince Edward Island's agricultural land base is 620,000 acres, of which 450,000 acres represents cropland or improved pasture. Forage crops and pasture, consisting mainly of perennial grasses and legumes, represent the largest portion of PEI's total crop land (38 per cent), followed by cereals and soybeans (36 per cent), potatoes (21 per cent), and other minor crops (5 per cent). With the possible exception of non-crop land that could be dedicated to short rotation coppice (SRC)[10], the 450,000 acres likely represents the land base that could be readily allocated to the production of biofuels.

The agricultural industry could generate a number of different biofuels for space heating, electrical generation, and transportation applications. Specifically, space heat and electricity could be generated from the combustion of crops and crop residues, pure plant oils (extracted from oilseed crops), and methane gas (anaerobic digestion of manure and crop residues). Transportation fuels, such as ethanol, biodiesel, or pure plant oils, could also be produced from energy crops (e.g. sugar beets, canola, soybeans).
The quantity of available agricultural feedstock for combustion and its energy content, in terms of gigajoules (GJ)-almost one million BTUs- and the equivalent number of homes heated is summarized below.

Source (assumption 20 % of current production used as feedstock)	**Annual Production**	**Estimated Feedstock Available for Biofuel Initiatives**	**Energy Content**	
	tonnes	**tonnes**	**GJ**	**Homes**
Cereals	**190,000**	**38,000**	**532,000**	**4,800**
Cereal Straw	**105,000**	**21,000**	**294,000**	**2,600**
Tame Hay	**430,000**	**86,100**	**1,205,400**	**11,000**
Pasture	**80,000**	**8,000**	**112,000**	**1,000**
			2,143,4000	**19,400**

Other feedstocks, including adapted perrenial grasses and short rotation coppicing, could be further developed or introduced in Prince Edward Island for space heating applications. Switchgrass is currently grown for energy (pellet) production in Ontario, Quebec and Manitoba and has energy content comparable

[9] According to the US Department of Agriculture (Handbook #72, 1974), softwood has an energy content of 18 GJ / ODT (17 M Btu / ODT), while hardwood has an energy content of 27 GJ / ODT (26 M Btu / ODT). The average Prince Edward Island home uses approximately 110 GJ (2,800 L of furnace oil) per year for space and water heating (Mike Proud – PEI Environment, Energy and Forestry)
[10] SRC refers to a method of wood production in which young tree stems are harvested on a recurring triennial basis.

to straw and hay. Short rotation coppicing is currently under evaluation. Material can be harvested every three years, yielding 10 – 12 ODT (oven-dried tonne) per acre.

Pure plant oils could be used in farm machinery or modified transportation and home heating applications. It can also be blended with furnace oil or further refined to produce biodiesel. Oilseed crops are currently being grown in Prince Edward Island. Soybeans represent more than 10,000 acres of annual production. Canola, a relatively new crop in Prince Edward Island, is grown on 850 acres. For production, canola is the preferred crop, producing double the amount of oil (330 litres per acre) than soybeans. Potential exists for the expansion of these crops on Prince Edward Island.

Source	**Annual Production acres**	**Feedstock Available for Biofuel Initiatives acres**	**Energy Content**	
			L	**Homes**
Soybeans	**10,000**	**10,000**	**1,650,000**	**600**
Canola	**850**	**850**	**280,500**	**100**
			1,930,500	**700**

[11]

Ethanol is a transportation fuel, suitable for use in vehicles in blends of up to 10 per cent. Sugar beets are currently being grown on 40 acres as a feedstock for a potential ethanol production facility. On-farm trials in 2007 produced an average of 20.7 tonnes per acre, which should provide a yield of 2,070 litres of ethanol per acre.

Methane gas (biogas) generated through anaerobic digestion, could represent a significant biofuel for space heat or electricity generation. Production of biogas through the anaerobic digestion of manure is enhanced if crop material such as silage, oilcake from the processing of oilseeds, or byproducts from food processing is combined with manure and added to the digester. In addition, a byproduct of the digestion process makes a suitable odor free fertilizer. Each year, Prince Edward Island livestock generate approximately 1.8 million tonnes of manure. Currently this manure is used in on-farm nutrient management applications. About 10 per cent of the total might be initially available for biofuel initiatives.

The Island's major commercial crop, potatoes, is extensively used for commercial food products, and potato cull waste is dedicated mostly to other uses.

Marine-Based Resources

Prince Edward Island's fish processing sector produces 15,000 metric tonnes of waste annually, predominantly from the mussel, lobster and crab processing. Fish processing waste could be used as a feedstock for anaerobic digestion, however, shell is not a suitable feedstock and removing shells from this waste stream could be challenging. In addition, nutraceutical and pharmaceutical uses may represent a competing market. As with any potential feedstock for the renewable energy sector, highest economic return will continue to determine the end use of the material.

