ROADMAP TO A SELF-SUFFICIENT ENERGY FUTURE

By Toby Couture and David Coon

Conservation Council *of* New Brunswick
Conseil de conservation *du* Nouveau-Brunswick

Road Map to a Self-Sufficient Energy Future

Part of the Atlantic Canada Sustainable Energy Coalition Series on Global Warming, Energy and Economic Development.

Conservation Council *of* New Brunswick
Conseil de conservation *du* Nouveau-Brunswick

About the Conservation Council of New Brunswick

The Conservation Council of New Brunswick (CCNB) believes the future of all life depends on bringing human activity in balance with ecological limits. CCNB is a citizens' action group that creates awareness of environmental problems and advocates solutions through research, education and interventions. In pursuit of its mission, the organization has established four priority program areas: climate action, health and the environment, forest conservation, and the *Fundy Baykeeper Program.* To contact the Conservation Council visit www.conservationcouncil.ca, e-mail info@conservationcouncil.ca, write CCNB at 180 St. John Street, Fredericton, New Brunswick E3B 4A9, phone (506) 458-8747, or fax (506) 458-1047.

About the Atlantic Canada Sustainable Energy Coalition

The *Atlantic Canada Sustainable Energy Coalition* (ACSEC) is an alliance of the *Environmental Coalition of Prince Edward Island, The Ecology Action Center* in Nova Scotia, *The Conservation Council of New Brunswick* and *The Sierra Club of Canada* – Atlantic Canada Chapter. The ACSEC takes action on climate change by promoting a strategy for the adoption of sustainable energy solutions, with an emphasis on energy efficiency and renewable energy development.

Acknowledgements

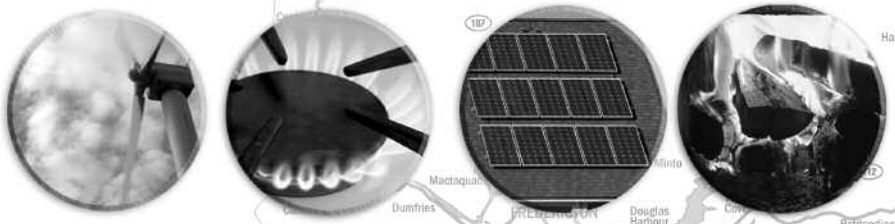
The Conservation Council of New Brunswick (CCNB) would like to thank the *Henry P. Kendall Foundation* and the *Oak Foundation* for supporting this project. In particular we would like to recognize the contributions of our colleagues at the *Ecology Action Centre, EcoPEI*, and *Sierra Club Atlantic*, without whose participation this work would have never seen the light of day.

The Conservation Council of New Brunswick would like to extend its sincere thanks to Toby Couture, Taylor Gray, Brenda Kelley from *Sustainable Development Bathurst*; Joe Waugh of *Efficiency New Brunswick* and the *NB Homebuilders Association*; Monica Adair and Stephen Kopp Certified LEED Architects; David Belliveau of *Kwesawek Energy*; Eric Tusz-King of *EnerGreen Builders Cooperative* and *EOS Eco-Energy*; Jean Arnold, Executive Director of *Falls Brook Centre*; John Simon of *Renew Coop;* Paul Lanteigne, Manager of *Lamèque Wind Coop*; and Cedric MacLeod of *MacLeod Agronomics* for their insights and input.

Any errors or omissions found in this report are the responsibility of the Conservation Council of New Brunswick alone, and not of its members or advisors. Any views contained herein are those of CCNB, and not necessarily of the contributors that helped make this document possible.

Table of Contents

ROADMAP TO A SELF-SUFFICIENT ENERGY FUTURE



Preface

Scientists and economists around the world are insisting that failure to achieve deep greenhouse gas reductions will have serious consequences for the economy, ecology, and overall health of our society.

- Since 1988, the Intergovernmental Panel on Climate Change (IPCC), a United Nations body tasked with forging an international scientific consensus on the science of global warming, has made it clear that climate change is occurring as a result of human activity. The IPCC has shown that the impacts will be devastating and costly, however solutions are available and affordable.
- In 1992, the *United Nations Framework Convention on Climate Change* (UNFCCC) recognized the need for global cooperation to avoid "dangerous" climate change, and recognized that industrialized regions have a responsibility to take action and demonstrate global and regional leadership.
- In October of 2006, Sir Nicholas Stern, former Chief Economist of the World Bank, released a review of the economics of climate change and warned governments around the world that the cost of inaction far outweigh the costs of action.
- The European Union has called for an "energy revolution," agreeing to reduce their emissions by 20% below 1990 levels by 2020 unilaterally and to reduce emissions by 30% if other industrialized countries, such as Canada, agree to do the same.

There is a growing consensus that we must stop the planet from warming by 2ºC to avoid the most serious consequences of climate change. This objective requires industrialized countries to reduce greenhouse gas emissions by at least 25-30% below 1990 levels by 2020 and 80-90% below 1990 levels by 2050.

There is a growing consensus that we must stop the planet from warming by 2°C to avoid the most serious consequences of climate change.

To achieve these targets we must transform the way we use and produce energy. This will necessarily require governments to implement energy policies which rapidly move us toward a low-carbon economy.

Leading environmental organizations in the four Atlantic provinces have created the *Atlantic Canada Sustainable Energy Coalition* to promote policies that will move us toward a low carbon economy that is ecologically sustainable and supportive of local economies. The following pages provide a roadmap to achieve deep greenhouse gas reductions while contributing to the economic development of our communities.

PART I. The New Brunswick Context

It is widely acknowledged that the extraction, production, transmission and utilization of energy are the single largest human contributors to global climate change. In New Brunswick the production of electricity for in-province use and for export accounts for almost half of all our greenhouse gas emissions. Another third of the emissions results from the refining of petroleum products for both export and to fuel our cars and trucks.

Making deep reductions in New Brunswick's greenhouse gas emissions requires a profound reassessment of both energy and economic development policies.

We must redesign the way we use and produce electricity and fuel. We must transform our economy so that future growth is no longer dependent on fossil fuels.

New Brunswick is rich in renewable energy resources distributed throughout the entire province. These include energy efficiency, wood energy, wind, biogas, and solar. An energy system based on these local resources has the potential to ignite local economies across the province while delivering deep reductions in greenhouse gas emissions.

The following pages outline strategic opportunities to fight global warming, reduce air pollution and contribute to the economic development of every community in New Brunswick. Such a self-sufficient energy strategy will meet our energy needs and allow us to achieve our environmental and economic goals.

