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Towards a new energy strategy for Nova Scotia

Response to
The Nova Scotia Department of Energy's Consultation Paper
Nova Scotia's Renewed Energy Strategy and Climate Change Action Plan

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Executive Summary

In December 2001, the Nova Scotia government released its energy strategy report, *Seizing the Opportunity*, detailing how the province's anticipated offshore natural gas riches would change the face of Nova Scotia forever. Six years later, the government has released its consultation paper, *Nova Scotia's Renewed Energy Strategy and Climate Change Action Plan*, explaining the need for a renewed energy strategy: "dramatic changes in energy supply, demand, and prices—along with the reality of climate change."

In response to the government's call for comments on the consultation paper, members of the Energy Research Group (ERG) at Dalhousie University wrote *Towards a new energy strategy for Nova Scotia*. The ERG report begins with a brief review of the 2001 energy strategy, which is followed by a discussion of the consultation paper's three major topics: natural gas exploration, the province's proposed response to climate change, and electricity.

Like the original 2001 energy strategy, the consultation paper focuses on the offshore and its potential for natural gas. The ERG report questions the wisdom of continuing to place so much emphasis on the offshore, given the expected lifetime of both Sable and Deep Panuke, as shown in Figure 2 of the report. This is not to say that the offshore is not important, it is that there are other more pressing issues that the province must begin to address.

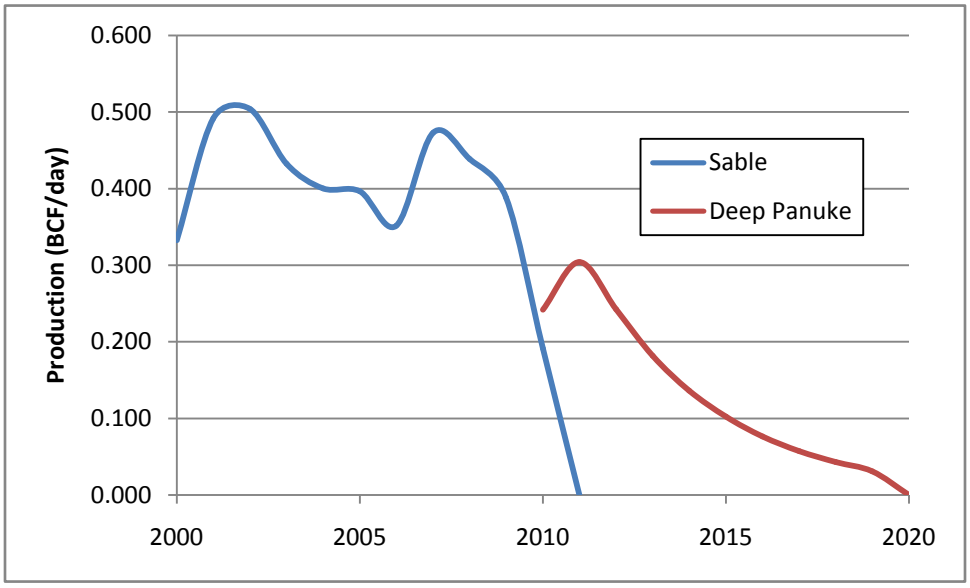

Figure 2: Nova Scotia's offshore (actual 2000-06 and projected 2007-2020) (NEB, 2007)

In addition to the offshore, the consultation paper also discusses climate change and how Nova Scotia can meet the greenhouse gas reduction target of ten percent below 1990 levels by 2020 as outlined in the *2007 Environmental Goals and Sustainable Prosperity Act* (EGSPA). This target will require Nova Scotians to reduce their emissions by ten megatonnes—an impressive goal, as shown in Figure 3, using the province's projected emissions (as defined by NRCan) and the 2020 target.

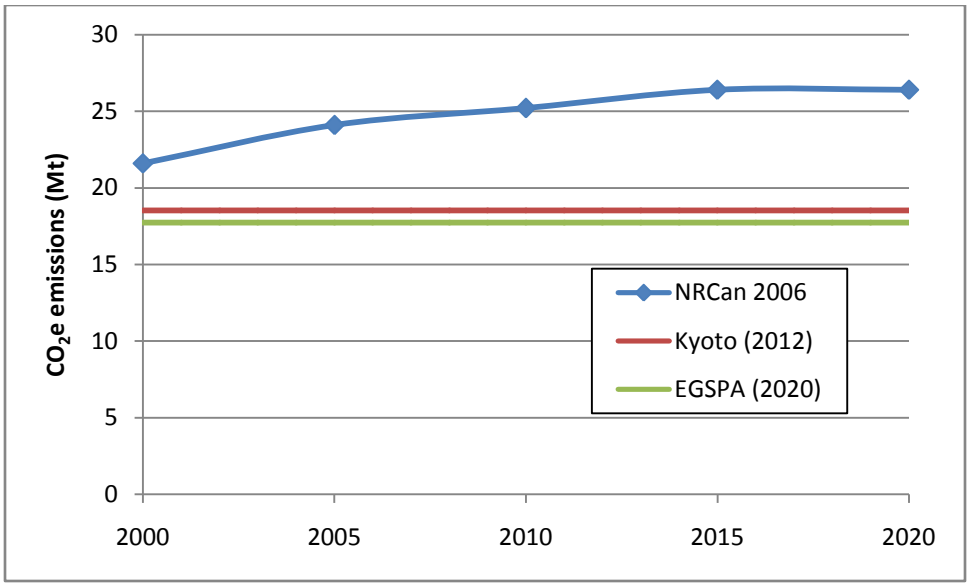

Figure 3: Nova Scotia's projected greenhouse gas emissions and reduction targets

The report shows that the consultation paper's lack of any overarching vision or principles, and only the vaguest of goals, means that the province's ten megatonne reduction target is unlikely to be met by 2020.

Climate change is not the only problem that the consultation paper inadequately addresses—the ERG report shows that Nova Scotia's overwhelming reliance on energy imports has been overlooked or disregarded, meaning that the province is energy insecure. Figure 7, a security-emissions diagram for the province, illustrates the problem faced by Nova Scotia: too great a reliance on insecure, high-carbon sources of energy with limited use of secure, low-carbon sources of energy.

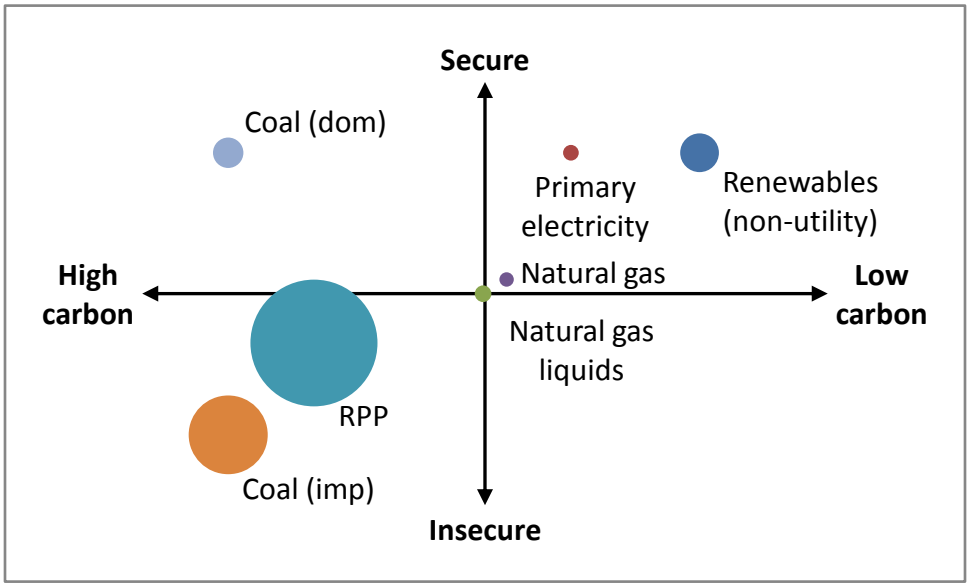

Figure 7: A security-emissions diagram for Nova Scotia

The province's failure to concentrate on how energy is used rather than how it is produced probably accounts for the province relying on insecure-high carbon energy sources. This is reflected in the original energy strategy's—and the consultation paper's—continued focus on electricity generation and energy exports.

Using research conducted by members of the Energy Research Group, the report presents a methodology that could be used to systematically improve Nova Scotia's energy security and reduce greenhouse gas emissions. This process—the three 'R's of energy security—consists of *reviewing* (an analysis of existing sources of energy, infrastructure, and types of consumption), *reducing* energy consumption, and when possible, *replacing* insecure energy sources with ones that are secure and preferably domestic. Using the methodology, the report presents a number of secure, low-carbon replacement energy sources, including bio-energy, solar, and wind. The report shows how these could be used to address the two major end-uses of energy in the province: transportation and space heating.

The ERG report employs the three 'R's methodology to create a set of reduction and replacement wedges that contribute to the 20 recommendations that will both improve the province's energy security and reduce its greenhouse gas emissions. The recommendations focus on the two primary end-users of energy in the province: transportation and residential and commercial space and water heating.

The report concludes with a call for the province to create an entirely new energy strategy, one that recognizes and addresses the energy needs of Nova Scotians, not one that just creates an environment to export energy products such as natural gas and electricity.

Towards a new energy strategy for Nova Scotia

1 Introduction

The Nova Scotia government and its Department of Energy are in the midst of "renewing" the province's 2001 energy strategy. The reasons for this renewal—a mere six years after it was released to Nova Scotians—are summarized in the following two paragraphs from the 2007 energy strategy renewal consultation paper:

> *The Energy Strategy (2001) envisioned an energy industry "balancing economic growth, social goals, and respect for the environment for generations today and tomorrow."*
>
> *That vision remains true today. But the world has changed. There have been dramatic changes in energy supply, demand, and prices—along with the reality of climate change. [Page 1]*

Undoubtedly the world is changing, Nova Scotians are experiencing these changes on a daily basis: from rising gasoline and home heating fuel prices, to increasing food costs. The problem of rising energy costs is being compounded by the mounting evidence that anthropogenic emissions of greenhouse gases—notably carbon dioxide—are changing the planet's climate (IPCC, 2007).

But why should changes outside Nova Scotia affect the province—a province with natural gas reserves and "world class *average* wind speeds"?

This report, a submission made in response to the Nova Scotia Department of Energy's Consultation Paper *Nova Scotia's Renewed Energy Strategy and Climate Change Action Plan*, answers this question, and more importantly, argues that the renewed energy strategy must go further if Nova Scotians are to weather the expected changes in world energy markets.

2 Background: The 2001 Energy Strategy

In 2001, the government of Nova Scotia released *Seizing the Opportunity*, a two volume report outlining the government's energy strategy (NS Petroleum Directorate, 2001). This section discusses some of the reasons why the Nova Scotia government is now renewing its energy strategy.

2.1 Premier Hamm's vision

In the introduction to *Seizing the Opportunity*, then premier of Nova Scotia, John Hamm, presented his vision of the province's future: a strong, diversified economy built on the wealth from the "oil and gas under the sea-beds off our coast." The government had a "clear plan" to create a "world-class oil and gas industry and secure additional jobs and business growth in Nova Scotia"—quite simply to "encourage exploration."

Although well over half of the energy strategy report was devoted to offshore oil and natural gas, the premier listed other actions, from using "local coal in an environmentally responsible manner", to "working closely with the federal government on climate change issues", and to "carefully introduce competition to the electricity industry."

With Sable achieving its all-time peak production in November 2001, about the same time *Seizing the Opportunity* was released, it should not be too surprising that two sentences in Premier Hamm's introduction were overlooked by most Nova Scotians:

> *As a result [of the 11 September 2001 terrorist attacks on the United States], Nova Scotia's political stability and proximity to the large northeastern US markets are taking on more importance. We are also very fortunate as Canadians to be energy self-sufficient and, in fact, one of the few nations in the world to be net energy exporters. [Page 3]*

These two sentences give the impression that Nova Scotia, being a good neighbour, could help out its friends to the south with natural gas because Nova Scotians, like all Canadians, are self-sufficient in energy. The fact of the matter is, although Canada remains a net energy exporter (IEA, 2000), some Canadian provinces rely almost exclusively on energy *imports*: Nova Scotia being one of these provinces.

In other words, rather than using the energy available from a relatively modest offshore natural gas resource for the development of the provincial economy, the Nova Scotian government opted to export the natural gas and live off the limited royalties, while relying on the import of increasingly expensive energy from overseas suppliers.