A lab scale bio-gas project presently underway at UPEI using sea lettuce (*Ulva lactuca*) harvested from PEI estuaries has shown some technical potential, however, the economic potential is not well understood[12].

[11] Soybeans are currently used as animal feed. The quantity that could be diverted to biofuel initiatives is unknown, but for the purposes of this report, the entire amount is presumed.

[12] Chris Mills, PEI Fisheries and Aquaculture

Waste Resources

Material entering Prince Edward Island's current waste stream could contain feedstocks for biofuel initiatives. Approximately 2,500 tonnes of finished compost is produced each year at the Central Compost Facility (Brookfield). Finished compost has been test-incinerated at PEI Energy Systems and could be used as part of the Charlottetown District Heating System. Alternatively, unfinished compost (green cart material), combined with livestock manure, could be used to generate methane gas through anaerobic digestion. Approximately 26,000 tonnes of green cart waste is collected each year by Island Waste Management Corporation.

Food processing facilities, such as McCain Foods and Cavendish Farms, generate about 750 tonnes per year of waste cooking oil. This material could be incinerated at PEI Energy Systems and fuel part of the Charlottetown District Heating System or used in "straight oil" type burners on farms or households. However, recent plans to divert this material to anaerobic digestion facilities could diminish feedstock availability in subsequent years.

Yard debris gathered in the spring and fall is a suitable source for combustion bio-energy. Currently delivered to the Central Compost Facility at the rate of 2,500 tonnes per year, this material is used in the composting process.

BIOFUEL POTENTIAL IN PRINCE EDWARD ISLAND

In determining the potential for biofuel development in Prince Edward Island, tow key factors must be considered. Specifically:

1. Do we have or, can we grow, sufficient feedstocks for biofuel development?
2. Do sufficient local or regional markets for biofuels exist?

The PEI Biofuels Evaluation Framework (adapted from *Assessing Opportunities in Renewable and Alternative Energy for Prince Edward Island*[13]) represents a tool to assess proposed projects and ensure that economic, environmental and social concerns are effectively evaluated (Appendix V).

Biocombustibles

Biocombustibles from forest and agricultural sectors are the most readily available feedstock for biofuel development in Prince Edward Island. Wood supplies from softwood pulp, post-harvest material, plantation thinnings, and roadside material could represent a significant feedstock for space and water heating, provided a market for softwood pulp does not redevelop and remaining biomass material can be harvested in an economical and environmentally sustainable fashion. Agricultural feedstocks, including established (e.g. cereals and forages) and emerging crops (e.g. switchgrass and short-rotation coppicing) could be further developed provided market demand is sufficient.

Markets for bio-combustibles could include the residential, commercial and institutional sectors. Wood supplies from softwood pulp, post-harvest material, plantation thinnings, and roadside material could displace up to 100 million litres of light fuel oil; approximately 65 per cent of current demand. Bio-combustibles are not compatible with existing oil heat systems (although they can work in combination or concert with oil heat) and would require installation of alternative heating systems. In 2006, 38 per cent of Island homes have wood burning units, but only half of these homes used wood as their primary heating fuel[14]. Recent tax exemptions for wood heat systems (wood and wood pellets) has increased the popularity of these systems and resulted in a larger market for wood pellets, in particular. Biomass fired district-heating systems for municipalities or small communities could also represent a viable market, provided these systems are developed.

There are currently suffcient quantities of biomass for serious further study as biocombustibles. Development of forest and agricultural feedstocks for space and water heating could also support future use of these feedstocks for the production of cellulosic ethanol.

[13] Jacques Whitford (February 2, 2007) report to Invest PEI
[14] *Prince Edward Island Wood Fuel Survey 2006*

Pure Plant Oils

Canola and soybeans are currently grown on just over 2 per cent of Prince Edward Island's cropland. Canola is particularly well suited for our climate, and has high energy content. Acreage of canola and soybeans are currently not sufficient for broad-scale use of pure plant oils, but could support pilot initiatives and be further developed once market demand is demonstrated.

Pure plant oils have a number of applications and potential markets. Germany, for example, has standards for pure plant oil as a fuel. Pure plant oil can displace light fuel oil for space and water heating applications and in diesel engine for transportation applications, however modifications to the fuel system may be required. Pure plant oil has a higher viscosity than petroleum and blends may be necessary in order to optimize equipment efficiency. Cold weather may also require blends, particularly in outdoor equipment or fuel tanks.

Large commercial, institutional, and industrial users of oil may also represent a suitable market for pure plant oils. Plant oils are already being used in some commercial fleets in Prince Edward Island. The provincial government alone uses more than 10 million litres of light fuel oil and 2.5 million litres of diesel in fleets and facilities.

Extracting pure plant oil is a relatively simple technology that can be developed incrementally, with oil being pressed from oilseed crops. In additon, pure plant oil is a precursor to biodiesel development.