New Brunswick and Global Climate Change

The impact of global warming is already being felt in New Brunswick. The snowpack in southern New Brunswick is only half the historical norm, extreme weather has increased five-fold, sea level has risen by 30 cm, and the average annual temperature has increased by 0.7°C.[1]

Surprisingly, given the province's small size, New Brunswick's per capita emissions are among the highest in the country. This is partly due to the fact that our economy is more dependent on fossil fuels than any other province in Canada outside of Alberta and Saskatchewan. Furthermore, we largely heat

[1] New Brunswick's Climate Action Plan, Department of Environment, 2007.

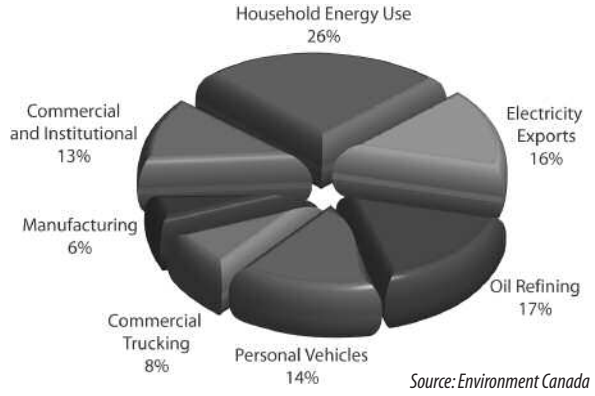
our buildings with electricity generated with fossil fuels and our economy is dominated by exports of electricity and refined petroleum products. Unlike Alberta and Saskatchewan, these exports are dependent on purchased imported energy which drains the provincial economy of hundreds of millions of dollars annually.

In 1990, New Brunswick's greenhouse gas (GHG) emissions totalled 16.1 million tonnes; by 2005 they totalled over 22 million tonnes, an increase of almost 37%. GHG emissions are expected to rise dramatically due to: the expansion of Saint John as an energy hub; the construction of a liquefied natural gas terminal; the planned construction of a second massive oil refinery; the increased burning of high-carbon fuels, such as petroleum coke by NB Power; and increased electricity exports. Clearly we are on the wrong track.

In June 2007, Premier Shawn Graham committed his government to cutting greenhouse gas emissions to 1990 levels by 2012 and 10% below 1990 levels by 2020. Premier Graham released a five-year climate action plan detailing his government's intentions to cut New Brunswick's annual greenhouse gas emissions by 7.1 million tonnes by 2012.

New Brunswick's climate action plan seeks to achieve its greatest emission reductions by reducing the demand for electricity through energy efficiency improvements, reducing the reliance on electricity for space and water heating, and increasing the use of renewable sources of power generation. Provincial regulations are not planned to limit emissions from power plants or any other industrial sector.

New Brunswick Carbon Pollution Sources, 2004



Source: Environment Canada

The Self Sufficiency Agenda

Premier Shawn Graham has made it the central tenet of his leadership that New Brunswick achieves economic self-sufficiency by 2026. His goal is to expand the provincial economy sufficiently to provide a large enough tax base to eliminate the use of federal transfer payments to provide public services. He describes his self-sufficiency agenda as transformative.

To provide a roadmap to self-sufficiency, the Premier established the *Self-Sufficiency Task Force* which made 91 recommendations for change. Unfortunately, these recommendations would intensify and perpetuate New Brunswick's economic dependence on energy imports and export markets for petroleum and electricity.

The Self-Sufficiency Strategy's economic agenda is a throwback to the past. It promotes economic growth that is based on importing fossil fuels and uranium and exporting gasoline and electricity. This is a strategy for further dependence, not self-sufficiency – by focusing on an import/export model of energy development we are tying ourselves to both the supply and the demand sides of foreign markets, locking ourselves into a fossil fuel dependent economy that will be uncompetitive in the 21st century as carbon emissions are increasingly constrained.

Half a billion dollars paid to NB Power by its customers is shipped out of the province every year to pay for fuel to run its thermal power plants. That's half a billion dollars lost from our economy. If we were more self-sufficient in energy, hundreds of millions of dollars would stay in New Brunswick to create jobs and economic opportunities at home.

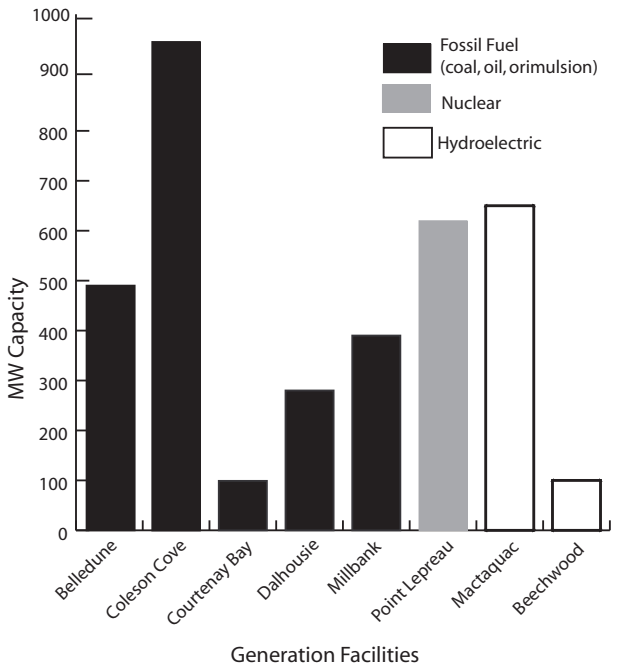
> "New Brunswick does need transformative change – this change should be driven by a move to a more sustainable future, one with novelty and innovation at its heart, and one that is focused on harnessing of our local, indigenous energy potential."

A truly self-sufficient energy future can bring greater benefits and a more lasting prosperity for every community in New Brunswick than megaproject-style energy developments can ever hope to deliver. We must diversify not only our energy sources, but also the communities that benefit from energy-related development. Anything less will perpetuate unsustainable and unbalanced growth that will fail yet again to bring the province as a whole closer to self-sufficiency.

This roadmap points the way to a self-sufficient energy future built on a community-based energy system that fully exploits New Brunswick's abundant potential for energy efficiency and community power fuelled largely by local renewable resources.

Pursuing the goal of energy self-sufficiency will ensure New Brunswick does its share to fight global warming while strengthening local economies throughout the province.

NB Power Generation



"Any intelligent fool can make things bigger, more complex, and more violent. It takes a touch of genius – and a lot of courage – to move in the opposite direction."

- E. F. Schumacher, Author of Small is Beautiful

PART II. Energy Hub versus Community Power - A Question of Scale

Demand for electricity is extraordinarily high in New Brunswick. This demand is largely fuelled by the large number of households and businesses dependent on electric heat, the inefficiency of our building stock, and a handful of large industrial facilities.