Was the Nova Scotia government aware of what it was doing in 2001 and what the impact on the province would be? From reading the 2007 consultation paper, one would think that the

government was ignorant of the energy trends that were taking place in 2001, given what the consultation paper states in defense of the 2001 energy strategy vision, "But the world has changed. There have been dramatic changes in energy supply, demand, and prices—along with the reality of climate change."

In 2001, many energy analysts were warning the Nova Scotia government of the significant changes that were taking place in energy supply, demand, and prices, as well as the impact of climate change. The summaries of these warnings are reprinted in Appendix I.

2.2 Some of the outcomes of the 2001 Energy Strategy

Premier Hamm's vision of Nova Scotia's energy future has not turned out the way he had hoped:

- For most of his tenure as premier, John Hamm was engaged in a struggle with Ottawa over ownership of offshore royalties, culminating in Nova Scotia winning 100 percent of the royalties under the Atlantic Accord—an agreement signed by Premier John Hamm and Prime Minister Paul Martin. Within two years of the agreement being reached, Prime Minister Steven Harper changed it, allowing Nova Scotia to continue with the existing equalization program with 100 percent of the royalties or accept a revised equalization program but reverting to the original royalty package.
- The Sable Offshore Energy Project, Nova Scotia's sole natural gas play, was originally expected to have reserves of about 2.5 trillion cubic feet of natural gas and was to last about 25 years. Within three years of the start of the project, the reserve size was decreased to about 1.4 trillion cubic feet and the field's lifetime was reduced to about 12 to 13 years (Myrden, 2004).
- As the number of $100 million dry holes being drilled increased, interest in the offshore entered a phase of rapid decline, with companies forfeiting licenses rather than undertaking exploration. The one bright spot was EnCana's on-again, off-again Deep Panuke project, a small sour-gas field of about 700 billion cubic feet (about half the size of Sable). Despite a world-wide shortage of offshore rigs and limited prospects for Nova Scotia's offshore, the province continued talking about offshore riches, announcing plans to open costly data

libraries and lower license fees for would-be offshore developers.

- The promise of natural gas being available to the majority of Nova Scotia's homes quickly evaporated when Sempra Gas left the province in 2001. After a lengthy delay, Heritage Gas won the franchise to distribute gas to Halifax and Dartmouth, Amherst, and a few communities near the Maritime and Northeast (M&NE) pipeline.
- One of the foci of *Seizing the Opportunity* and the government's energy policies has been on renewable *electricity* as opposed to renewable *energy*. As a result, a great deal of effort has been expended in lengthy studies, such as the *Electricity Marketplace Governance Committee* (EMGC), which created a list of some 89 recommendations, most of which have been ignored by the provincial government. The influence of Nova Scotia Power Incorporated (NSPI)—the private utility which monopolizes the local electricity industry—appears in much of the legislation introduced. For example, the 2004 Electricity Act introduced competition to the Nova Scotia electricity market by giving IPPs the right to compete with NSPI to sell electricity to small municipal utilities—a total of 1.6 percent of NSPI's total electricity sales. As a result, NSPI became Federal Energy Regulatory Commission (FERC) compliant, allowing NSPI to export electricity to New Brunswick and New England. Nova Scotia's tiny open-market stands in contrast to other jurisdictions, where truly open-markets create opportunities for entrepreneurial activity and energy diversification with multiple benefits across the marketplace—more than merely maneuvering to open export markets for a large private utility.

2.3 Nova Scotia Offshore Heritage Trust

During the excitement of 2001, with the offshore's bustling activity, many comparisons with Alberta were made: *Seizing the Opportunity* showed a table of Alberta's oil and gas revenues between 1996 and 2002, implying that Nova Scotia would soon be enjoying a similar bonanza. Former Alberta premier, Peter Lougheed, was invited to the province to make pronouncements on what Nova Scotia should do with natural gas liquids; and, like any "have-not" province on the verge of becoming a "have" province, a Heritage Trust was to be established:

> *Once offshore royalties become "net" royalty revenues (net royalties based on a percentage of producers cash flow (20-35 percent) after cash expenditures), the*

> *province will establish a Nova Scotia Offshore Heritage Trust for the benefit of future generations. The Heritage Trust will receive and manage a meaningful portion of these revenues so that Nova Scotians, today and in the future, benefit from these non-renewable resources. [Seizing the Opportunity, page 43]*

Nova Scotia's offshore royalties entered the "net" royalty revenue phase several years ago, yet the province has still not established an Offshore Heritage Trust. Instead of investing in our children's future, the province has spent millions of dollars on politically-motivated, poorly-designed initiatives such as the blanket eight percent home-energy rebate—a program with the net effect of encouraging current high-rates of energy-use, obscuring the market-signals which forewarn Nova Scotians of future rises in energy-costs, and simultaneously decreasing provincial revenue.

3 A review of the consultation paper

The consultation paper focuses on three topics: natural gas, climate change, and electricity.

3.1 Natural gas

The main focus of the original energy strategy was offshore natural gas and how it would improve the wellbeing of Nova Scotians. This remains unchanged in the consultation paper, with over 100 references to the offshore and natural gas.

3.1.1 Offshore: Present

Nova Scotia has one active offshore play, the Sable Offshore Energy Project (SOEP). A natural gas pipeline was built by Maritimes and Northeast (M&NE) to transport the natural gas to export markets in New Brunswick and New England.

Production from SOEP began in December 1999 and peaked at approximately 512 million m^3 in November 2001. The project was originally expected to produce about 2.5 TCF over a 25 year period; however, the geological complexity of the field resulted in a reduction in the size of the reserves to about 1.4 TCF, shortening the project's lifetime to about 13 years. In order to increase flow, a compression deck was added in 2006-07, bringing production up from below 300 million m^3 in the summer of 2006 to over 400 million m^3 in September 2007. Sable's production history is shown in Figure 1.

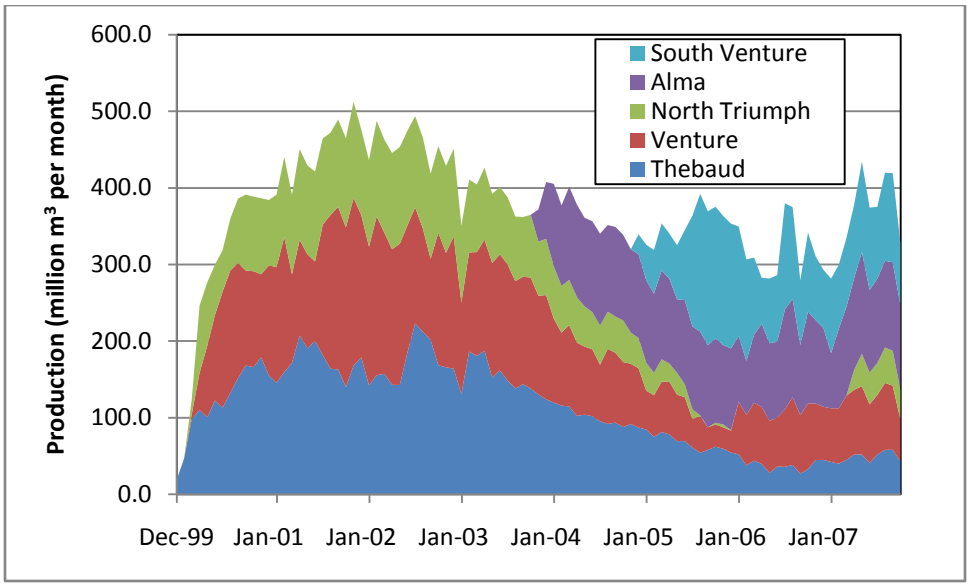

Figure 1: Sable production (monthly data from (CNSOPB, 2007))

The availability of the compression deck is expected to boost production and possibly increase the volume of natural gas extracted from the project; however, it also anticipates hastening the demise of the project. According to the National Energy Board, production will remain about 400 million m^3 per month throughout 2008, and then drop off significantly (NEB, 2006; NEB, 2007).

3.1.2 Offshore: Future

With the unexpectedly rapid decline of the Sable project and the continuing lack of offshore exploration success, the Nova Scotia government has put a great deal of faith in EnCana's Deep Panuke project. After years of delays, EnCana announced its decision to proceed with Deep Panuke in late 2007. Not surprisingly, this has been greeted enthusiastically by the government as it will mean the creation of a number of short-term jobs and royalties amounting to $400 million.

Little has been said by the government about the anticipated lifetime of Deep Panuke or the expected production volumes. According to the most recent NEB projections for Nova Scotia's offshore, Sable will have played out by 2011, while Deep Panuke is expected to begin production in 2010, reach its peak within a year, and cease production by 2020 (see Figure 2).

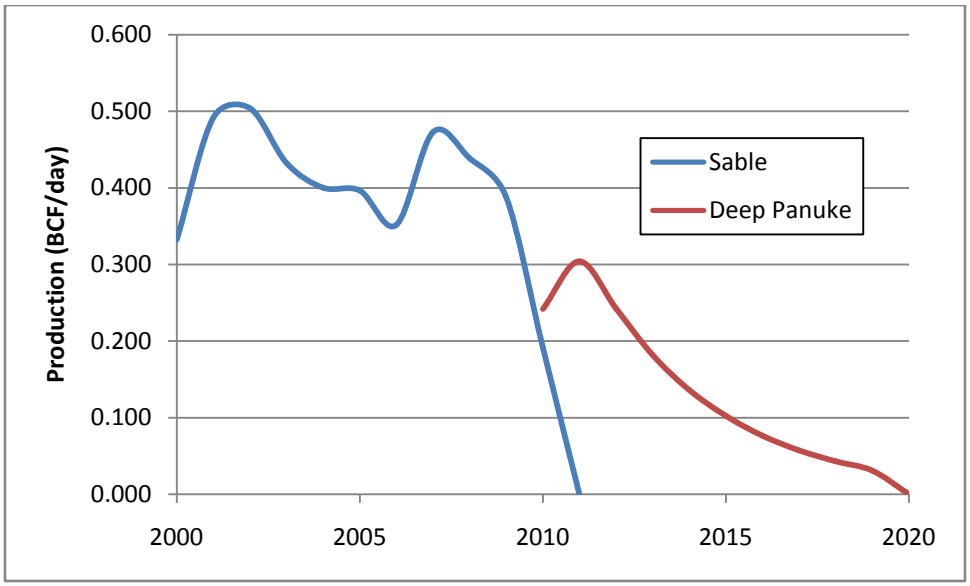

Figure 2: Nova Scotia's offshore (actual 2000-06 and projected 2007-2020) (NEB, 2007)

The projected declines in offshore natural gas supply, the lack of exploration, and the world-wide shortage of offshore rigs do not bode well for Nova Scotia's emerging energy industry. Despite this, the consultation paper puts a positive spin on offshore resources:

> *Recent exploration drilling has yet to yield new commercial finds. This is leading to a re-thinking of geological assumptions.*
>
> *Pending the results of new geological studies, the Nova Scotia Department of Energy estimates that there is over 40 trillion cubic feet of natural gas potential in the offshore. [Page 15]*

At its peak, few of even the most optimistic projections concerning Nova Scotia's offshore reserves came close to 40 TCF. While there is nothing wrong with promoting the offshore, it should be tempered with realism, giving Nova Scotians the opportunity to determine its true state. Rather than speaking on past-assumptions, the government should wait for the results of the new geological studies before promoting the *potential* of the offshore (for example, see (Dawe, 2004)).

3.1.3 Onshore: Coal bed methane

Several companies have had success in finding commercial quantities of onshore coal bed methane (CBM). The nature of CBM means that these projects are expected to produce small volumes of natural gas over many years—in the order of tens of millions of cubic feet per day as

opposed to the hundreds of millions obtained from the offshore. In keeping with most other natural gas discoveries in the province, the producers of the CBM are more interested in exporting the natural gas to New England than meeting the small Nova Scotia market (Massinon, 2007). Thus, while these projects may generate some economic return for the province, they cannot be relied on to meet the future energy needs of Nova Scotians.

3.1.4 Royalties

Offshore royalties have been an issue between the Nova Scotia and federal governments since the 1980s when the first Atlantic Accord was signed. Being a "have-not" province, any royalties collected by Nova Scotia resulted in the federal government reducing transfer payments. After years of unsuccessful attempts by former Premier Hamm at ending this process through his "Campaign for Fairness", followed by pressure from Premier Williams of Newfoundland and Labrador over Newfoundland and Labrador's loss of royalty income in 2004, the federal government of Prime Minister Martin was forced to sign a second Atlantic Accord which allowed 100 percent of the royalties to be kept by both provinces.