Biodiesel

Currently, there are limited feedstocks for the production of biodiesel. Oilseed crops, such as canola, could be further developed on Prince Edward Island. Approximately, 4,000 to 6,500 acres (depending on extraction method) of canola would be necessary in order to produce 1 million litres of biodiesel[15]. Canola could be complemented with waste cooking oils and / or waste animal fats (some of which may have to be imported) to develop an adequate supply for a viable commercial application.

Current demand for diesel and light fuel oil in the region exceeded 3 billion litres in 2006. At blends of 5 to 20 per cent, regional demand for biodiesel could exceed 600 million litres. Wilson Fuel Company Ltd. of Nova Scotia is currently the only large distributor of a bio-diesel like product (produced from fish oil) in the region.

Biodiesel is currently being used to heat facilities, run vehicles fleets, and in farm machinery throughout the region. In 2006 and 2007, the Government of Prince Edward Island piloted biodiesel (Wilson Fuels) in select vehicles in Transportation and Public Works (B5 blend) in 2006 and 2007. Few operational issues were encountered, but fuel availability was problematic.

Biodiesel is more likely to be compatible with residential and commercial / institutional heating applications than pure plant oil, as its use requires little or no modification to existing engines or fuel injection equipment. Biodiesel does not void parts and materials workmanship warranties of any major engine

[15] *Economic impact study for a canola-based biodiesel industry in Canada*. July 2006. BBI Biofuels Canada Report for the Canola Council of Canada.

manufacturer provided its composition is certifiable (ASTM[16] D-6751).

The potential market for biodiesel for heating is significant, with 76 million litres used each year in Island homes and 62 million litres used in commercial and institutional facilities. Provincial government alone uses more than 10 million litres of light fuel oil and 2.5 million litres of diesel in fleets and facilities. Approximately 625,000 litres of biodiesel would satisfy provincial government demand at a 5 per cent blend. Higher blends could be employed depending on availability of supply.

Production of biodiesel is scalable, meaning small-scale facilities are viable and can expand to large-scale commercial facilities once demand is established. A renewable fuel standard (i.e. mandating minimum biodiesel content in light fuel oil or diesel) would facilitate the development of a local biodiesel industr. Government has a number of active biodiesel development proposals and a file of assessed proposals from recent years.

Life cycle emissions - from growing oil-seeds or collecting waste oil rendering animal waste through fuel production and use – of biodiesel produces 60 to 100 per cent fewer greenhouse gas emissions (depending on the feedstock) than diesel or light fuel oil.

Ethanol

Availability of local feedstocks (e.g. corn, wheat, sugar beets) and demand for ethanol in Prince Edward Island (compared to minimum expected production capacity) is limited. Feedstocks could be further developed provided acreage is available. There are 450,000 acres of usable farm land on Prince edward Island. Potato production (including land that is part of the 3 year rotation) occupies 293,000 acres of cropland.

Some energy crops, like sugar beets, cannot be easily integrated into the potato rotation and will likely displace crops grown on the remaining 157,000 acres of cropland. With respect to sugar beets, a range of 17,000 to almost 40,000 acres of production would likely be required to support commercial ethanol production. In a three-year crop rotation this would entail between 50,000 and almost 120,000 acres under cultivation, an amount close to the whole balance of available cropland on Prince Edward Island. It has also been suggested that imported supplementary feedstock for ethanol production may also be necessary in parts of the production cycle.

Unlike, biodiesel, ethanol facilities are not easily scalable, and a viable facility is likely to have an annual capacity of no less than 50 million litres. Current gasoline demand in Prince Edward Island is 234 million litres (regional demand is 2.5 billion litres). At a 10 per cent ethanol blend, provincial demand for ethanol will not exceed 23 million litres, approximately half of the production capacity of a minimum sized facility. Higher ethanol blends (i.e. E15) are not compatible with typical gasoline fuelled vehicles, but can be used in flex-fuel vehicles. Regional demand for ethanol could exceed 250 million litres. A commercially viable large-scale ethanol production facility will require a broader market, most likely the Maritimes or the New England States. A Maritime Renewable Fuel Standard could be necessary for the development of a local ethanol industry.

Like biodiesel, ethanol can reduce greenhouse gas emissions (depending on the feedstock). However, ethanol production is more energy and emission intensive than biodiesel production. Compared to gasoline,

[16] American Society for Testing and Materials

ethanol reduces greenhouse gas emissions by 25 to 40 per cent[17]. Ethanol production from corn or other cereals has raised concerns about environmental sustainability. Environmental concerns for sugar beets particularly around their potential effects on soil structure and erosion need to be considered. Ethanol production has also raised concerns regarding the environmental sustainability of energy crops, namely the impacts of additional pesticide and fertilizer use (i.e. nitrate concentration of groundwater), soil erosion, and irrigation demands.