More than 60% of existing homes, 85% of new homes and 30% of commercial buildings are dependent on electricity for heat. With some of the oldest housing stock in Canada dependent on electric heat, NB Power maintains 1300 MW of its 3,770 MW of generating capacity just to supply the demand for electric heat. In total, the residential and commercial sectors consume almost 60% of NB Power's annual output for New Brunswick.

On the industrial side, the demand for electricity is dominated by the Irving Oil refinery and a handful of pulp and paper mills, consuming 40% of NB Power's annual output for the province.

The bulk of electricity consumed in New Brunswick is supplied by large, centralized thermal plants where imported fuel is used to produce steam which turns their electrical turbines that generate electricity. These plants are linked to homes, businesses, and industries by long networks of transmission and distribution wires.

Of the billion dollars consumers pay NB Power for electricity every year, $500 million leaves the province to purchase imported oil, coal, orimulsion, and uranium. New Brunswickers are paying half a billion dollars annually to generate wealth in other countries rather than have the money circulate in New Brunswick's economy where it could create local jobs and opportunities from the development of our own energy resources. Our economy bleeds a half billion dollars every year and in return we get high levels of greenhouse gases, air pollution, radioactive wastes, and an increasing dependence on imported energy.

> *"Electricity's environmental impacts, which once mainly affected local communities, [have become] regional and global… Tied to fossil fuel mining, extraction and combustion, nuclear fission, and the construction of massive hydroelectric dams, the large-scale generation, transmission, and distribution of electricity is currently among the most ecologically disruptive of all human activities."*[2]

The overwhelming majority of New Brunswick's electricity, roughly 95 percent, is produced by large generating facilities that range in size from 100 MW to 1000 MW, whereas the demand for electricity ranges from a few kilowatts at the household level to 100 MW from the most demanding pulp and paper mill. Close to half the electricity consumed in New Brunswick is produced with fossil fuels, roughly 20 percent is hydroelectricity, and the remaining 30 percent is generated with uranium.

This centralized model of electricity generation that depends on large quantities of imported fuel to run very large power plants to deliver electricity over long distances, wherever and in whatever increments, voltage, or frequency required has its roots in the latter half of the 20th century. New Brunswick committed to its first large thermal power plants in the 1970's

[2]Worldwatch Paper 151, *Micropower: The Next Electrical Era*, p.31

with the construction of the 1000 MW Coleson Cove oil-fired generating station and the 640 MW uranium-fuelled nuclear power plant at Point Lepreau.

By the 1980s it was widely acknowledged, particularly in the United States, that large power plants are inherently problematic – they are incredibly inefficient at converting fuel into electricity - operating at a wasteful 30% efficiency; they take years to site and build, they are expensive to build, they create large amounts of pollution and dangerous wastes, and particularly in the case of nuclear power plants they become increasingly unreliable with age and carry astronomical repair costs.

> *"The bigger-is-better ideology that had become widely accepted within the industry and reached its apex in the 1970s would become so discredited by the end of the 1990s that even utility spokespersons acknowledged that "the era of big [power] is…over."* [3]

The dangers and risks associated with big power plants led a number of analysts and economists to speak of the **diseconomies of scale** that come with over-sized generation.[4] Rather than power generation becoming cheaper with increasing size, traditionally known as **economies of scale**,[5] there is a point at which larger systems actually become *more* expensive than smaller systems for delivering the same service. This is particularly the case when those smaller systems can be mass produced, rapidly deployed, sized to match the job at hand, and deliver high efficiencies with little environmental impact.

Large thermal plants such as Coleson Cove (which burns heavy oil), Belledune (which burns a mix of coal and petroleum coke), or Point Lepreau

(which uses uranium to fuel a nuclear reaction) are dreadfully inefficient and wasteful, running at roughly 30 percent efficiency. The equivalent of three barrels of oil (or tonnes of coal or kilos of uranium) are burned in order to generate only one barrel of oil's worth of electricity. The other two barrels of oil are simply lost as heat to the Bay of Fundy or Baie de Chaleurs.

Furthermore, the long and complex transmission and distribution system needed to get the electricity from the power plants to where it is required leads to further energy losses.

Back to the Future

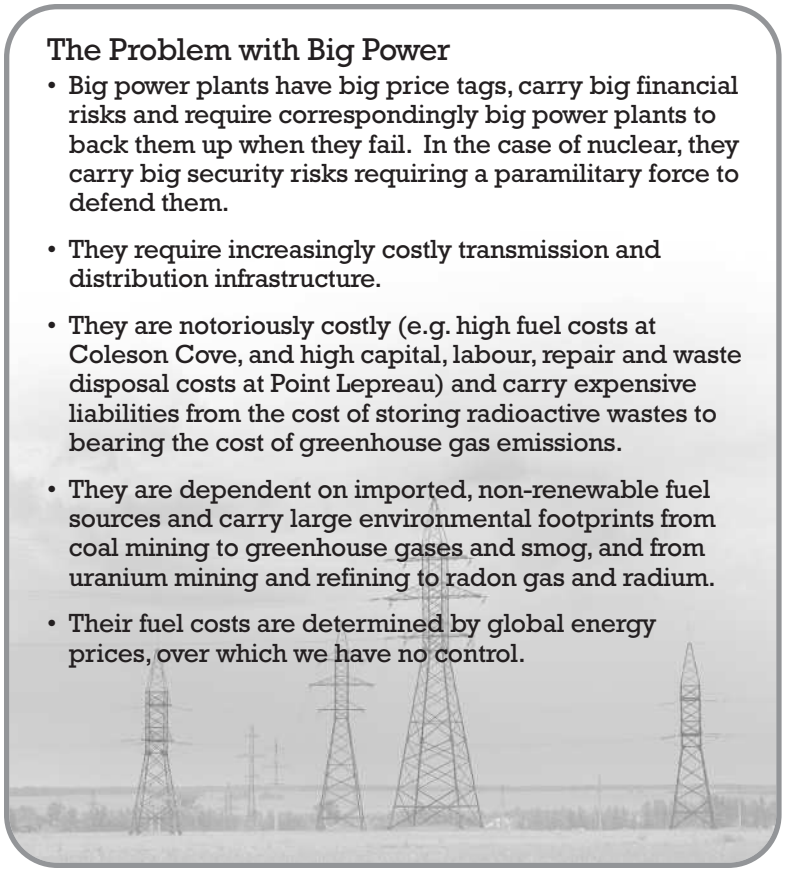
> *"I have no doubt that it is possible to give a new direction to technological development, a direction that shall lead it back to the real needs of [humanity]…" - E. F. Schumacher*

The notion that society has an insatiable appetite for electricity that must be supplied by building ever more and bigger power plants is the old way of thinking. In its place, there is a growing movement, driven largely by the

[3] Worldwatch Paper 151, *Micropower: The Next Electrical Era*, p.16
[4] Worldwatch Paper 151, *Micropower: The Next Electrical Era*, p.14
[5] Economies of scale occur when increasing the scale of production reduces the actual cost of each item produced.