In 2007, Prime Minister Harper reversed this agreement, causing a constitutional showdown between Newfoundland and Labrador, Saskatchewan, and Nova Scotia. In late summer of 2007, Premier MacDonald of Nova Scotia broke ranks with the two other provinces and agreed to a formula which would, apparently, mean the province would be better off by $229 million sometime after 2016. There is considerable debate about this figure, as it appears to make a number of optimistic assumptions about future natural gas production and prices.

Provincial royalties from Sable are now beginning to rise dramatically because of the tiered royalty scheme structure. The consultation paper makes note of this:

> *The province receives significant fiscal benefits from the offshore. From 1999–2000 to 2006–07 royalties received amounted to $496 million. In 2007–08 alone, royalties are expected to be an additional $410 million, but will soon taper off as production begins to decline. Total project-life royalty revenues continue to be forecast in the range of $1.6 to $2.4 billion.*

However, what the consultation paper fails to report is that:

- Sable is in decline and after 2008, production and royalties can be expected to decrease

sharply (NEB, 2006). Whether the "total project-life royalty revenues" reach the $1.6 to $2.4 billion is open to debate, as total royalties to 2007-08 for Sable will amount to $906 million.

- The *total* royalty revenues of the much heralded Deep Panuke project between 2010 and 2020 are expected to be $400 million—an amount less than Sable's 2007-08 royalties of $410 million!

It is unclear whether the authors of the consultation paper are aware of the changes that have taken place between Nova Scotia and the federal government with respect to the Atlantic Accord:

> *Under the 2005 Accord Agreement on offshore revenues with Ottawa, all of these revenues are to the benefit of Nova Scotians. [Page 14]*

A substantial portion of the revenues from Nova Scotia's offshore will be diverted to Ottawa under the revised Atlantic Accord.

3.1.5 Liquefied Natural Gas (LNG)

The decline of natural gas production from the offshore, limited prospects for new offshore exploration, and the modest scale of onshore production, have resulted in the push for at least one liquefied natural gas (LNG) regasification facility in Nova Scotia (Guysborough, 2006). In addition to the aforementioned reasons, there is also the belief that an LNG facility would result in the construction of a petrochemical plant and numerous construction jobs (Bernard, 2007).

Although the government has expressed support for both an LNG and petrochemical plant, the consultation paper makes no reference to the possibility of liquefied natural gas (LNG) facilities in the province.

To date, neither of these projects is proceeding due to the absence of an LNG supplier—in fact, the LNG project at Bear Head failed specifically because Anadarko was unable to find a supplier. Worldwide, most supplies of LNG have been spoken for and, at present, there are limited prospects for finding new suppliers (Skrebowski, 2007). It therefore seems unlikely that a Nova Scotia-based LNG facility will play a role in the province's near- to medium-term energy future.

3.1.6 Benefits of natural gas to Nova Scotians

Despite the vision outlined in the original energy strategy, Nova Scotians have seen few benefits from offshore natural gas:

- As discussed above, royalties have fallen short of original expectations and will be short-lived.
- The demand for natural gas in the province has been slower than expected.
- Business and employment opportunities have not met expectations; the absence of any significant new discoveries has sent job-seekers and investors elsewhere.

For many Nova Scotians offshore natural gas has had only a limited impact on their daily lives. The offshore industry on its own will not be sufficient to place Nova Scotia on a path to prosperity or guarantee future energy supplies for its citizens.

3.2 Climate Change: Reducing CO_2 Emissions

Both the federal and Nova Scotia governments have abandoned any pretext of meeting the Kyoto target of a reduction in CO_2e[1] emissions of six percent below 1990 levels by 2012. Instead, Nova Scotia recently announced a new target of 10 percent below 1990 levels by 2020 as part of the 2007 Environmental Goals and Sustainable Prosperity Act (EGSPA) (Environment Act, 2007). (This target was originally agreed upon by the New England Governors and Eastern Canadian Premiers in 2001 at their meeting held in Westbrook, Connecticut.)

The consultation paper bases Nova Scotia's future greenhouse gas emissions on data from NRCan's 2006 energy outlook (NRCan, 2005). According to NRCan, emissions are expected to reach 27.8 Mt by 2020 under a business-as-usual (BAU) scenario—meaning that the province must reduce its emissions by slightly over 10 Mt between now and 2020 if the Environmental Goals and Sustainable Prosperity Act target is to be met (see Figure 3). This requires a 36 percent reduction from the BAU case.

[1] CO_2e or carbon dioxide equivalent. CO_2e refers to a basket of greenhouse gases with different global warming potentials, all equated to that of CO_2. For example, methane has a GWP of 21, which means a tonne of methane has a global warming potential equivalent to 21 tonnes of carbon dioxide.

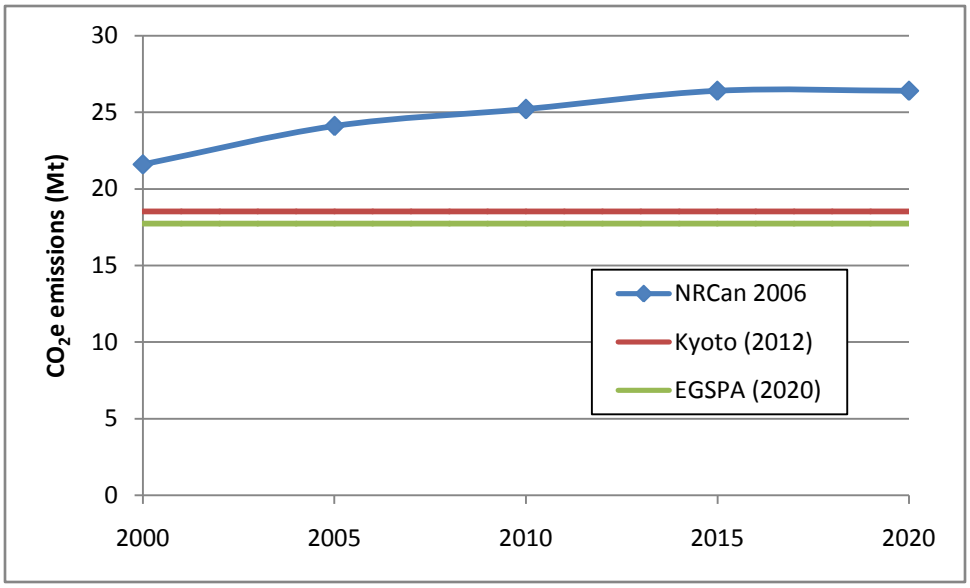

Figure 3: Nova Scotia's projected greenhouse gas emissions and reduction targets

Although climate change and the Kyoto protocol were discussed in the original energy strategy, the province committed itself to very little, other than attending a series of ministerial meetings.

Between 1990 (the starting year for the greenhouse emissions targets for both Kyoto and the Environmental Goals and Sustainable Prosperity Act) and 2005, Nova Scotia's emissions showed a fairly steady growth; however, in 2001 and 2002, Nova Scotia's CO_2e emissions actually declined. This can be attributed to NSPI's decision to burn natural gas rather than oil for the generation of electricity (see Figure 4); a clear demonstration that strategies which reduce the consumption carbon-intensive fuels such as of oil, petroleum coke, and coal can dramatically reduce CO_2e emissions.

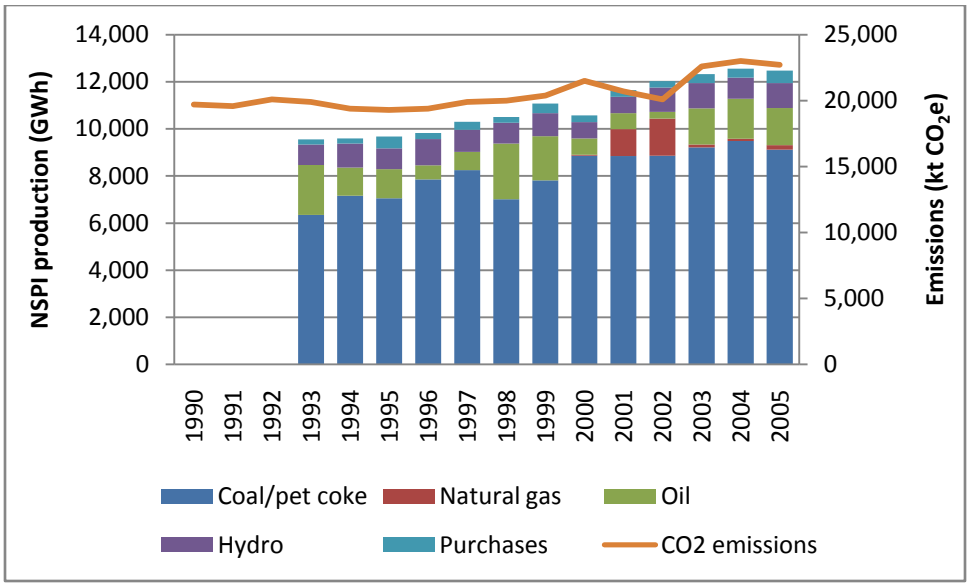

Figure 4: Greenhouse gas emissions and NSPI's fuel mix

3.2.1 Government policies

The Nova Scotia government has made commitments to reducing its own greenhouse gas emissions as well as those of the province.

Sustainable procurement policy for government fleet vehicles

In September 2007, the premier announced that the province would institute a policy of replacing its vehicular fleet at the end of its service life with low-emission vehicles from 2010 onwards. This announcement was greeted with enthusiasm by both the media and local environmental groups. The calculated impact indicates that while perhaps sending a positive message, the effect of this decision will be very limited on provincial CO_2 emissions:

Fuel economy		Average NS distance travelled		Gasoline usage per year		CO_2 emissions		Total vehicles in Gov't fleet		Annual fleet CO_2 emissions
10L/100km	×	20,000 km/y	=	2,000 L/y	×	2.5 kg CO2/L	×	500	=	2,500 t CO_2/y

By 2020, if the vehicles were to emit no emissions whatsoever, then the savings would be 2,500 tonnes. Of the 10 Mt reduction needed, this would be a contribution of 0.025 percent. Since few of the vehicles will achieve this level of emissions reduction, the contribution to the province's 2020 target will be even less.

If the province were serious about reducing greenhouse gas emissions, they would require that by 2020, all vehicles on Nova Scotia's roads met California emission standards. A complete fleet replacement of new, low-emission vehicles could, ideally, achieve a one megatonne reduction in greenhouse gas emissions (or ten percent of Nova Scotia's EGSPA target) with fuel savings on the order of half-a-billion litres. Better yet, the province would adopt a province-wide public transportation scheme, offering Nova Scotians an alternative to the private automobile.

Residential emissions

Earlier this year, Conserve Nova Scotia announced its "EnerGuide for New Houses" program, intended to encourage new-home builders to reach the EnerGuide 80 rating by 2011. Conserve Nova Scotia's central argument for constructing a home to the EnerGuide 80 rating is, "When you build to 80, you also prevent about 5.6 tonnes of greenhouse gas emissions from entering the atmosphere every year."

This argument is based on two assumptions. First, the new home is the same size as the original. Second, the source of heat remains unchanged: if electric, both the original and new homes are electrically heated; if oil, the original has an inefficient furnace, whereas the new has an efficient one. If these two assumptions are met, and the home achieves an EnerGuide 80 rating, the saving will be about 5.6 tonnes of carbon dioxide.

However, when many people build a new home, it is typically larger than the original. In these cases, the home may achieve the EnerGuide 80 rating, but its size means it will meet neither the energy nor the greenhouse gas reductions predicted. There is also a trend for people building EnerGuide 80 homes to opt for electric heating rather than oil; in these instances, greenhouse gas emissions can actually increase if the electricity supplier relies heavily on coal (which is the case in Nova Scotia).

The Conserve Nova Scotia website gives more details of the program, stating, "The average energy rating of a home in Nova Scotia is 67. Beginning in 2009, all new homes could be required to achieve an energy rating of 72. In 2010, the minimum rating would increase to 77. In 2011, the minimum would be 80."

At first glance, using a graduated approach to introducing EnerGuide 80 seems reasonable in

that it allows builders to learn the standard; however, these numbers are misleading.