Of all the liquid biofuels, ethanol requires the largest amount of production for viabilty and in most scenarios very high acreages of land in energy crop cultivation. Cellulosic ethanol, which is not yet commercially viable, has fewer environmental impacts (although water demand during production may be significant) and reduces emissions by 60 to 80 per cent.

Biogas

While large quantities of manure are generated on Island farms, only limited amounts might initially be available for biofuel initiatives. As well, with the recent downturn in hog and beef markets, quantities of manure are expected to decline in the coming years as more and more livestock operations downsize or cease operation. It is expected that any generation of biogas would be initiated on farms that have to deal with large quantities of manure and / or which have access to other digestible material.

Crops, crop residues, and food processing by-products could also be used to generate methane gas. Highest use of these feedstocks, whether for existing markets, biogas, or other biofuel initiatives, would have to be assessed.

Biogas production is occurring in Prince Edward Island. Methane is being used on site at wastewater treatment facilities and industrial operations. Cavendish Farms is currently building a large bio-digestor fuelled by food processing waste. Supplementary feedstocks may be used at this facility.

[17] *The Addition of Sugar Beet to Ethanol Pathway in GHGenius* (2007), Report to Natural Resources Canada

PROJECTS, PROPOSALS, AND INITIATIVES

This section covers the current projects, proposals and initiatives for biofuels in process and / or underway in Prince Edward Island.

Biomass

1. Thermal heat project, at the proof of concept stage, to develop combustion equipment (i.e. boiler / furnace) designed to burn cereal crops for heat in agricultural, commercial, industrial and institutional facilities.

2. On-farm biomass testing: Corn/Barley/Straw. (completed through ACCAF funding)

3. Application lead by the Nova Scotia Agricultural College (NSAC) was made to the Agricultural Bio-products Innovations Program (ABIP) from local participating organizations and with partners from other areas of Canada. Funding is being sought to further investigate the development of an herbaceous perennial bio-refinery network.

4. Construction currently underway for a plant to pelletize agricultural feedstocks. Proponents have developed a burner that can be retrofitted to a commercial boiler. They have also passed through the first stage of an approval process to receive funding from SDTC but that only means they are eligible to develop a full proposal.

5. Project proposed for 'on-farm' pelletizing (planning phase).

Pure Plant Oils

1. Concept plan seeking federal and provincial funding support for the collaboration with local participating organizations and with partners from other areas of Canada and lead by Linnaeus Plant Science.

2. Funding is being sought through ABIP to further investigate oilseed production and the use of *Brassica sp.* oil seeds as platform crops.

3. Canola cold press oilseed extraction plant is in the process of being established.

Biodiesel

1. Several biodiesel initiatives are currently or have just completed feasibility studies. As of this time, local production of biodiesel has not yet proven to be economically feasible.

2. Mid-scale commercial (22 million litre) biodiesel plant based on canola feedstock is in 'business plan' development phase. Consultant is recommending pursuing plant oil commercialization, prior to full biodiesel production.

3. PEI Biodiesel Initiative led by the PEI Energy Corp employed (S&T)[2] Consultants Inc (January 2006) to assess responses to a provincial RFP for the establishment of a ten (10) million litre biodiesel plant on Prince Edward Island. The consultants reviewed seven (7) proposals, with a Nova Scotia based proposal scoring the highest. Further assessment on the proposals was deferred pending the development of provincial policy relating to the production and consumption of biodiesel and other biofuels.

4. Small scale/targeted use project to convert meat plant by-product/tallow oil and waste oil to biodiesel for use in specific industrial plant applications.

Ethanol

Large commercial scale ethanol plant (80 million litre) using local root crop feedstock has submitted a business plan and is conducting feedstock field trials. Proponent is seeking plant construction in 2008 and ethanol production in 2009. Proponents have made application under the federal *ecoABC* program that provides seed investment on capital construction costs. A mandated E10 blend would consume 23 million litres of production, with the balance exported to regional and/or New England markets. Proponent is seeking clarity on government's policy relating to biofuels production and specifically the timeline for a Renewable Fuel Standard (RFS) for E10.

Biogas

1. Large on-site industrial installation is taking place at processing facility.

[18]

[18] Under ABIP eligible activities include: development of crop platforms and cropping systems suitable to conversion of feedstocks to agricultural bio-products, developing effective and efficient technologies for agricultural biomass conversion, and product diversification through technologies such as agricultural and industrial chemicals, bio-materials, and health products.