The Problem with Big Power

- Big power plants have big price tags, carry big financial risks and require correspondingly big power plants to back them up when they fail. In the case of nuclear, they carry big security risks requiring a paramilitary force to defend them.
- They require increasingly costly transmission and distribution infrastructure.
- They are notoriously costly (e.g. high fuel costs at Coleson Cove, and high capital, labour, repair and waste disposal costs at Point Lepreau) and carry expensive liabilities from the cost of storing radioactive wastes to bearing the cost of greenhouse gas emissions.
- They are dependent on imported, non-renewable fuel sources and carry large environmental footprints from coal mining to greenhouse gases and smog, and from uranium mining and refining to radon gas and radium.
- Their fuel costs are determined by global energy prices, over which we have no control.



recognition that we must contain human activity within ecological limits, that recognizes we must limit our demand for electricity while supplying it far more efficiently and sustainably. This requires generation technologies that are sized to the job at hand, sited close to where the power is required, and fuelled by renewable sources of energy.

It would appear there is a gradual shift toward this way of thinking in New Brunswick, with the first tentative steps being taken to increase energy efficiency, break our dependency on electric heat, and increase the production of renewable energy. However the old way of thinking is deeply entrenched. With New Brunswick's electricity use declining, the provincial government is looking to southern New England's supposed insatiable appetite for power to provide the rationale for building more big power plants.

Thomas Edison, inventor of the incandescent light bulb, envisioned small, decentralized electricity systems as the way of the future. Edison envisioned decentralized production servicing local districts, scaled to the size of the demand and the needs of the individual customer – in effect, community power.

Edison's vision of the future could become New Brunswick's reality. The mass production of energy efficiency, biomass, biogas, wind, solar, fuel cells, and combined heat and power technologies hold out the tantalizing possibility of realizing Edison's vision in New Brunswick. One could argue that New Brunswick is more suited to such community power development

than just about anywhere else. Every community should be an active participant in increasing energy efficiency and generating power. This is the idea at the heart of community power.

New Brunswick does not contain large concentrations of populations; our small cities, towns and villages are widely dispersed across the province. We do have tremendous reserves of energy efficiency, wood, organic wastes, wind and solar energy. In southern New Brunswick we have access to low carbon natural gas which can be used to provide the hydrogen for fuel cells or fuel highly efficient small scale combined heat and power technologies. We also have a desperate need to rebuild our local economies.

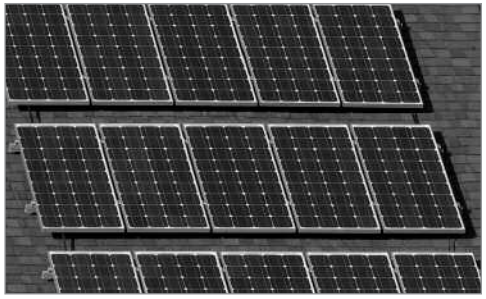
From buildings that use only a tenth of the energy of conventional homes and businesses to homes and businesses becoming sources of power, the energy system in New Brunswick could become a source of jobs and business opportunities in every community in the province.

A community-based energy system powering energy efficient local economies, largely based on the use of our own indigenous renewable resources, could be New Brunswick's future – one that is largely energy self-sufficient and sustainable.

As energy expert Amory Lovins writes, *"Electricity demand comes in myriad small pieces interspersed with a few bigger ones; electricity supply can do the same thing."*[6] Lovins describes over 200 benefits of a decentralized system of power generation in his book, "Small is Profitable".[7]

Lovins writes *"The shift [to smaller scale energy resources] has so far been motivated less by an understanding of appropriate scale's opportunities than by unpleasant experience of inappropriate scale's dangers…"* but *"With a more balanced appreciation of the opportunities that spring from making electrical resources the right size, the transition could be far faster, smoother, and more profitable."*[8]

Small IS Beautiful



Building design has progressed to the point where new homes and buildings can be constructed so they consume only a fraction of the energy required by conventional structures. These same homes and buildings can be sources of power, using technologies ranging from roof-top solar panels to combined heat and power systems fuelled by wood pellets, natural gas, or hydrogen.

There are no fuel costs when it comes to tapping our energy efficiency resources. Rather there are financial benefits in lower energy costs. Converting away from electric heat means burning fuel (gas, oil, wood pellets) at very high efficiencies with very low emissions to provide heat

[6] Amory Lovins et al., *Small is Profitable*, p.105
[7] Amory Lovins et al., *Small is Profitable* 2002
[8] Amory Lovins et al., *Small is Profitable* p.3

where it is needed in the amounts that are required. This is in contrast to the status quo of burning fuel at distant power plants at very low efficiencies with very high emissions to generate electricity that has to be converted back to heat hundreds of kilometres from where it was created.

Solar and wind energy are readily available, have no fuel costs and generate neither pollution nor wastes. Combined heat and power systems fuelled by wood pellets or chips use locally available low cost fuel which is low in emissions, high in efficiency and makes no net contribution to global warming (since the carbon dioxide released by burning wood is re-absorbed by trees that re-grow in the areas from where the trees were cut).

Combined heat and power systems are installed where the heat and power are required, not hundreds of kilometres away. Surplus electricity is sold to the electrical grid while the heat produced from generating electricity can be used to supply energy for heating, cooling, steam, hot water or humidity control. Combined heat and power (CHP) systems can be fuelled by wood pellets or chips, biogas from landfills, manure or sewage, agricultural wastes, natural gas or hydrogen.

According to the US Combined Heat and Power Association, *"CHP may achieve efficiencies exceeding 80%. Some systems have been shown to reach efficiency levels in excess of 90%."*[9] Given the 30% efficiency of traditional power plants, combined heat and power systems represent substantial financial, economic and environmental gains over big power plants.