Although the average EnerGuide rating for homes in Nova Scotia may well be 67, this number takes into account all homes, including poorly insulated ones built prior to the 1960s; looking at only newly built homes produces a considerably different number. According to NRCan's CANMET Energy Technology Centre, in 1997 the average newly constructed conventional home in Atlantic Canada achieved an EnerGuide rating of 72.3, while R2000 homes received an EnerGuide rating of 80.1. In other words, since 1997, most new homes probably met the 2009 target and those built to the R2000 standard already exceed the 2011 target.

Despite these shortcomings, Conserve Nova Scotia is offering a $350 cash incentive to cover the cost of the energy audit of any new home that achieves a rating of 77 or better, while homes with a lesser rating get half the amount. Homes built to the EnerGuide 80 rating, regardless of their energy consumption or greenhouse gas emissions, receive an additional $500, bringing the total to $850.

3.2.2 Emissions credits

If all else fails and Nova Scotia is unable to meet its emissions targets, the consultation paper proposes an "out": the purchase and trade of emissions credits:

> *Create new regulations for GHG emissions and market incentives (e.g., carbon credits) allow them to either buy "credits" if they can't comply or sell "credits" if they over comply. [Page 22]*

Emissions credits have been described as modern-day indulgences, a "get out of jail free" card for those not willing to change their practices to reduce their emissions. Before the province decides to opt for emissions credits as a means of meeting its 2020 target, it should consider:

- Whether the credits are verifiable by international standards. Unverifiable credits will do nothing to reduce anthropogenic emissions.
- The potential future costs of credits. As more jurisdictions decide to use emissions credits, their value will increase—it may become too costly for Nova Scotia to purchase credits.
- Alternatives to credits. Rather than creating wealth outside Nova Scotia, every effort should be made to utilize technologies that keep wealth within the province.

3.3 Electricity

The consultation paper discusses electricity at some length, with a focus on "green energy" sources such as wind and tidal. Most of the discussions around these energy sources are in terms of NSPI's total capacity rather than the volume of electricity generated—this is an important distinction because a large capacity need not translate into large volumes of energy generated.

The examination of tidal power is a case in point. As the consultation paper states "recent research estimates a potential 300 MWs from two sites in the Bay of Fundy (14 per cent of total capacity now in power grid)", implying that these sites could meet 14 percent of Nova Scotia's electricity requirements. Subsequently, the consultation paper expresses concern about tidal and its need for backup sources of energy, admitting that tidal is non-constant, "…intermittent sources of energy such as tidal…"

The consultation paper's use of words like "intermittent" and "unpredictable" when referring to wind and tidal power run counter to the provincial government's enthusiastic endorsement of these energy sources. What is even stranger is the fact that the consultation paper does not suggest using natural gas as a means of overcoming the intermittent and unpredictable nature of wind (tidal is intermittent but predictable), given that gas turbines are seen as an ideal backup energy source for intermittent energy sources. Instead, when decrying the intermittency of wind and tidal, the consultation paper implies that any backup energy would have to be imported, but even that would be dodgy, because Nova Scotia has "limited ability to import quick backup power".

What is most discouraging about the consultation paper's backhanded criticism of renewable energy is that a number of wind energy developers in Nova Scotia are now seeking ways of exporting wind-generated electricity to New England—clearly some markets want to purchase renewable energy.

If, as the 2007 Environmental Goals and Sustainable Prosperity Act claims, Nova Scotia is to be a "world-leader in leading-edge innovation in environmentally sustainable technologies", then it will be necessary for the province to show some leading-edge innovation when it comes to

integrating renewables into Nova Scotia's energy mix.

Quite simply, there is more to energy than electricity.

4 Energy security

Security, the freedom from risk or danger, is commonly used in reference to personal or national security. Our view of security has expanded in recent years to include *food security* when referring to a nation's ability to feed itself and *water security* when confronted with the issues of declining water quality. Over the past decade, increasing energy costs, coupled with rising demand and tight production, have resulted in a new type of security, often referred to as *energy security*.

The International Energy Agency defines energy security as "*the physical availability of supplies to satisfy demand at a given price*" (IEA, 2001). The World Bank has refined this definition to mean those activities that allow countries to produce and use energy sustainably at a reasonable cost in order to (World Bank, 2005):

- Facilitate economic growth and, through this, poverty reduction; and
- Directly improve the quality of people's lives by broadening access to modern energy services.

Strategies for achieving energy security vary by jurisdiction, and depend upon the state of development and the availability of secure—preferably domestic—energy supplies. According to the World Bank, the priorities of industrialized, net-energy importing countries are (World Bank, 2005):

- Avoid disruption of energy supplies;
- Diversification of energy supply sources;
- Security concerns for energy infrastructure;
- Technological solutions to reduce dependence on imported supplies.

Ultimately, the success or failure of an energy security policy depends upon energy supply and the associated energy infrastructure. Ideally, a jurisdiction has adequate energy supplies with an infrastructure that allows those supplies to be distributed to meet all demand for energy

services. History has shown that the failure of supply, or the loss or absence of infrastructure, can negatively impact the energy security of a jurisdiction. Broadly speaking, a jurisdiction's energy security improves as its reliance on insecure—often imported—energy decreases.

Maintaining energy security is central to the stability of any society: price rises and supply shortages can lead to a breakdown in energy security creating societal unrest (Gas week, 2007; Bai & Shen, 2007).

Politicians, policy makers, and energy analysts in many jurisdictions are expressing concern over energy security, as the worldwide demand for energy shows no sign of abating. Although all energy sources are of concern, world oil demand is particularly worrisome. The most recent International Energy Agency (IEA) five-year forecast projects that by 2012 demand will increase by another 11 million barrels to 95.8 million barrels a day (IEA, 2007). Although an increase of this magnitude is staggering in itself, what is even more astounding is that this rise will take place over six years, whereas previously it took ten years (between 1997 and 2006).

This past July, two reports were released that examined how this demand will be met. The first, the *Medium-Term Oil Market Report* from the IEA, forecasts a gradual slowing in oil supply from non-OPEC countries between now and 2012 (in percentage terms, world supply of oil from non-OPEC countries is projected to drop from about 56 percent to 53.6 percent during this period) (IEA, 2007). The IEA expects any shortfall to be met by increasing output from OPEC countries and a marked growth in the use of biofuels, notably ethanol and biodiesel. Despite the availability of these resources, a "supply crunch" is expected as early as 2009, continuing until at least 2012 (the final year of the forecast) as OPEC's spare capacity falls, potentially resulting in supply shortages.

The second report, *Facing the Hard Truths about Energy*, was published by the National Petroleum Council (NPC) in response to a request in 2005 from US Energy Secretary Samuel Bodman (NPC, 2007). It examines a wide range of energy supply options to 2030. One of the more troubling findings continues where the IEA left off, "Oil production growth after 2015 appears subject to increasing risks as both subsurface and above ground issues become more challenging. The risks include production declines of many of the world's maturing fields,

increasingly restricted access to resources, and unprecedented investment requirements under uncertain fiscal regimes."

4.1 Energy security in the consultation paper

The word "security" is used eight times in the consultation paper:

- Four references to electricity and energy security use the catch-phrase "energy security through diversity."
- A paragraph entitled "security" mentions that "Nova Scotians need for a reliable supply of energy", but offers no suggestions for how this could be achieved.
- One mentions "security in energy supply" in the context of air pollution and industrial air emissions, but fails to explain how addressing air pollution will help the province achieve energy security.
- Two references link energy security with climate change but offer no explanation for what this linkage means.

The consultation paper's focus on electricity implies that a more diverse supply of electricity will improve the energy security of the province. Ignoring the fact that—despite its importance—electricity is responsible for only 21 percent of Nova Scotia's final energy demand, it is debatable whether there are sufficient actions planned in the consultation paper to make any significant improvement on Nova Scotia's energy security. Figure 5 shows the projected electrical supply from NSPI's primary energy sources—although there is a decline in the use of oil, coal consumption actually increases, and the total reliance on fossil fuels remains between 75 and 80 percent.

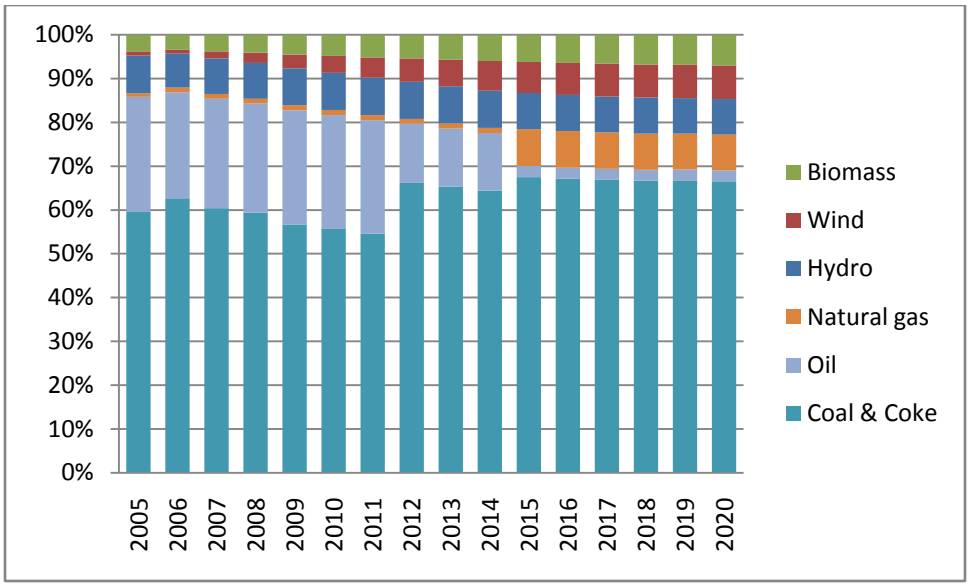

Figure 5: NSPI's projected electrical supply and primary energy sources (NEB, 2007)

Changing primary energy sources can improve the degree of energy security in the province if the supply shift occurs from an insecure import to a more secure, preferably local, source. For example, the growth in consumption of natural gas in Figure 5 would provide a greater degree of energy security if local natural gas reserves were utilized for supply, whereas imported LNG would do nothing to improve energy security.

The consultation paper recognizes that demand reduction is a way to improve energy security and reduce greenhouse gas emissions:

> *Cutting energy use has a double benefit: it cuts greenhouse gas and saves money. Reducing energy demand is the single most effective way we can lower our GHG footprint while also addressing higher energy prices and energy security. [Page 10]*

This is true if demand reductions target insecure sources of fossil fuels. For example, reductions within the transportation and residential-commercial sector—which could be achieved through investments in public transportation or improved building standards—will reduce demand for refined petroleum products (Hughes L. , 2007). In turn, this will lower primary energy demand. If reduction in primary energy demand targets insecure, high-carbon sources, the efforts will improve energy security and reduce greenhouse gas emissions. It is worth noting that demand reductions resulting from a fossil fuel replacement—such as replacing an oil-fired boiler with a more efficient electric one in a residential heating

application—can result in *decreased* energy security and *increased* greenhouse gas emissions due to the nature of electricity generation in Nova Scotia. Demand reduction efforts must consider the primary source of energy and target reduction of insecure, high-carbon imports.

A great deal of emphasis is placed on "energy security through diversity"; for example:

> *Objective: energy security through diversity [addressing technology and fuel-supply risks through a diversified portfolio of electricity supplies]. [Page 13]*

What exactly qualifies as a "diversified portfolio of electricity supplies" is not identified—the consultation paper talks of intermittent wind, yet-to-be-discovered supplies (or suppliers) of natural gas, and unknown sources of biomass. With Nova Scotia's limited energy resources, the province should be actively pursuing the broadest portfolio of secure electrical sources, including options such as the Lower Churchill hydroelectric project and nuclear from New Brunswick, as Ontario, Rhode Island, and Maine have been doing in recent months.

4.2 Energy security and climate change

With the correct policies, improving energy security can help reduce greenhouse gas emissions; similarly, reducing emissions can improve energy security. On the other hand, the wrong policies can be detrimental to energy security or greenhouse gas emissions, or both. For example, in the discussion on electricity prices, the consultation paper states:

> *With abundant supplies of coal at Donkin mine, there may be an opportunity to replace some portion of the imported coal with domestic supplies. [Page 12]*

This is an example of improving energy security (by turning to a secure, domestic fuel source) while doing nothing to reduce greenhouse gas emissions (other than achieving some emissions reduction by reducing coal transportation).

Figure 6 shows a security-emissions diagram, with each quadrant representing one of the four possible climate-security combinations. The goal of any government should be to move its citizens from relying on insecure, high-carbon sources of energy (quadrant III—least desirable) to secure, low-carbon sources of energy (quadrant I—most desirable).