CONCLUSIONS AND RECOMMENDATIONS

Biofuels are developing rapidly in Canada, driven by rising energy costs, concerns over climate change, and opportunities to support struggling agricultural and forest industries. Some provincial governments have hastened the development of biofuels by establishing renewable fuel mandates, tax incentives, and programs for renewable energy technology research and development. More than half of Canadian provinces have existing policy relating to the production and / or consumption of biofuels. And while policies have yet to develop in Atlantic Canada, there has been clear direction from the New England Governors and Eastern Canadian Premiers (NEG ECP), the Council of Atlantic Premiers (CAP) , and the *Atlantic Energy Framework for Collaboration* regarding the need to assess and develop local biofuel opportunities.

Biofuels produced from energy crops grown on Prince Edward Island could reduce our dependence on imported fossil fuels, reduce the emission of greenhouse gases and other air pollutants, and provide the agricultural and forestry sectors with alternative sources of revenue. Local feedstocks are readily available or could reasonably be developed in support of biofuel initiatives.

Specifically, biomass feedstocks (e.g. wood, cereals, straw, grasses, crop residues) offer significant potential for space and water heating applications and electricity generation. Currently, wood is readily available due to collapsing pulp and log markets. As well, the quantity of post-harvest material that can be removed while ensuring the continued health of our forests must be further studied. Development of additional straw and grass feedstocks could provide additional feedstocks in the event pulp and log markets rebound or to fuel the development of cellulosic ethanol (once this technology becomes commercially viable).

Opportunities also exist to further develop pure plant oils. Production of canola for pure plant oil could also serve as a precursor for biodiesel production. Biodiesel is a more broadly applicable fuel, capable of displacing significant amounts of light fuel oil and diesel. Production costs for biodiesel however, are higher than for pure plant oil. Large-scale production of biodiesel will require the establishment of new or modified storage, blending, and refuelling infrastructure.

Feedstocks for large-scale ethanol production are currently limited in Prince Edward Island and would require further development. The cost of ethanol production is significant and requires large-scale production to ensure economic viability. Prince Edward Island alone does not have a large enough market to support a commercial scale operation and regional markets would be necessary. A renewable fuel mandate for ethanol (E10 or less) could be necessary in order to stimulate local ethanol production. Environmental concerns regarding the establishment of another intensive agricultural crop (e.g. sugar beets) and the net environmental benefits of ethanol as a renewable must be evaluated.

In addition, commercialization of cellulosic ethanol and anticipated improvements in economic feasibility may replace traditional ethanol production technologies in the next 5 to 10 years. Further assessment of the feasibility, net benefits, infrastructure requirements (i.e. storage,

blending, and refuelling) and appropriate regulatory framework relating to the production and/or consumption of ethanol transportation fuels on Prince Edward Island is necessary.

Government has traditionally played a role in the development and implementation of renewable energy initiatives. As a significant energy consumer, government could lead by example and demonstrate the use of biofuels at government facilities (offices, schools, hospitals, etc.) and in government fleets. Not only would this demonstrate the applicability of biofuels to Islanders but government, as a significant energy consumer, could contribute to the development of biofuel markets.

The sustainable development of biofuels may diversify Prince Edward Island's energy mix, strengthen the Island economy, and help meet regional greenhouse gas emission reduction targets. With PEI's annual expenditure of $334 million on imported, petroleum-based energy products, the advancement of made-in- PEI biofuels should clearly be encouraged in the overall public interest of Prince Edward Islanders.

In particular, the development of biofuels could significantly add to income opportunities for Island farmers, and, given the challenges facing the agricultural sector, is a worthy socio-economic objective to pursue. As a result of this logic, a project evaluation framework which places farm incomes and farmer support for projects at the forefront is attached as Appendix V to this report.

ERIC recommends government pursue measures that encourage the development of economically viable biofuels projects that are consistent with our energy goals, respective of our environment, and return maximum benefits to Islanders. This report completes the work of ERIC as an information gathering and analysis structure, and sets the stage for new structures and processes that Government should create and pursue for specific assessment and implementation of biofuels projects and prioriites.

ERIC recommends that Executive Council:

1. Establish an Inter-Departmental Biofuels Committee (IDBC) to be composed of representatives from each of Agriculture, PEI Business Development Inc., Development & Technology, Environment, Energy and Forestry (EEF), the Forestry Division of EEF, Fisheries & Aquaculture, the Office of Bioscience and Economic Innovation, and Provincial Treasury.

2. Designate Agriculture as Chair of IDBC.

3. Confirm the Terms of Reference for IDBC with the following 5 key areas of responsibility.

    i) Evaluate proposals for biofuels projects and studies with a view to making recommendations to Executive Council on their potential economic, environmental, and social benefits to Prince Edward Island.

ii) Work with biofuels proponents to identify applicable federal and provincial government assistance programs, as well as sources of private sector investment.

iii) Make recommendations to Executive Council by September 2008 on the feasibility of mandated renewable fuel standards for transportation and/or heating fuels (with and without a requirement for locally produced fuels), and the economic implications of road tax exemptions, rebates, and related policies and measures.

iv) Identify potential biofuels demonstration projects that can be implemented at government facilities and in government vehicle fleets, thus enabling government to lead by example in the advancement of biofuels.

v) Require that the committee's activities be linked conceptually and strategically with the economic innovation strategy being developed by the Office of Bioscience and Economic Innovation.