The Benefits of Community Power

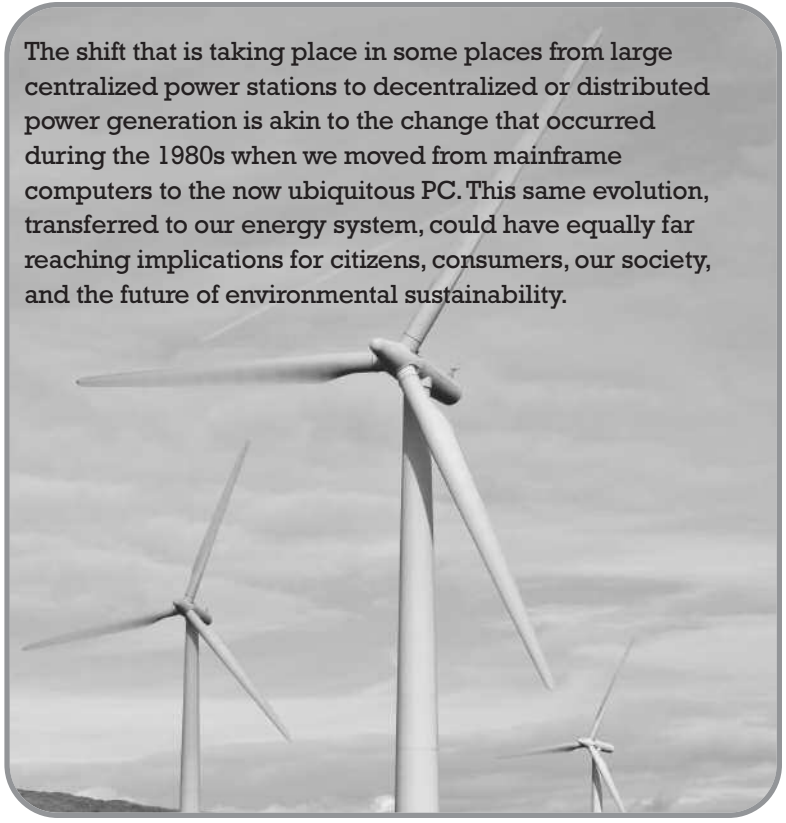
- Smaller systems incur less financial risk than large facilities.
- Combined heat and power technologies operate at much higher efficiencies than large central power plants
- They have little impact on the environment, produce little or no waste and generate no or low greenhouse gas emissions.
- Smaller systems can be sited where power is actually used, reducing the amount of power lost through transmission and distribution.
- New job and business opportunities are created evenly throughout the province.
- Smaller dispersed community-based systems increase the overall reliability, efficiency, and resilience of our energy system.

[9] http://uschpa.admgt.com/CHPbasics.htm

Combined heat and power systems are well suited to supply electricity and heat to a variety of commercial and institutional buildings, including: colleges, universities, food processing plants, commercial greenhouses, hospitals, hotels, hockey arenas, livestock farms, nursing homes, office buildings, warehouses, malls, supermarkets, restaurants, theatres, and sewage treatment plants. Somewhat larger systems are well suited to small industry such as sawmills and bigger industries such as pulp mills.

Smaller scale systems can be easily financed and quickly installed. A typical nuclear power plant can take more than a decade to go into operation from conception to construction with the attendant doubling or tripling of its price tag. A small to medium scale wind turbine or a combined heat and power facility can be installed in a matter of months, and solar panels and energy efficient technology can be added virtually overnight. The lower capital cost and shorter lead time result in reduced financial risk. Additional power can be added as it is needed.

When breakdowns occur in small scale systems, the impact is far more limited compared to breakdowns in larger scale power plants. Small scale systems tend to be faster and easier to repair and maintain, and require far less monitoring than large scale installations do. They also do not require the expensive back-up capacity in case of a breakdown or maintenance shutdown.[10]



[10] *Brittle Power,* Lovins & Lovins, 1982

By harnessing the energy of communities, a growing portion of the half billion dollars we spend on imported fuel to run NB Power's big power plants would be spent in our communities, creating jobs and new economic opportunities at home in New Brunswick.

In the case of wood-based combined heat and power systems, a new market would be created for woodlot owners and for sawmills looking to sell their chips. Both the combined heat and power systems and the wood pellets used by such systems could be manufactured here in New Brunswick. Engineers, manufacturers, installers, truckers and service people will all be required whether combined heat and power systems are fuelled by wood pellets, natural gas or biogas.

Over the course of the next 20 years, New Brunswick has the opportunity to create an energy future that is less dependent on foreign supplies of fuel, that is protected against continual increases in the international energy prices, and that harnesses the transformative power of the market. If New Brunswick pursues this path to a more community-based energy future, it will buffer itself against higher energy prices, create a lower carbon energy system, all the while broadening local economic benefits.

With all of these benefits, the time has come to aggressively pursue energy efficiency in the way we use and produce electricity. Community power generation systems are the right size for the job. The opportunities presented by a more self-sufficient energy future are enormous – the key is to generate the political will to move New Brunswick in that direction.

"Relatively small-scale, localized power was what [Thomas Edison] had in mind when first installing his electric power-and-lighting systems in the late nineteenth century. Edison envisioned a dynamic, decentralized electricity industry..."[11]

"It is simply not possible to achieve a sustainable electricity future in the face of inefficient uses of electricity."

–Ralph Torrie [12]

Part III. The Road to Energy Self-Sufficiency

Using less energy, ending our dependence on electric heating, and generating power and heat where needed with clean efficient technologies are the pillars of a more self-sufficient energy future for New Brunswick. A self-sufficient energy future is one that is based on community energy projects and not energy megaprojects.

What is community energy? Energy efficiency resources, and some combination of wind, solar, wood, and biogas resources are waiting to be developed in every community.

First and foremost, by using less energy we can shrink the environmental footprint of our communities and boost the competitiveness of our local economies. The energy efficiency resources found in every community have barely been tapped. Tapping these resources means renovating and building in ways that fully exploit energy efficiency.

Second, the use of efficient, cleaner community power systems can help rebuild local economies and make us more energy self-sufficient. Community power means local ownership. Ownership can range from a farmer or group of woodlot owners to cooperatives, building and local business owners, or a large number of small local investors.

Together, energy efficiency, community power and fuel switching away from electric heat will help the province phase out polluting, wasteful and risky mega-power plants.

Developing New Brunswick's Energy Efficiency Resources

Exploiting energy efficiency is the most cost-effective and environmentally friendly energy resource found in New Brunswick. It is the cheapest and quickest route to making deep reductions in greenhouse gas emissions. Moreover, it is abundant, locally available, and can be captured more inexpensively than producing or purchasing energy.

> *"Considered from the demand as well as the supply side of the equation, [we can ask] what is the cheapest, cleanest way to deliver each of these services? Often the better, more cost-effective way is using less energy more productively, with smarter technologies. Efficient end-use can thus compete with new supply as an energy resource."*
> *– Amory Lovins* [13]

Exploiting energy efficiency is essential to building a more self-sufficient energy future for New Brunswick:

i) Reducing the demand for electricity through energy efficiency will enable us to retire some big power plants, reducing greenhouse gas emissions, pollution and waste.

ii) Energy efficiency stems the flight of capital from the province to purchase fuels from foreign sources.

[11] Worldwatch Paper 151, *Micropower: The Next Electrical Era*, p.6
[12] Ralph D. Torrie and Richard Parfett, *Phasing out Nuclear Power in Canada: Toward Sustainable Electricity Futures*, Torrie Smith Associates, July 2003, p.14
[13] Lovins, Amory, *Journal of International Affairs*, Fall 1999, 53, no. 1.

iii) Most efficiency investments have a rapid rate of return.

iv) Energy efficiency reduces monthly energy bills.

v) Energy efficiency improves business and industry competitiveness.

vi) Investments made in energy efficiency re-circulate directly within the local economy, employing local people and stimulating local enterprise.