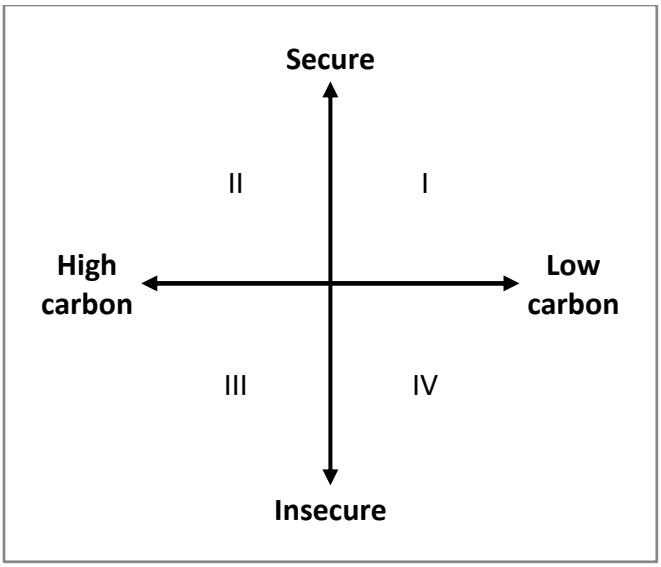

Figure 6: A security-emissions diagram

4.3 Nova Scotia's existing energy supplies

Although the consultation paper mentions that Nova Scotia imports almost 90 percent of its primary energy from suppliers outside the province, it makes no connection between this fact and energy security in the province. Table 1 lists Nova Scotia's sources of primary energy, the suppliers of the energy, and the total energy supplied.

Table 1: Nova Scotia's sources of primary energy (Hughes L. , 2007)

Fuel source	Supply[2]		Suppliers
Refined petroleum products	178.3 PJ	63.1%	UK North Sea, Venezuela, Middle East, NFLD, U.S.
Coal (imported)	69.1 PJ	24.5%	Colombia, Venezuela, U.S.
Renewables (non-utility applications)	16.6 PJ	5.9%	Nova Scotia
Coal (local)	10.3 PJ	3.7%	Nova Scotia
Natural gas liquids	3.1 PJ	1.1%	Imported, Nova Scotia
Primary electricity	2.7 PJ	1.0%	Nova Scotia
Natural gas	2.3 PJ	0.8%	Nova Scotia
Total	282.4 PJ	100.0%	

Of Nova Scotia's external suppliers of crude oil and refined petroleum products, the UK sector of the North Sea has peaked, Venezuela's production has peaked and is problematic due to

[2] A "PJ" is a petajoule, roughly the amount of energy found in 28 million litres of gasoline.

internal and external pressures on the government, the Middle East is unpredictable, most of Newfoundland and Labrador's production has peaked (although Hebron will be on-stream within a few years), and U.S. production is in decline (Hughes L. , 2007). Similarly, coal supply from civil-war torn Colombia has already proved difficult for NSPI, with one shipper refusing to return to Colombia for a second shipment of coal (Mensah-Bondsu, 2007).

Figure 7 shows a security-emissions diagram for Nova Scotia in 2006: each bubble represents a different type of energy, the horizontal position of each bubble represents its relative impact on the climate, the vertical position shows the level of security associated with the fuel, and the bubble's size is its contribution to the energy mix.

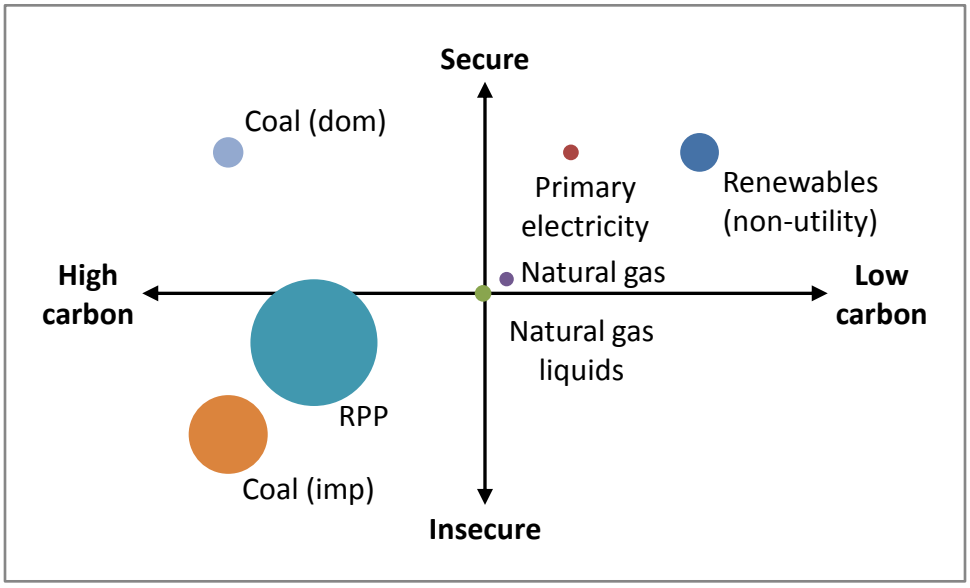

Figure 7: A security-emissions diagram for Nova Scotia

The province's reliance on insecure-high-carbon fuels should be a concern to all Nova Scotians.

4.4 Nova Scotia's energy infrastructure

Nova Scotia's energy infrastructure consists of a number of NSPI-owned electrical generating stations (thermal, gas turbine, and hydroelectric), a refinery in Dartmouth, several hundred kilometres of natural gas pipeline, a 300 MW electrical connection to New Brunswick, and some 20,000 kilometres of electrical transmission and distribution grid. From this, one can conclude:

- The network of natural gas pipelines is too small to meet the energy needs for all but a

limited number of Nova Scotians. Since almost 90 percent of Nova Scotia's natural gas is exported to New Brunswick and New England, the limited supply of natural gas available for the province from its offshore and onshore projects will restrict the expansion of the natural gas pipeline network.

- Most of NSPI's electrical generating stations rely on imported coal, petcoke, and refined petroleum products—a supply failure would restrict the generation of electricity.
- The refinery in Dartmouth relies on imported crude oil.
- The transmission and distribution grid is prone to failure under various weather conditions, from wet snow to remnants of tropical storms, to category one hurricanes.
- To be of any use, the grid requires a supply of electricity (see above).

4.5 Relying on Canada

In addition to the security risks described above, Nova Scotia has limited energy connections to the rest of Canada:

- A 300 MW electrical connection to New Brunswick.
- A natural gas pipeline from Guysborough to New England. Although it would be possible to have natural gas flow from the United States to Nova Scotia through this pipeline, the demand for natural gas in the United States for heating and electrical generation makes this an unlikely possibility.

A suggestion has been made to nationalize energy supplies (such as Sable or Newfoundland and Labrador's offshore) to stop the flow of this energy to the United States. Based on restrictions imposed by NAFTA, the chances of this happening are practically non-existent (NAFTA, 2002a; NAFTA, 2002b).

4.6 Government policies

Figure 8 shows a security-emissions diagram for some of the energy projects discussed in the consultation paper and recently announced government projects.

	High carbon	Low carbon
Secure	• Donkin coal	• Renewables (not requiring fossil energy backup)
Insecure	• Highway expansion • Continued reliance on imported oil and coal	• Imported LNG • Renewables (requiring fossil energy backup)

Figure 8: A security-emissions diagram for some Nova Scotian energy projects

From Figure 8 it is clear that little is being done to shift Nova Scotia from quadrant III (insecure, high-carbon) to quadrant I (secure, low-carbon). At a minimum, it is unlikely that Nova Scotia will achieve its 2020 emissions target, let alone improve its energy security.

4.6.1 Residential Energy Affordability Program[3]

The Residential Energy Affordability Program (REAP), run by Conserve Nova Scotia with provincial funding, provides energy efficient home weatherization retrofits to low income households in Nova Scotia, unable to afford the up-front costs of the EnerGuide for Houses program. The current outreach is quite small, with the hope of retrofitting 200 homes by the end of this fiscal year, spending an average of approximately $5,000 on each home. The program's grants are predominantly for insulation and air sealing, because it has been shown that these improvements result in the most energy savings. Since the project is in its first stage, data on the actual reduction in energy use has not been collected, but projected outcomes are for up to a 50 percent reduction in home heating energy consumption. If these projections are accurate, then the program has the potential to greatly reduce energy costs for those who are in the greatest need.

However, since the outreach is quite small, in order for the program to make a significant impact on overall energy consumption in Nova Scotia there needs to be a large increase in funding for the program and a supply of qualified workers in the province who are able to complete these tasks on such a large scale. Also, one of the criteria of the program states that the resident must obtain quotes from three different sources. In some cases, it is difficult to get one quote, let alone three, especially for rural residents who live in isolated regions. Yet, even with an increased outreach, the program does only insulation and air sealing retrofits, and

[3] This section was written by Ms. Sarah Chisholm, a fourth year BA student in the Energy Research Group.

does not address the issue of energy security or require the use of renewable energy. In many cases, these homes are still being heated by oil or electricity (generated in large part from coal), both of which are imported, constantly increasing in cost, and contributing to greenhouse gas emissions. If energy prices get high enough then even with these retrofits, many low-income Nova Scotians will be unable to afford to heat their homes.

4.7 Price rises and supply shortages

As discussed above, price fluctuations and changes in energy supply are expected events, given the realities of current global energy market. Ideally, potential price rises and supply shortages would be known several years in advance, giving both the government and the people of Nova Scotia time to prepare. In reality, unexpected price rises or supply shortages could catch everyone off-guard:

- Although rapid price rises can be dealt with in the short term through subsidies, they do nothing to address the problem. In fact, they will ultimately exacerbate the situation as there will be limited funds available to address the problem.
- Supply shortages cannot be subsidized, as there is no energy available to be purchased. In these cases, the only answer is energy rationing.

A proper energy strategy must provide an effective means to deal with price rises and supply shortages. The next section suggests a methodology to address these issues, along with examples of potential solutions.

5 Improving Nova Scotia's energy security

A first look at Nova Scotia's security-emissions diagram, with the province's overwhelming reliance on insecure high-carbon energy sources, generates a concern that is compounded by a consideration of Nova Scotia's limited supplies of domestic energy:

- Most hydroelectric sites have been tapped. The possibility of electricity from tidal sources is limited to about 300 MW (Hagerman, 2005).
- There is about a 70 year supply of coal at present rates of consumption (Hughes L. , 2007).
- Production from the two offshore natural gas projects is used primarily for export and both

projects are expected to be played out by 2020.

This view of Nova Scotia's energy requirements considers only the primary energy sources—it implies that future energy requirements and how these are met will be much the same as they are today. This is the approach taken in the consultation paper, which, for example, proposes adding intermittent supplies of electricity from wind to the grid, requiring accommodation by the utility, rather than questioning whether this the most appropriate use of wind?

Instead of taking the approach favoured by the consultation paper, this report recommends that Nova Scotia adopt a methodology that can be used to analyze and improve the province's energy security by *reviewing* (an analysis of existing sources of energy, infrastructure, and types of demand), *reducing* energy demand, and when possible, *replacing* insecure energy sources with secure, preferably domestic ones. This methodology—referred to as the three 'R's of energy security—offers an understanding of a jurisdiction's energy supplies, requirements, and alternatives, thereby permitting the development of appropriate energy security policies. A brief overview of the three 'R's is found in Appendix II.

5.1 Review

Review, the first 'R', requires an analysis of the province's energy supply and demand. As discussed in section 4, about 90 percent of Nova Scotia's energy is imported from insecure and potentially insecure sources. Of the remaining ten percent, these can be considered secure as they come from domestic sources.

Figure 9 shows Nova Scotia's energy demand by-sector—with transportation being the largest consumer of energy and agriculture the least. In addition to the sectoral ranking, it is clear that the refined petroleum products (RPP) are used in every sector and that they are the dominant source of energy in the province. After RPP comes electricity and renewables (biomass, for industrial purposes and residential for space heating); natural gas and natural gas liquids (NGL) have made limited penetrations into the province.