4. Direct EEF to take an active leadership role in regional collaborative initiatives (e.g Council of Atlantic Premiers, the Atlantic Energy Framework and New England Governors Eastern Canadian Premiers) regarding biofuels development. Specifically, EEF will solicit interest for the establishment of mandated regional renewable fuel standards for biofuels, and in particular, ethanol.

5. Direct Agriculture to develop an agricultural policy regarding the development of an agriculture-based biofuels industry.

6. Direct EEF to develop a forestry policy regarding the development of a forestry-based biofuels industry.

7. Approve, in principle, the expenditure of funds from the *Trust Fund for Clean Air and Climate Change* for potential studies, demonstration projects and pilot projects.

8. Identify and consider other sources of funds for the work of IDBC.

APPENDIX I: DEFINITIONS

***Biocombustible*:** Solid biological material (e.g. wood, straw) that can be burned or combusted to generate energy.

***Biodiesel*:** A type of liquid biofuel produced to a recognized standard. Biodiesel is typically created through a chemical reaction of oils or greases with methanol, to create methyl ester (also known as biodiesel). It can be used directly in internal combustion engines at full concentration, or blended with petroleum diesel. It reduces atmospheric emissions in conventional applications.

***Biofuel*:** Fuels (solid, liquid or gaseous) made from renewable resources are referred to as biofuels or renewable fuels. Primary sources of biofuels include: agricultural crops and crop residues, residues from food processing industries, livestock and deadstock, trees, logging and forestry products, industry residue, organic portion of municipal solid waste, sewage sludge, and, industrial, commercial and institutional waste.

***Biogas*:** Generated by the anaerobic digestion (no oxygen) or fermentation of organic matter such as manure, sewage sludge, municipal solid waste, biodegradable waste or any other biodegradable feedstock. Biogas can be burned to produce steam or used directly in some internal combustion engines or turbines to generate electricity.

***Biomass*:** Forms of energy derived from living things - heat produced by burning wood, biofuels made from canola or sugar beets, biogas extracted from sewage sludge and animal and vegetable waste in landfill sites.

***Bio-oil*:** A type of liquid biofuel. This fuel is created through the thermochemical pyrolysis process, and can be combusted directly to generate heat, burned in a steam boiler to generate electricity, or used as a feedstock for an array of chemical products and natural resins. It has a higher energy density than the original biomass, and can be easily handled and stored (although shelf-life is limited due to settling).

***Carbon Credits*:** Refer to tradable environmental commodities representing a reduction in greenhouse gas emissions. Credits can be generated by activities including energy efficiency, renewable energy development, landfill gas capture, forest management, soil conservation practices, and manure management. Carbon credits can be sold and traded on voluntary or regulatory markets.

***Cellulosic Ethanol*:** Ethanol fuel derived from cellulose, rather than starch. Feedstocks for cellulosic ethanol include wood, crop residues, grasses, and even municipal waste.

***Commodity System*:** The complete system, including all pre and post-harvest activities such as growing, harvesting, drying, storage, processing, marketing, and preparation for market consumption.

***Energy Crops*:** Crops grown specifically for their ability to generate energy. Energy crops include food crops (e.g. corn and sugarcane) and non-food crops (e.g. poplar trees and switchgrass).

***Ethanol*:** The most widely used liquid biofuel. Ethanol is made by converting starch crops into sugars, which are then fermented into ethanol and distilled to fuel grade. It is mainly used as a fuel oxygenate to improve combustion and reduce tailpipe emissions.

***Feedstock*:** A raw material required for a use or process.

***Greenhouse Gases (GHG)*:** Gases in the atmosphere that give rise to this greenhouse effect – a phenomenon that insulates the planet from heat loss. Greenhouse gases are produced through a variety of natural and human activities, but namely the burning of fossils fuels (coal, oil, and natural gas) in our vehicles, our homes, and our businesses. An increase of GHGs is contributing to climate change.

***Pelletization*:** A mechanical process that utilizes pressure to form wood fibre into pellets. Raw material (chips, saw dust) is dried and ground into a uniform size. Once dry, the raw material is forced through a press under a very high pressure to create the pellet. Pellets are then cooled to allow the natural bonding agents to set.

***Pure Plant Oil*:** A non-chemically extracted vegetable oil obtained by pressing and filtering oil-based crops such as canola, soybeans or other vegetable seeds or nuts that contain a high oil content.