Energy efficiency gains are available virtually everywhere in our province and in our economy.

A study for New Brunswick's Department of Energy by *Marbek Resource Consultants* and *Neill & Gunter*, concluded that investments in industrial energy efficiency and fuel switching could eliminate one traditional power plant's worth of electricity demand and save industry approximately $1.3 billion between 2006 and 2020.[14] The bulk of these savings, almost $780 million, are achievable through boiler and pump upgrades in industrial facilities alone!

In an earlier study[15] the same consultants calculated the potential for economically attractive energy savings across all sectors. Fully exploited, they calculated these energy efficiency resources would yield a reduction in greenhouse gas emissions of nearly 5 million tonnes within 8 years and provide a net increase of 2,424 jobs annually. That's the power of community energy in action.

Recognizing the benefits to New Brunswick society of developing our energy efficiency resources, the provincial government created its own energy efficiency agency, *Efficiency New Brunswick*. It provides grants, loans and technical assistance to home and business owners to leverage investments by homeowners and business in energy efficiency.

The maximum development of New Brunswick energy efficiency resources must be the cornerstone of energy self-sufficiency and a credible climate action plan.

To Create an Energy Efficient New Brunswick:

1.1 **Establish short, medium and long-term targets for Efficiency New Brunswick to ensure New Brunswick's entire building stock is refurbished in a timely manner.** Energy use can be cut in most New Brunswick households by 30 to 40 percent through improvements to insulation, air tightness, windows and doors. Energy use can be cut by half in office and retail buildings, schools and hospitals through retrofits. A special program is required to ensure all apartment buildings are retrofitted by 2020, since tenants often pay the energy costs, removing much of the financial incentive for building owner to invest in energy efficiency upgrades.

1.2 **Assign Efficiency New Brunswick greenhouse gas reduction targets and accelerate the pace of energy efficiency upgrades and fuel switching to achieve them over the next five years by providing the necessary staff and budget.**

[14] "Energy Performance Benchmarking and Best Practices in the New Brunswick Industrial and Manufacturing Sector," Canadian Association of Manufacturers and Exporters, Marbek Resource Consultants, Neill & Gunter, November 2006.

[15] "Energy Efficiency Potential Study for New Brunswick," Marbek Resource Consultants, May, 1992.

1.3 **Provide discounts on electricity prices for those who consume the least.** Customers that consume between 1000 kWh and 1400 kWh per month should be rewarded with a discount, and those consuming less than 1000 kWh would be charged an even lower price. This would encourage further investments in energy efficiency improvements and fuel switching.

1.4 **Mandate that an energy audit be conducted as a condition of home sales.** This would create an incentive for home sellers to upgrade their homes and provide buyers with information they can factor into the offer they make.

1.5 **Demonstrate the full potential for energy efficiency in commercial and institutional buildings through a major retrofit program for New Brunswick's schools, hospitals and other public buildings.**

1.6 **Incorporate energy performance standards in the provincial building code for residential and commercial buildings by 2009.** The energy demand of typical new buildings can be reduced by a half to two thirds if the building code required new construction to meet the energy efficiency standards of R2000 homes (an Energuide 80 rating) and C2000 commercial buildings.

1.7 **Require NB Power to offer tankless and solar water heaters as part of its water heater rental program.** This will help reduce energy demand from hot water heating, lower the related greenhouse gas emissions and reduce electricity costs.

1.8 **Mandate NB Power to invest directly in energy efficiency and fuel-switching for measures that are less costly than investing in new generating capacity.** Reducing electrical demand through efficiency improvements are generally cheaper and less risky than adding new generating capacity. Expenditures by NB Power to assist its customers in reducing their electricity requirements will have a lower impact on rates than building new power plants. Government should direct NB Power to return 5% of its revenues to its customers in direct grants through *Efficiency New Brunswick* to assist with energy efficiency upgrades and fuel switching.

Breaking New Brunswick's Dependence on Electric Heat

Second only to exploiting our local energy efficiency resources, breaking our dependence on electric heating will rapidly reduce our dependence on imported energy, inject new money into our provincial economy, increase our use of renewable and cleaner sources of energy and rapidly reduce greenhouse gas emissions.

According to *Efficiency New Brunswick*, approximately 80% of New Brunswick's

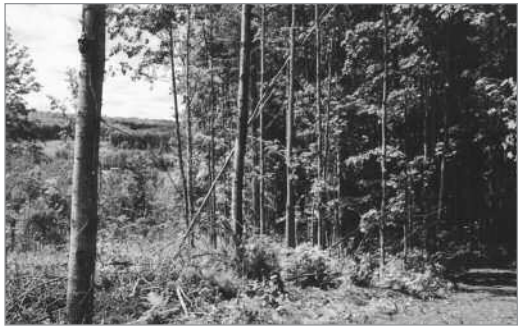
[16] c.f. Efficiency New Brunswick: www.efficiencynb.ca

homes depend on electricity for space or water heating and 85% of new buildings are designed with electric heat.[16] This dependence must be drastically reduced if the province is to move to a more self-sufficient energy future. This will require policies to promote fuel switching to low-carbon natural gas, clean burning wood pellets, solar energy and super-efficient oil burning furnaces and boilers. Where practical, both heat and electricity should be produced on-site using natural gas or wood pellets.

Three barrels of oil must be burned at a traditional power plant to provide one barrel of oil's worth of electric heat to our homes and offices, which are often located hundreds of kilometres away. If fuel is burned directly in a high efficiency furnace or boiler where that heat is required, more than 90 percent of the fuel can be turned into useful heat. That is why converting an all-electric home to oil reduces the greenhouse gases associated with space and water heating by 40%. If natural gas can be used instead, greenhouse gas emissions can be cut by 60% since gas contains much less carbon than oil or coal. If wood or solar energy are used, greenhouse gas emissions associated with space and water heating as can be eliminated entirely, along with dependence on non-renewable imported sources of energy.

In the case of solar and wood-based heating, the increased use of these locally available renewable sources of energy would move us closer to the energy self-sufficiency goal while putting more dollars into our local economies instead of sending them out of province.

A major shift away from electric heat to wood and pellet based systems for



residential and commercial buildings provides an excellent opportunity to create a local market for one of our local renewable resources supporting our woodlot owners and sawmills and creating new economic opportunities for those who design, manufacture and service the pellet heating and storage systems.

With an ailing woodlot sector in need of new markets for its wood fibre, a transition to wood and pellet based systems for residential and commercial sites provides an excellent opportunity to create a local market for private woodlot owners.