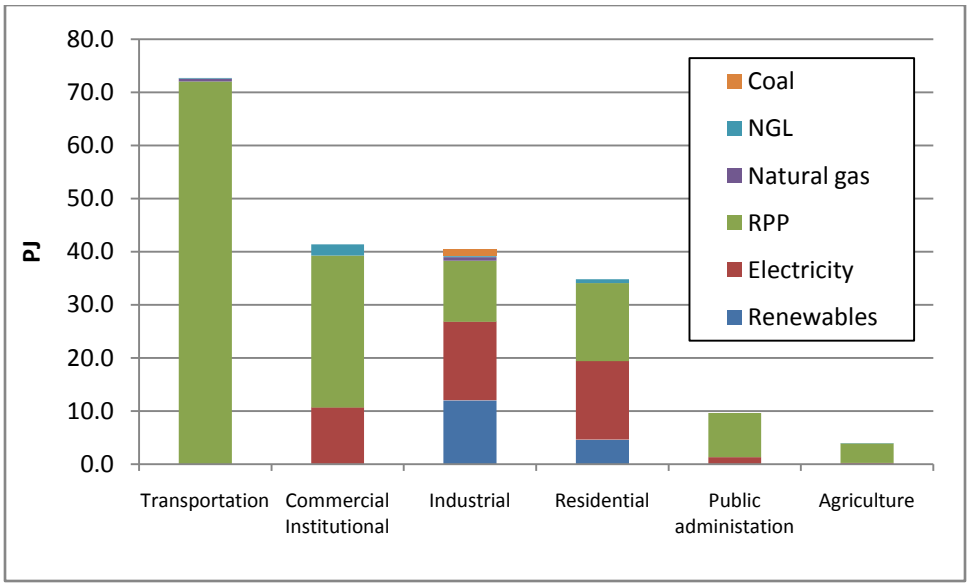

Figure 9: Nova Scotia's sectoral energy demand in 2004 (Hughes L. , 2007)

It is tempting to stop the review process at this point and focus on finding replacements for existing sectoral energy demand. This can be misleading and counterproductive because looking at energy alone does not indicate *how* the energy is used.

By determining Nova Scotia's end-use energy requirements, one finds a different picture: transportation is still the dominant energy consumer; however, space and water heating for the residential and commercial sectors is the second largest (see Figure 10).

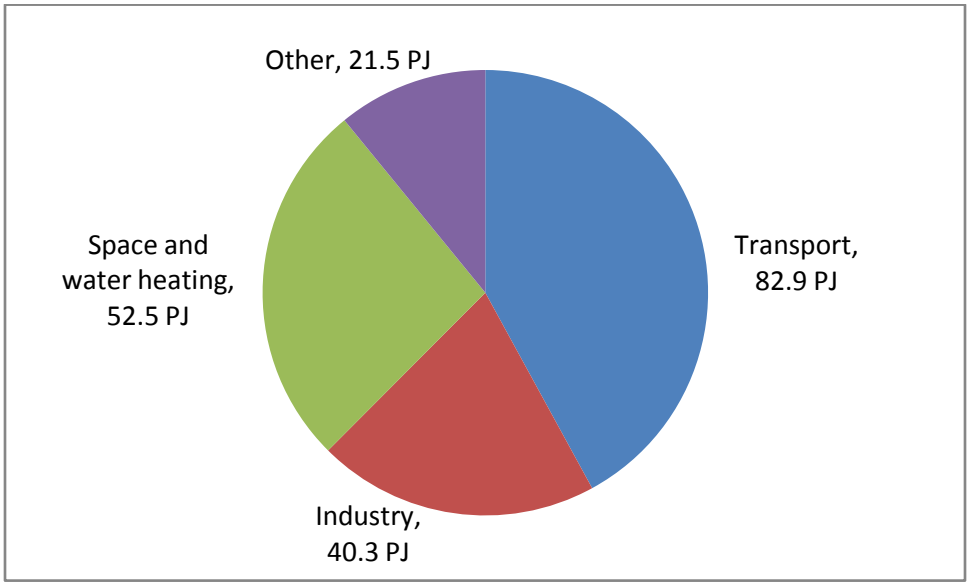

Figure 10: Nova Scotia's energy end-use (Hughes L. , 2007)

Despite the importance of space and water heating to the health and wellbeing of Nova

Scotians, neither the original energy strategy nor the consultation paper makes reference to it! For details on how this can be achieved, please see *Energy Security in Nova Scotia* (Hughes L. , 2007).

5.2 Reduce

The second 'R', reduce, are those policies that result in actual, verifiable reductions in energy consumption.

5.2.1 Space and water heating

Section 4.7 discussed two of the outcomes that could be expected as world demand for energy increases: prices will invariably rise and shortages may occur. If either of these events occurred in the depths of the heating season and home heating oil (light fuel oil) became difficult to obtain, many Nova Scotians would probably try to stay warm by turning on their ovens or purchasing baseboard heaters. The increase in electricity demand would undoubtedly put strains on NSPI, jeopardizing the province's electricity system.

Reducing thermal energy demand in the residential and commercial sectors is vital to energy security, climate change, and the health of Nova Scotians. Operating buildings at a lower temperature is one approach, but is limited since once temperatures get too low, people find it uncomfortable to live and work; in extreme cases it can lead to hypothermia and death. Furthermore, for those on low-income, rising energy costs eat away at an already limited budget, meaning that less is available for energy. Building envelops must be improved to the point where each building's energy requirements are as low as technically feasible.

Buildings fall into two camps: those that are yet to be built (i.e., new buildings) and those that have already been built (i.e., existing buildings). Every new building that is not constructed to the highest possible standards will become a problem as energy prices continue to rise or supply shortages occur. Similarly, existing buildings are problems until their energy requirements have been lowered to the point where it is no longer feasible to reduce any further.

In order to minimize the number of problem buildings, legislation and regulations will be

required to ensure that new buildings are constructed to the highest possible standard of the day and existing buildings are upgraded to their highest possible standard. Fortunately, the technology exists to construct and upgrade buildings, as well as to measure their probable energy requirements.

5.2.2 Transportation

Reducing transportation energy demand is easier than reducing thermal energy requirements for the simple reason that unlike space and water heating, there are quick, short-term alternatives to driving from one point to another: the trip can be cancelled, postponed, chained (with other trips), shared (with other passengers), or replaced (by a letter or a telephone call).

Over the longer term, as prices increase, vehicle owners will realize that lowering driving speeds, maintaining the vehicle according to the manufacturer's specifications, and purchasing more efficient vehicles will reduce their transportation energy requirements. Ultimately, energy prices will reach a point where a significant number of Nova Scotians will be unable to afford the cost of private transportation—at this point they will rightly turn to the government for help in achieving their accessibility needs.

The problem with this scenario playing out is the fact that it won't only be Nova Scotians calling on their government to "do something"—people in every jurisdiction in North America facing a transportation crisis will be doing the same thing. If "something" entails purchasing buses, rail passenger cars, or track, the accessibility needs of many people will not be met because of the lead-times required to build passenger transportation equipment.

Those governments that had the foresight to plan for such an event will be able to meet many of the transportation needs of their citizens. Nova Scotia's recently announced plan to expand its network of twinned highways throughout the province fails entirely to take energy security and climate change into account.

5.2.3 Electricity

Electricity is a politically sensitive issue in most jurisdictions. Public reaction to the UARB's decision to allow NSPI to proceed with a fuel adjustment mechanism (FAM) is one such

example. The push by various groups for NSPI to adopt Demand Side Management (DSM) will be another, since it will result in a rate increase to cover the cost of the DSM program.

Reducing energy consumption can improve energy security and reduce greenhouse gas emissions. It can also reduce the amount a consumer has to pay the utility; however, the existing flat-rate billing system is inherently unfair since low-volume consumers cross-subsidize high-volume consumers. Furthermore, with flat-rate billing there is no incentive for consumers to change their consumption habits.

There are at least two alternatives to flat-rate billing, both of which have been addressed by the Energy Research Group: the inverted block and time-of-use metering. Of the two, time-of-use metering (with time-of-use billing) offers the ability to change consumption habits through the introduction of pricing signals. When NSPI is using more expensive fuels, the consumer can be charged at a higher rate, and vice versa. By requiring NSPI to install time-of-use meters and adopt time-of-use billing, consumer electricity costs will more closely reflect the true cost of the fuel used to generate the electricity.

5.3 Replace

The third 'R', replace, calls for the development of policies that require the jurisdiction to replace existing, insecure sources of energy with those that are secure. Based on Nova Scotia's overwhelming reliance on insecure, high-carbon energy sources, and its 2020 CO_2 emissions target, it is clear that any replacement energy source should be secure and low-carbon.

This section considers four different replacement energy sources and discusses how they are applicable to Nova Scotia.

5.3.1 Bioenergy

Biodiesel

The consultation paper discusses the potential for bioenergy in the province:

> *Nova Scotia has about 215,000 hectares of cleared farmland of which 40,000 hectares are under-utilized. One near-term possibility would be to cultivate canola plants on that land with potential production in the order of 48 million litres a year of biodiesel. To help expand these business ventures, as of July 2006, the province*

> *has exempted biodiesel produced in Nova Scotia from the 15.4 cent per litre Motive Fuel Tax. [Page 7]*

In 2005, Nova Scotia's total demand for diesel fuel was 813 Ml (megalitres or million litres), as shown in Table 2. If the under-utilized farmland could be cultivated with canola for biodiesel and the 48 Ml were made available to diesel consumers in the province, about 5.9 percent of total diesel demand would be met. The motive fuel tax exemption would cost the province about $7.4 million.

Table 2: Nova Scotia's diesel fuel demand in 2005 (ESTAT, 2007a)

Demand	Ml
Total industrial	107.9
Total mining and oil and gas extraction	59.2
Total manufacturing	23.1
Forestry and logging and support activities for forestry	6.9
Construction	18.6
Total transportation	444.9
Railways	38.3
Road transport and urban transit	119.8
Retail pump sales	157.0
Agriculture	61.9
Public administration	41.3
Commercial and other institutional	157.0
Energy use, final demand	813.0

No mention is made of the energy required to process the canola into biodiesel, nor are the sources of this energy, and its effect on the climate.

Replacing 5.9 percent of the province's diesel fuel requirements with a secure, domestic source of biodiesel will make a (very) small contribution to improving the energy security of the province. Given the importance of targeting end-use applications, a biodiesel policy could be more beneficial to the province if the fuel was made available to services that benefit the public, such as emergency services (fire and ambulance), public transportation (bus and rail), and agriculture.

Bio-ethanol[4]

The consultation paper mentions the potential for cellulosic ethanol, but then shifts to a discussion of canola biodiesel. Expecting Nova Scotia to develop an ethanol industry based on cellulosic ethanol, a non-commercial experimental technology, is not a reasonable strategy.

Consider, for example, using cellulosic ethanol to replace Nova Scotia's gasoline demand (see Table 3).

Table 3: Nova Scotia's gasoline fuel demand in 2005 (ESTAT, 2007b)

Demand	Ml
Total Transportation	1,162.8
Road transport and urban transit	13.0
Retail pump sales	1,149.8
Agriculture	8.6
Public administration	11.5
Commercial and other institutional	45.5
Energy use, final demand	1,228.4

Cultivating cellulose-rich crops on 40,000 hectares of underutilized land could result in 70 million litres of ethanol,[5] meeting 5.7 percent of the provincial demand for gasoline in 2005.

The forestry sector is an alternate source of cellulose fibre for ethanol production; however, far greater energy can be obtained from directly combusting woody fibres for heating or heat and electricity cogeneration (Main, Joseph, Zhang, & MacLean, 2007).

Cellulose ethanol production costs are not known and Nova Scotia is located in relative proximity to already established low-cost ethanol producers. Pursuing a large-scale ethanol industry in the province is likely to result in a costly, energy-inefficient, and environmentally questionable investment, with minimal benefits to energy supply and climate. Reducing highway speed-limits would result in a similar fuel-replacement savings and would avoid converting large areas of the province into energy plantations.

[4] The following section was written by Mr. Alain Joseph, a PhD student in the Energy Research Group.
[5] Assuming a crop production of 5 oven-dry t/ha and a 35 percent ethanol conversion process.

Wood and Fibre-based Bioenergy[6]

Rather than focusing exclusively on experimental cellulosic ethanol and an emerging biodiesel industry, the energy strategy document should examine the existing bioenergy infrastructure across the province. Wood fibre is an important source of energy being used in residential, institutional, and large-commercial sectors—supplying a considerable portion of Nova Scotia's residential space-heating demand and is also employed in numerous commercial boilers as well as a large-scale electricity cogeneration facility.