***Regional Greenhouse Gas Initiative* (RGGI):** A cooperative effort by Northeastern and Mid-Atlantic states to reduce carbon dioxide emissions. Central to this initiative is the implementation of a multi-state cap-and-trade program with a market-based emissions trading system.

***Renewable Energy*:** Energy that is naturally replenishing. Renewable energy resources include biomass, hydro, geothermal, solar, wind, ocean thermal, wave action, and tidal action.

***Renewable Fuel Standard*:** Establishes a minimum content of renewable fuel that must be incorporated into petroleum blends (e.g. gasoline, diesel, light fuel oil).

***Renewable Portfolio Standard*:** Establishes a minimum content of energy from renewable sources in electricity generation or consumption.

***Sustainable Agriculture*:** A means of producing and processing agricultural products that can be carried out over the long term, in a manner that supports or enhances the high quality of life we enjoy in Canada today.

***Sustainable Crops*:** Adequate, high quality food, feed and fibre supplies that are produced economically and with the added responsibility to safeguard the environment.

***Sustainable Development*:** Integrates environmental, economic, and social interests in a way that allows today's needs to be met without compromising the ability of future generations to meet theirs.

APPENDIX II: RESOURCE MATERIALS

The following resources were provided to the group throughout the duration of ERIC:

- A web portal was developed by Deborah Hagen to serve as a central repository of information to store presentations, studies and/or publications on renewable energy technologies;

- A listing of local, national and international biofuel studies and publications were collated by Peter Boswall and Deborah Hagen;

- A Maritime Summary of biofuel initiatives and/or activities was provided by Peter Boswall as well as a summary document on biofuel activities that the PEI Department of Agriculture was either involved with or aware of;

- A background document list on renewable energies was provided by John Hughes;

- An evaluation framework (based on the February 2007 Jacques Whitford report) and a draft preliminary table of contents was provided by Deborah Hagen;

- A process implementation schematic was drafted by Gailene Tobin;

- An overview of the current situation and opportunities for renewable energy strategies on PEI was prepared by Peter Boswall;

- Two SWOT analyses were completed by John Hughes: one dealing with 'commercial' scale ethanol and the second on ‘commercial’ scale bio-diesel for PEI;

- A report entitled: PEI Biofuels Overview: Seeking the Path to Sustainability, was prepared for the ERIC group by Paul Stewart of Abiogen Services.

Presentations

Several individuals presented to ERIC. By understanding current and possible inputs and relevant policy issues, members felt ERIC would be in a better position to explore potential energy initiatives for PEI and to make policy recommendations based on how these initiatives. The following is a list of presentations made:

- Feedstocks Inventory: Primary, Processing and Agricultural Inputs (Oct. 12, 2007) - John Hughes

- Potential New Crops (Oct. 12, 2007) - Peter Boswall

- Fishery Inputs (Oct.19, 2007) - Chris Mills

- Forestry Inputs (Oct. 26, 2007) - Jon Hutchinson
- P.E.I. Energy Mix, Energy Vision to 2017 and Challenges (Nov. 2, 2007) - Wayne MacQuarrie
- Policy and Fiscal Dimensions of Biofuels (Nov. 2, 2007) - Peter Boswall and George Mason
- Environmental Issues and Considerations (Nov. 9, 2007) - Deputy Minister John MacQuarrie

APPENDIX III- Federal Funding and Programs

ecoEnergy for Biofuels	$1.5 Billion	9 Years	‣ boost Canada's production of renewable fuels such as ethanol and Bio-diesel ‣ intended to lessen investment risk ‣ excise tax to be eliminated ‣ $0.10/L for ethanol and $0.20?L for Bio-diesel for 1st three years of production
ecoABC *under ecoAgriculture*	$200 Million	4 Years (ends 03/31/2011)	‣ provides repayable contributions for the construction or expansion of transportation biofuel production facilities ‣ producer must invest to be eligible ‣ agricultural feedstock only ‣ delivered by AAFC
BOPI *under ecoAgriculture*	$10 Million	$3 Million in 2006/2007 $7 Million in 2007/2008	‣ an initiative under the Advancing Canadian Agriculture and Agri-Food Program ‣ provides assistance to pay for business proposals and feasibility studies ‣ involving significant (greater than one-third) ownership by agricultural producers. ‣ delivered by AAFC
SDTC	$500 Million	7 Years	‣ Funding for large-scale facilities for next-generation renewable fuels (agriculture and forest residue)
ABIP Agriculture Bioproducts Innovation Program *under ecoAgriculture*	$145 Million	Multi Year Program	‣ to build greater research capacity in agricultural bioproducts and bioprocesses ‣ development of crop platforms and cropping systems suitable to conversion of feedstocks to agricultural bioproducts; ‣ developing effective and efficient technologies for agricultural biomass conversion; and ‣ product diversification through technologies such as agricultural and industrial chemicals, biomaterials and health products.