To Get Off Electricity:

1.1 **Provide a comprehensive program of incentives and zero interest loans to increase the rate of fuel switching across the province through a targeted increase in Efficiency New Brunswick's budget.** Eligible technologies should include wood pellet stoves, efficient low emission wood stoves and furnaces, solar space and water heaters, high efficiency gas, propane and oil heaters, and ground-source heat pumps.

1.2 **Require NB Power to charge less for lower levels of electricity use.**

1.3 **Phase in a ban on electric resistance heating technology for primary heating systems in all new residential, commercial and institutional construction**. New Brunswick already bans the sale of inefficient furnaces, boilers and appliances through the *Energy Efficiency Act.* This approach must be extended to heating with electricity if we are to improve the overall efficiency of our energy system, and reduce the wasteful and polluting use of imported non-renewable sources of energy.

1.4 **Lead by example by reducing the dependence on electric heat of government buildings by converting to wood- and solar-based heating sources for its buildings and facilities and designing new building to use these energy sources.** This would help rapidly develop local wood and solar energy markets if a priority was placed on converting schools, hospitals, and other government buildings.

1.5 **Establish a model energy self-sufficient subdivision where wood-based fuels and solar energy provide space and water heating.** The Drake's Landing solar subdivision in Okotoks, Alberta has drawn international attention and was inspired by that community's drive to reduce its environmental footprint. New Brunswick should place a priority on demonstrating how our abundant solar and wood-energy resources can be efficiently used to provide space and water heating in our communities.

Where There's Power There's Heat – Plugging Into Community Power

"A review of the international literature on low emission futures reveals cogeneration to be second only to improved efficiency in the size of the contribution it can make to a more sustainable and efficiency (sic) electricity supply and demand system…" –Ralph Torrie[17]

To dramatically increase the efficiency of power generation, the heat it produces must also be used. This requires that power be generated on a smaller scale where it is needed so that the resulting heat is available in appropriate amounts to provide space heating, steam or hot water.

Connecticut: A Leading Example of Community Power

Connecticut has implemented a Renewable Portfolio Standard which sets targets for the development of a variety of community power sources.

- By 2010, 7% of the power supply by 2010 is to be provided by solar, wind, fuel cells, methane from landfills, sustainable biomass, run of river hydro of less than 5MW, wave and tidal power.
- By 2010, 4% of the total power supply is to come from combined heat and power (CHP) facilities, energy efficiency upgrades, conservation, or load management programs.

[17] *Toward Sustainable Electricity Futures*, Ralph D. Torrie and Richard Parfett, Torrie Smith Associates, July 2003, pp.14-5

A combined heat and power (CHP) system, also known as a cogeneration system, produces useable electricity and heat from a common fuel source. Surplus electricity can be sold into the electricity grid. These technologies can be fuelled by natural gas, wood pellets converted to gas, biogas from landfills, sewage plants or livestock farms, or natural gas converted to hydrogen. They typically achieve efficiencies of 70 to 90% compared to the 30% of large centralized power plant where the vast amounts of heat produced must be vented to a nearby water body.

Large CHP systems are already used in New Brunswick at large industrial facilities such as the Irving Oil Refinery and the Fraser Papers pulp mill. While the potential for more industrial CHP systems is high, there are also many applications appropriate for sawmills, commercial greenhouses, schools, hospitals, malls and other commercial buildings. These power sources remain untapped in the absence of supportive public policy.

Expanding these sources of community power and heat will expand the market for wood-based energy and create the demand for new low or zero emission technologies. New Brunswick-based Atlantic Hydrogen has pioneered technology that removes hydrogen from natural gas making it available to run fuel cells; a zero emission CHP system that relies on a chemical reaction rather than combustion.

Another advantage of CHP systems is that sufficient heat can be produced to supply a district heating system, where heat is piped throughout a subdivision to meet the heating requirements of every home while electricity is pumped into the power grid.

Industrial, institutional and commercial facilities currently burn large amounts of oil or natural gas to produce heat, hot water and steam but discard the potential to generate electricity that could be sold into the grid by using furnaces and boilers instead of combined heat and power technologies. Supplying energy efficiently means generating heat and power at the same time in the amounts that are needed, where they are required.

If New Brunswick plugged into community power every commercial an institutional building could become a small-scale power plant while meeting their requirements for heat. This would dramatically reduce the need for large centralized power plants in two ways. They wouldn't be required to provide electricity for heating, and new sources of low or no emissions power distributed across the entire province would replace electricity currently supplied by the big power plants.

In order to harness the enormous potential that exists for low or no emission community power there must be supportive public policies.

To Bring Power To Communities:

1.1 **Mandate that all new thermal generating capacity must be provided by combined heat and power systems.** In the context of the environmental crisis and the need for greater energy self-sufficiency we can no longer afford the pollution and waste created by large inefficient thermal generating stations dependent on imported non-renewable sources of energy. We need to maximize the efficiency of our power supplies and minimize their emissions. This means community power.

1.2 **Enact a combined heat and power portfolio standard under the *Electricity Act* requiring NB Power to supply 10% of its power from combined heat and power systems by 2012.**

1.3 **Require NB Power to provide long-term contracts at a fixed price to community power producers which reflects the additional costs the utility would incur from acquiring new centralized generating capacity and the benefits provided to the electrical grid and the environment.**

1.4 **Establish an *Energy Self-Sufficiency Fund* to ensure that community power producers in local businesses, hospitals, schools, shopping centers, etc., would receive the necessary revenue to finance their combined heat and power systems over the lifetime of the installation.**

A Solar Economy

Instead of continuing to be opportunistic in the highest degree and concentrating our research toward finding more economically efficient ways of tapping mineral energies – all in finite supply and all heavy pollutants – we should direct all our efforts toward improving the direct uses of solar energy – the only clean and essentially unlimited source. Already known techniques should without delay be diffused among all people so that we all may learn from practice and develop the corresponding trade. – Nicholas Georgescu-Rogen[18]

New Brunswick has made some tentative moves toward harnessing the power of renewable energy with its renewable portfolio standard. The *Electricity Act* imposes a legal requirement on NB Power to supply New Brunswickers with 10% of their electricity from new renewable sources by 2016. As a matter of policy the timetable has been moved to 2012. Roughly 400 megawatts of wind power is now under development. Wind is one manifestation of solar energy.

True energy self-sufficiency requires the establishments of a renewable energy-based economy. From the direct use of the sun's energy to generate electricity to more indirect methods which utilize the wind, wood, or agricultural wastes, the rapid development of our indigenous renewable energy resources should be a central component of the province's self-sufficiency agenda. Renewable energy can be developed to create many small to medium-scale installations, each requiring small to medium-scale capital investments, distributed throughout every community in the province.