The province has already dedicated considerable effort to the forest sector, developing forestry expertise within the Department of Natural Resources, negotiating forestry-leases with large industrial users, and intervening in electricity-rates cases to support forest-based paper production. Despite a demonstrated willingness by government to act in the forestry sector, the consultation paper has largely ignored the potential to develop forest resources as part of an overall energy strategy.

Wood-fibre bioenergy plays an important role in the energy strategy of countries such as Sweden, Finland, and Austria, where it provides roughly 20 percent of total energy needs. Nova Scotia is currently exporting wood fibre to supply renewable bioenergy demands in the United States and Europe. If the local energy demand could be developed then some of this bioenergy could be used to meet local energy needs, replace imported fossil energy with a secure, low-carbon energy source. Policies towards greater use of wood bioenergy in Nova Scotia could benefit forestry and agricultural sectors, while providing enhanced local energy security and reduced carbon-dioxide emissions.

Before such a policy formulation takes place, an in-depth evaluation of the resource and its impact on environment will be needed to determine the level of the local demand that market and ecosystem can handle sustainably. Nonetheless, the consultation paper needs to discuss the effectiveness of current wood-energy policies in order to develop strategic and sustainable targets for future activity in this sector.

[6] The following section was written by Mr. Alain Joseph and Ms. Mandeep Dhaliwal, an MASc student in the Energy Research Group.

5.3.2 Solar[7]

Solar energy is dismissed in the consultation paper under "Options for a Renewed Energy Strategy":

> *(thermal and photo-voltaic) will become increasingly viable options for homes and buildings as prices become more affordable. [Page 7]*

There are many ways to use solar energy to reduce dependency on fossil fuels. The simplest and most effective use is the conversion of sunlight into heat, which can be applied to any thermal demand. This characteristic makes solar energy a viable option for improving energy security and reducing greenhouse gas emissions within the province—where a review of end-use demand indicates space and water heating is responsible for 27 percent of the provincial requirements (from Figure 10).

Solar energy can be applied to heating demands through either a passive or active system approach. Passive systems—such as south facing sunspaces, solar walls, or windows—allow solar radiation to be captured within a structure, reducing its space heat demand. Active systems—such as solar domestic hot water (DHW) systems—provide thermal energy through the use of prefabricated collectors and the circulation of a working-fluid. Both passive and active applications hold the potential to improve energy security and lower greenhouse gas emissions in Nova Scotia by reducing the energy demands on fossil fuel supplied heating systems.

Increasing solar penetration

Increasing solar penetration in the province can be achieved by following the example recently announced in Germany (Burgermeister, 2007). A new law—the Renewable Heating Law—set to be passed by parliament next year, will require all new homes built in Germany as of 1 January 2009 to utilize renewable heating systems for 14 percent of their total energy consumption. The law will also require existing houses to be retrofitted—commencing in 2010—to incorporate a renewable heating system to support their demand.

The law is intended to reduce greenhouse gas emissions as well as to protect residents of

[7] This section was written by Mr. Tylor Wood, an MASc student in the Energy Research Group.

Germany from rising energy prices. To support this law, the government is providing 350 million euros annually, as grants to homeowners installing such systems. Renewable heating systems can include a variety of technologies—such as solar panels, solar walls, pellet stoves, or heat pumps; however, greatest uptake is expected for solar heating applications. In conjunction with the Renewable Heating Law, the German federal government is launching a program to reduce energy waste through efforts aimed at improving insulation in the existing housing stock. The initiatives are estimated to cost 31 billion euros a year, however will save 36 billion euros a year through lower energy bills.

A similar mandate in Nova Scotia would provide a substantial boost to the province's renewable energy sector, as well as improve energy security and reduce greenhouse gas emissions.

There is a growing body of anecdotal evidence which indicates that it is difficult to purchase solar thermal systems in the province. It is believed that this difficulty is the result of a lack of qualified installation technicians. To overcome this issue, the province needs to foster the development of local renewable energy technicians by funding community college programs which train local residents on installation and maintenance of renewable heating systems (there is a precedent for this—the provincial government supported the development of petroleum technology courses).

Heat is critical to healthy communities in Nova Scotia. Dismissing the potential for solar energy in general, due to costs associated with photo-voltaic collectors is a mistake and requires further consideration.

5.3.3 Wind[8]

According to the consultation paper, Nova Scotia possesses world-class average wind speeds; however, wind generation as a major source of electricity is not attractive due to its intermittent nature. Despite this fact, the province is conducting a wind integration study and the number of wind turbines is expected to increase six-fold. For these reasons alone, it is worth investigating the potential of any end-use applications that could compensate wind's shortcomings.

[8] This section was written by Ms. Nikita Sheth, an MASc student in the Energy Research Group.

Combining wind with Electric Thermal Storage (ETS) is one such option (Hughes, Dhaliwal, Sheth, & Long, 2006). An ETS unit is an electric heater that is capable of storing electricity in the form of heat for extended periods, giving it demand flexibility as well as the potential to overcome supply variability. Since the source of electricity is immaterial, an ETS unit can store electricity when the wind is blowing and use the heat during periods of little or no wind. Backup energy would only be required when there is a lack of wind and the ETS has exhausted its stored heat. Utilizing electricity from the grid as backup, during off-peak hours, eliminates the likelihood of energy shortages associated with a wind-heating application.

Further study is required to understand the potential for wind-heating in the province and how it can be integrated with the electrical grid. Wind-heating is an excellent example of a secure, low-carbon energy source that can meet some of the province's heating requirements.

5.3.4 Nuclear

Support for nuclear energy, the generation of electricity from steam created by the heat released in the fission of uranium compounds, is growing in some circles because of rising electricity demand and climate concerns. Proponents of nuclear energy point to Canada's uranium reserves and its reactor technology as a means of helping the country achieve energy security and reduce greenhouse gas emissions, whereas opponents question the size of the reserves, radionuclides escaping from mill tailings, reactor safety, waste disposal, and nuclear proliferation.

Part of the Nova Scotia Power Privatization Act states that NSPI is forbidden to build a nuclear power facility in the province. One of the principal reasons for this prohibition was to protect Nova Scotia's coal industry in the early 1990s.

Nova Scotia's indigenous supply of uranium appears to be limited (O'Reilly 2005); however, Canada has significant uranium deposits in northern Saskatchewan. By fueling nuclear reactors in Nova Scotia with Canadian uranium, the province could replace imported coal and oil used for electrical generation with nuclear energy.

An argument used by the provincial Department of Energy against nuclear energy is that the reactor size is so large (third generation reactors are typically over 1,000 MW), it would take

two reactors to replace all of Nova Scotia's electricity requirements. This is a very narrow view of the province's *energy* needs, which, as was shown in section 5.1, include transportation and heating—both of which could be supplied by electricity.

6 Recommendations

The following section presents a series of 20 recommendations intended to shift Nova Scotia from quadrant III (insecure, high-carbon) of the security-emissions diagram to quadrant I (secure, low-carbon). The recommendations are broken into three categories: review, reduce, and replace. Unless otherwise indicated, the final date for each recommendation is 1 January 2020, the target date of *2007 Environmental Goals and Sustainable Prosperity Act*.

The recommendations for reduction and replacement are intended for transportation and buildings (that is, space and water heating). Since there are many other end-uses that need to be considered, recommendation **R2** is intended to determine these.

Many of the recommendations are presented as wedges (Hughes L. , 2007), starting from nothing at the beginning of the recommendation (1 January 2009), increasing in size annually, until some maximum target is reached at the end of the recommendation period (1 January 2020).

6.1 Review

The review is intended to establish a baseline for Nova Scotia's energy supplies and end-uses. Data availability would determine the baseline year—ideally it would be the previous year.

R1. By 1 January 2009, complete a review of Nova Scotia's energy supplies and end-uses to determine the province's energy baseline.

Comments: The baseline will be used in subsequent years to show how Nova Scotia is improving its energy security and reducing its greenhouse gas emissions.

R2. By 1 July 2008, develop reduction and replacement strategies for Nova Scotia's other energy end-uses, in addition to transportation and buildings.

Comments: The present recommendations apply to the two largest energy end-uses (i.e.,

transportation and heating) in the province; this recommendation is intended to include other energy end-uses in future recommendations.

R3. By 1 January 2010, and every year thereafter, complete an annual review of Nova Scotia's energy supplies and end-uses for the previous year (or the year for which data is available).

Comments: The results of the review are to be compared with the baseline and adjustments can be made to the various reduction and replacement programs.

6.2 Reduction

Reduction is divided into buildings (for space and water heating) and transportation only, other end-uses have not been considered in these recommendations.

6.2.1 Buildings (residential and commercial)

Building reduction wedges are improvements in energy intensity—the energy consumed for space and water heating per unit of building area. The intention here is to decrease the energy intensity of both new and existing buildings over the duration of the recommendations (1 January 2009 to 1 January 2020): new buildings by 50 percent and existing buildings by 30 percent.

New buildings

R4. Starting 1 January 2009, all new buildings must have an energy-intensity that is 70 percent of a comparable-sized, conventional building.

Comments: As discussed in the report, improving energy intensity does not necessarily lead to energy reduction, as someone could meet the energy intensity target but consume more energy because of increased building size. However, recommendations **R9**, **R10**, and **R11** all impose consumption taxes to discourage the overconsumption of energy and, ideally, the construction of unnecessarily large structures.

How the energy-intensity is improved is not prescribed—it is up to the architects, engineers, and builders to decide. Note that this has nothing to do with things such as solar gain or heating plant technology, it deals entirely with the building envelop.

R5. Starting 1 January 2010 and every year thereafter until 1 January 2020, all new buildings must show a two percent decline in energy intensity over the previous year.

Comments: The two percent per year reduction in energy intensity would mean that by 2020, new buildings constructed during the 2019 building season would require an energy-intensity improvement of 50 percent over comparable-sized buildings (see Figure 11).

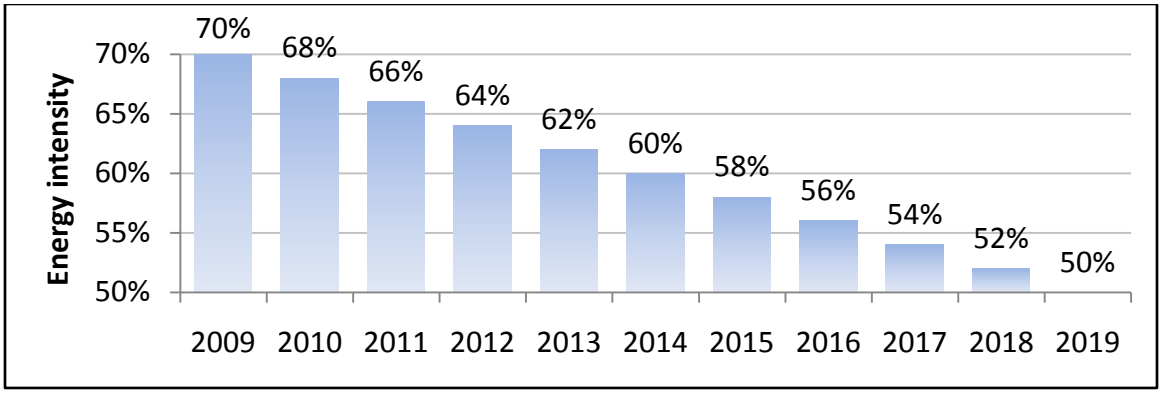

Figure 11: New-building energy intensity

Note that the energy-intensity of a building erected in a particular year would only be required to meet the energy intensity for that year, not subsequent years.

Existing buildings

R6. Starting 1 January 2009, all existing buildings (i.e., those constructed before 1 January 2009) must have an energy-intensity of 90 percent of comparable buildings.

Comments: Building owners would only have to demonstrate the compliance of their building when it changed owners or underwent a physical change requiring a permit.

R7. Starting 1 January 2010 and every year thereafter until 1 January 2020, all existing buildings must improve their energy intensity by two percent over the previous year.

Comments: By 1 January 2020, all existing buildings would be expected to have the energy intensity of buildings erected in 2009, that is, equivalent to the 2009 new building energy intensity. Figure 12 shows the expected energy intensity improvements in existing buildings.