Agri-Opportunities Program *under ecoAgriculture*	$134 Million	5 Years (ending 03/31/2011)	‣ accelerate the commercialization of new products, processes or services that are currently not produced or commercially available in Canada; ‣ projects that focus on new agri-food products or bioproducts; ‣ projects that can increase new market opportunities; ‣ max. repayable contribution of $10 million per project/recipient ‣ not for transportation fuel
CDI Co-operative Development Initiative *under ecoAgriculture*	$1 Million $5000 - $75,000 per project	2007 - 2008 (fiscal)	‣ to help people develop co-ops and research and test the co-operative model ‣ Components: - Advisory Services - Innovation and Research

Source: *PEI BioFuels Overview: Seeking the Pathways to Sustainability, Abiogen Development Services, Paul Stewart.* November 2007 and Government of Canada.

APPENDIX IV: Canadian Renewable Fuel Standards and Tax Incentives

Jurisdiction	Standard	Incentive
Canada (*Notice of Intent)*	**E5 by 2010** **E2 by 2012**	• Biofuels Opportunities for Producer Initiative (BOPI) • ecoAgriculture Biofuels Capital (ecoABC) • Production Incentive • Sustainable Development Technology Canada (SDTC)
British Columbia	**E5 by 2010**	Qualifying alternative fuels are road tax-exempt until they reach 3.5 % of BC's motor fuel market. Then tax rates are based on market share and environmental benefits.
Alberta	**3.5% by 2008**	• Bio-Energy Producer Credit Program • Bio-Refining Commercialization and Market Development Program • Bio-Energy Infrastructure Development Program
Saskatchewan	**E7.5** (Took effect in October 2006)	• Fuel distributors are eligible for a grant of $0.15/L for every L of ethanol produced and sold in the province. That amount equals the provincial gasoline fuel tax. • Saskatchewan Biofuels Investment Opportunity (SaskBIO) Program
Manitoba	**E8.5 (10% ethanol in 85% of gas products)**	• Ethanol blended fuel receives a 2.5 cents per litre tax exemption provided the blend is an E10 and the ethanol was produced and sold in Manitoba. Bio-diesel is exempt from road tax. • Manitoba Bio-diesel Production Program
Ontario	**E5** **E10 by 2010**	• Bio-diesel blended fuel is road-tax exempt (14.3 cents per L) • Ethanol production incentives of $520 million over 12 years • Ontario Ethanol Growth Fund
Quebec	**5% ethanol blend by 2012** (to be met by next generation celluslosic ethanol) **4000 MW wind by 2015**	• Income tax credit for ethanol producers that both produce and sell in Quebec. • Reimbursement of fuel taxes paid on the purchase of Bio-diesel • Energy Technology Support Plan

19 20

Source: *PEI BioFuels Overview: Seeking the Pathways to Sustainability, Abiogen Development Services, Paul Stewart.* November 2007 and Pollution Probe 2006, Green Power Provincial Targets and Policies

[19] 10% ethanol in 85% of gas products

[20] No mandate has yet been established. According to their Climate Change Action Plan, Quebec *aims* to have gas distributors include a minimum of 5 per cent ethanol in their total fuel sales by 2012.

APPENDIX V: P.E.I. BIOFUELS EVALUATION FRAMEWORK

Purpose:
To provide a decision-making framework to guide the Province of P.E.I. in assessing biofuel project proposals and to help determine investment priorities.

Policy Rationale:
Identification of biofuel energy projects that will meet our energy needs and encompass low environmental impacts, create economic benefits and foster sustainable renewable energy for P.E.I.

Advantage:
Increased energy security, a cleaner local environment and diversification of energy supply therefore providing more local power options.

Scope:
The scope of the decision-making framework should encompass the entire biofuel value chain from production to use. The goal is to provide decision-makers with a framework to guide them in developing new policies or determining new investments in biofuel projects.

Possible Opportunities:
- Bio- liquids
- Biomass
- Bio-gas
- Wind / Hybrid Systems

P.E.I. Renewable and Alternative Energy Policy Direction[21]:
1. Enhance security of supply;
2. Reduce price volatility for citizens and businesses;
3. Encourage diversity of supply;
4. Advance environmental sustainability;
5. Promote efficient energy use; and
6. Support economic development.

[21] Derived from the P.E.I. Energy Framework and Renewable Energy Strategy (2004)

Decision-Making Framework[22]:

Evaluation Criteria

a. Agricultural Sector Development
b. Specific Agricultural Considerations
c. Development Benefits and Risk
d. Technical Feasibility and Risk
e. Financial Feasibility and Risk
f. Environmental Benefits
g. Climate Change Impact
h. Barriers to Progress
i. Sustainability

[22] Based on 3.1 Assessment Tool Indicators, Jacques Whitford (February 2, 2007) report to Invest PEI