[18] Selections from "Energy and Economic Myths" by Nicholas Georgescu-Roegen. Published in Economics, Ecology, Ethics - Essays Toward a Steady State Economy, Herman E. Daly Editor, W.h. Freeman and Company, 1980.

Furthermore, the scale of renewable energy systems makes it possible for local communities to become active owners and developers of these technologies – in fact, this is also the best way for communities to benefit from renewable energy development. This makes renewable community power a natural fit for advancing self-sufficiency in the province, and a great way to create jobs in communities suffering from the downturn and closures plaguing the province's forestry industry.

New Brunswick's geography provides it with one of the best wind regimes and substantial potential for solar energy production. Environment Canada ranks New Brunswick as the sunniest province in Canada during the winter months, a fact that makes our province particularly well positioned to pursue solar technology more aggressively.

An Energy Self-Sufficiency Fund would facilitate the development of community based wind projects; it would enable combined heat and power facilities to be more aggressively developed in the province's hospitals, hotels and shopping malls; it would ensure landfills could generate power from the methane they capture; and would enable hog and cattle farmers to generate power from the biogas.

Hundreds of local renewable energy installations are more efficient than a few large projects in a small number of locales, and provide greater benefits to overall system stability and reliability. This allows for job creation as well as increased income flows to be spread throughout the province.

There is an incredible opportunity for re-building local economies through the rapid development of community power with both combined heat and power technologies and renewable systems. This would create countless opportunities in manufacturing, contracting, engineering, design, consulting, and in the supply, installation and servicing of these technologies. The environmental and economic opportunities associated with community power will remain untapped if the province does not give priority to developing our local renewable energy resources.

The Conservation Council of New Brunswick is calling for a scaling back of our electric power system to the community and industry level, where communities, and small and big business can actively participate in the creation of a more self-sufficient energy future for the province. This will require a system-wide reduction in the many barriers to individual and community-scale energy development.

If New Brunswick wants to rebrand itself as an exciting and dynamic place to live, as recommended by the Self-Sufficiency Task Force, taking a position of leadership on renewable energy development is a guaranteed way to foster this image.

The province that prioritizes the development of renewable community power systems will rapidly become a leader in environmentally sustainable energy development and will be better equipped to attract a young, innovative, and dynamic work force.

In order to truly become the leader in green energy technology that Premier

Shawn Graham says he wants to be, public policy must create a supportive economic environment. The existing Renewable Portfolio Standard is driving the development of large wind energy installations. There is no public policy in place to drive the development of more community-based power systems that range in size from 100 kilowatts to 10 megawatts.

To Harness Renewables for Community Power

1.1 **The Department of Energy should issue a request for an expression of interest from communities, entrepreneurs, businesses and cooperative to provide power from renewable energy technology ranging in capacity from 100 kilowatts to 10 megawatts.**

1.2 **The Department of Energy should establish a feed-in tariff policy to foster the development of community scale renewable energy systems.** A feed-in tariff has been established in Ontario as their Standard Offer Program. Fixed prices are offered to renewable energy developers over a specified time period to encourage the development of small and medium sized renewable power generation up to 10 megawatts in capacity. Renewable energy technologies from photovoltaics and wind to biogas and wood energy would be eligible.

1.3 **The Province should establish an *Energy Self-Sufficiency Fund* to finance a feed-in tariff for renewable energy-based community power systems to avoid any upward pressure on power rates.** A *Self-Sufficiency Fund* would bridge the gap between the price that NB Power will pay for community power and the price developers need to charge to finance the installations. This fund should be accessible to homeowners, farmers, First Nations communities, businesses, community groups, municipalities and cooperatives.

1.4 **NB Power should create RenewNB, the NB Power Renewable Energy Company, to develop local public power projects which use renewable energy resources.** Renew NB would champion small to medium-sized renewable energy developments with direct investments in community power initiatives. These could include power generated on rooftops from solar cells, on farms from biogas or wind, at landfills from methane, at sawmills from wood chips or in commercial and institutional buildings from wood pellets or solar cells.

1.5 **The provincial government must double NB Power's regulated requirement to supply electricity from renewable sources under the *Electricity Act* from 10% to 20% of our power by 2016 and apportion it among a more diverse source of renewables.** The current target will be met by 2012 entirely by large scale wind power development. An expanded target should be met by a diversity of small to medium scale solar, wind, wood energy, biogas and tidal resources ranging in size from 100 kilowatts to 10 megawatts, financed by a Feed-in Tariff funded by the proposed *Energy Self-Sufficiency Fund.*

The Path to a Self-Sufficient Energy Future

By adopting the goal of energy self-sufficiency, New Brunswick will be seen as a province in the forefront of the movement toward a low-carbon future. In pursuit of such a future, New Brunswick will become known not only as a place to invest in green energy technologies but also as a more desirable place to live.

New Brunswick's current power system is overwhelmingly dependent on the inefficient use of imported sources of non-renewable energy, making it a major per capita contributor to global warming and a growing repository of radioactive wastes. This is neither sustainable, nor self-sufficient. The decisions New Brunswick has made in the past have made it economically vulnerable in the face of the new green economy of tomorrow; it is time we change this.

It is time for New Brunswick to move toward a future that will make greater use of locally available renewable resources and promote local economic development. If New Brunswick is to remain competitive in an increasingly carbon-constrained world it will have to invest aggressively in energy efficiency and community power to help its households, businesses and industries reduce their dependence on imported sources of non-renewable fuels.

It is time to leave behind the bigger is better ideology that has left us economically dependent and environmentally unsustainable. If New Brunswick's government wants to inaugurate transformative change for the province, there is no better way than through a province-wide move toward renewable energy solutions and community power.

The intense development of energy efficiency resources and community power has long been ignored because New Brunswick governments have favoured the construction of electricity megaprojects. These are politically popular because of the large number of associated consulting and construction jobs that last just long enough to carry a government through their next election. They also provide an unparalleled ribbon-cutting opportunity for politicians when the plant opens its doors to newly hired workers. However, the high environmental costs, the resulting increase in power rates, the limited impact on local economies, and the extreme dependency on imported non-renewable sources of energy should render this approach to development obsolete.

The policies recommended in this paper depart significantly from business as usual. Continuing down the same path will only give us more of what we've got, trading off our environment for short-term jobs and a long-term dependency on imported energy sources. By setting a course for energy self-sufficiency, New Brunswick can integrate the twin imperatives of rebuilding our local economies and restoring our degraded environment.

In a future where energy efficiency and renewable energy become the basis of our energy development, green technologies will become the iconic symbols of a high quality of life. A province that heads down this path, fueled by the appropriate mix of public policies, will attract the young, innovative, and dynamic work force required to bring this vision to reality.