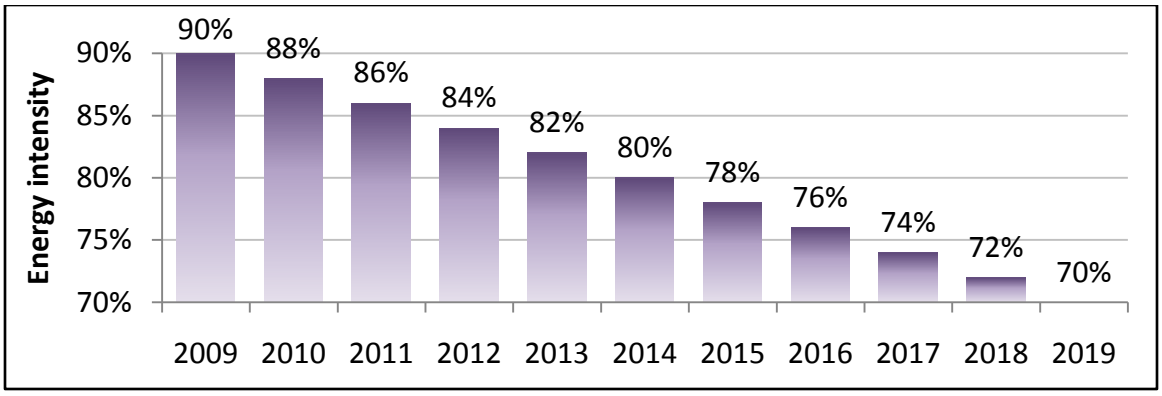

Figure 12: Existing-building energy intensity

As in **R6**, energy-intensity compliance need only be demonstrated when the building changes owners or undergoes a physical change requiring a building permit.

Common issues

The following recommendations are common to both new and existing buildings.

R8. By 1 January 2009 and every year thereafter, the Nova Scotia government must have sufficient certified building-inspectors who are equipped with the necessary technology to estimate the energy intensity of new and existing buildings.

Comments: The number of inspectors and the required equipment for testing new and existing buildings will depend upon the number of new buildings constructed and existing buildings sold or upgraded. In the residential sector, about 10,000 residential units are sold annually in Nova Scotia.

R9. By 1 January 2010, all electricity consumers in Nova Scotia must be connected to time-of-use meters that can record hourly consumption for up to three months.

Comments: Time-of-use meters will allow energy suppliers to determine when, and how much, energy has been consumed, thereby permitting more accurate billing based upon consumption and the generation source for that consumption. These meters will also allow for variable billing and taxing.

R10. Starting 1 July 2008, the Nova Scotia government should introduce an energy consumption tax that is applied to all energy used for space and water heating. Insecure, high-carbon energy sources, including electricity generated from these sources, should be

taxed at a higher rate than secure, low-carbon sources.[9] Revenues from the tax are meant to offset the cost of energy reduction programs for low-income families, such as REAP and other building energy reduction programs that may be introduced to offset the cost of upgrading buildings. Consumers can lower their tax burden by replacing insecure, high-carbon sources with secure, low-carbon sources, as required by recommendations **R15** through **R18**.

Comments: To ensure revenues are properly allocated, an independent authority would have to be created to administer the funds.

R11. Starting 1 July 2009, and every year thereafter, the energy consumption tax would increase by one-half percent.

Comments: This is in part to gain revenue to support energy reduction programs as well as to discourage the construction of large structures that offset gains made by increasing energy-intensity.

6.2.2 Transportation

The transportation energy reduction recommendation wedges are intended to lay the groundwork for a comprehensive public transportation system to serve all Nova Scotians. The approach is to apply an increasing tax on automotive fuel to discourage consumption—how an individual is to respond is not prescribed in these recommendations, although the choices include driving less, car pooling, purchasing a more efficient vehicle, opting for the proposed public transportation system (modal shift), or refusing to change (thereby funding public transportation).

Tax revenues should not be used to offset the cost of hybrid or other vehicles as the purpose of the tax is to develop a public transportation system for all Nova Scotians, not the few who will be able to make up the difference between the purchase price and any offset.

R12. By 1 January 2009, complete a comprehensive ten-year public transportation plan for the province. Implementation of the plan would begin 1 January 2009.

[9] The availability of time-of-use metering would permit a match between the fuels used to generate the electricity and the consumption, thereby allowing a more accurate taxing of energy consumption.

Comments: Much of the capital costs of the program would be covered by recommendations **R13** and **R14**.

R13. Starting 1 July 2008, the Nova Scotia government should introduce a one-cent per litre automotive fuel tax.

Comments: The tax will be used to fund the development of a new provincial public transportation network. As with the building energy-consumption tax, the funds would require administration by an independent authority.

R14. Starting 1 January 2009, and every year thereafter until 1 January 2020, the automotive fuel tax would be increased by one-cent per litre per year.

Comments: See discussion for **R13**, above.

6.3 Replacement

Replacement deals with replacing one fuel, preferably insecure, high-carbon, with another, preferably secure, low-carbon. As with reduction, the recommendations target heating for buildings and transportation.

6.3.1 Buildings (residential and commercial)

Technologies are not prescribed in the recommendation wedges, although they include, but are not restricted to, heat-recovery systems, active and passive solar heating, solar hot water, pellet stoves, and wind-heating systems.

New buildings

R15. Starting 1 January 2009, all new buildings constructed in Nova Scotia must obtain at least 15 percent of the energy they consume in space and water heating from renewable sources.

Comments: The energy source is not defined nor how the energy is used (space heating or water heating or both).

R16. Starting 1 January 2010, and every year thereafter until 1 January 2020, all new buildings constructed in Nova Scotia must increase the energy used for space and water heating from renewable sources by two percent over the previous year.

Comments: By 1 January 2020, all new buildings would be obtaining 40 percent of their space and water heating from renewable sources (see Figure 13).

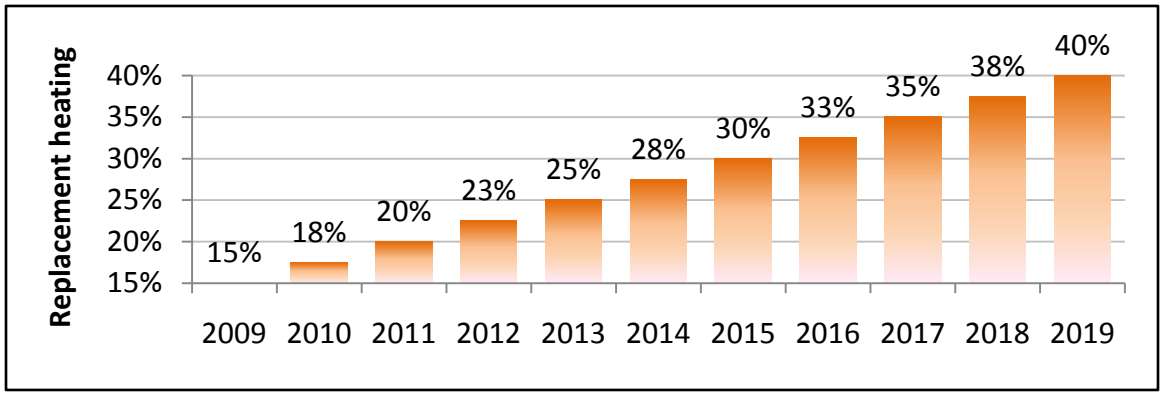

Figure 13: Replacement heating for new buildings

Existing buildings

R17. Starting 1 January 2012, all existing buildings in Nova Scotia must obtain at least five percent of the energy they consume for space and water heating from renewable sources.

Comments: This gives owners of existing buildings three years to upgrade their space and water heating systems to obtain the energy from renewable sources.

R18. Starting 1 January 2013, and every year thereafter until 1 January 2020, all existing buildings constructed in Nova Scotia must increase the energy used for space and water heating by 1.5 percent over the previous year.

Comments: By 1 January 2020, all existing buildings would be obtaining 15.5 percent of their space and water heating from renewable sources. Note that for existing buildings, most of this could come from a solar water heating system. The annual increments for replacement heating in existing buildings are shown in Figure 14.

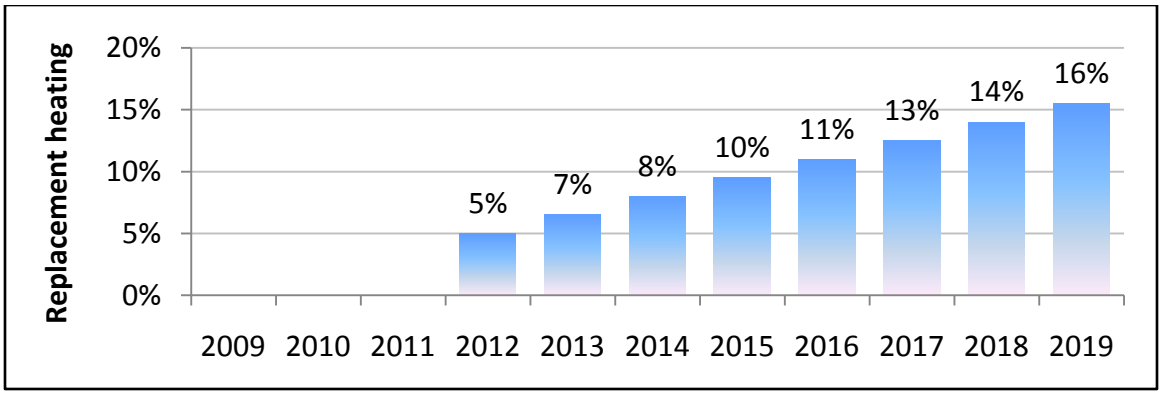

Figure 14: Replacement heating for existing buildings

Common issues

There are two issues of concern here: sufficient inspectors and sufficient skilled craftsmen who can install the necessary heating systems. Inspectors are discussed in recommendation **R8**.

R19. By 1 September 2009, the Nova Scotia Community College system must have programs in place to train students in the installation and maintenance of renewable energy space and water heating systems. The Nova Scotia government would be expected to fund these programs.

Comments: These programs could range from simple upgrading of plumbing skills to multi-year apprenticeship programs.

6.3.2 Transportation

There are no easy, widely available replacements for insecure, high-carbon transportation fuels. The consultation paper suggested biodiesel, but this was shown to be of limited use—possibly best targeted at public service vehicles with the modifications necessary to operate in low-temperature environments. It has been shown, both in this report and elsewhere (for example, see (Hughes L. , 2007)), that Nova Scotia is unable to produce sufficient bioenergy products for transportation replacement fuels.

Another option is to promote the use of electric vehicles, replacing refined petroleum products with electricity. Once again, the problem of energy sources becomes paramount—without a secure, preferably low-carbon energy source for the generation of electricity, electric vehicles are not an option. If the province were to make a commitment to rail for transporting both

goods and people, then rail electrification would be a sensible option, offering greater accessibility to more Nova Scotians that a select few driving electric vehicles.

R20. By 1 January 2009, a comprehensive public transportation framework must be created, identifying modes, energy sources, costs, and benefits.

7 Summary

This report has reviewed the Nova Scotia Department of Energy's consultation paper, *Nova Scotia's Renewed Energy Strategy and Climate Change Action Plan*. This review has demonstrated that the consultation paper:

- Does not address energy security adequately.
- Places too much emphasis on energy exports, natural gas, and electricity.
- Lacks a strategy to meet Nova Scotia's greenhouse gas reduction targets and renewable energy targets.

The treatment of these issues gives the casual reader of the consultation paper a false sense of Nova Scotia's true energy picture. The plain fact of the matter is, Nova Scotia relies overwhelmingly on insecure, high-carbon energy sources—meaning that it is a significant emitter of greenhouse gases that contribute to climate change, while being vulnerable to energy price increases and supply shortages.

The report has also shown that addressing these two issues will require significant changes to how Nova Scotians live, work, and move. Of the two, energy security is the more pressing, due to the growing pressures on world energy supplies, and should be given a higher priority by the province. Fortunately, as discussed in this report, if done correctly, improving Nova Scotia's energy security will reduce the province's greenhouse gas emissions.

The recommendations presented in this report are undoubtedly a challenge and would demonstrate Nova Scotia's international leadership by having one of the cleanest and most sustainable environments in the world by the year 2020—which is exactly what the government claims to want with its *2007 Environmental Goals and Sustainable Prosperity Act*.

7.1 The government's role

There are many difficult decisions that must be made with respect to Nova Scotia's energy future, some of which will require Nova Scotians to make significant changes to how they heat their homes and places of work, and how they move from place to place. These changes will require strong leadership from Nova Scotia's government. To date, this leadership has been lacking, with the province avoiding the difficult decisions, preferring the politically expedient.

As shown in the report, some decisions cannot be delayed or postponed, as there are no quick or simple fixes. Decisions relating to infrastructure and supply can take years—and multiple political cycles—to complete. Other decisions will undoubtedly be politically unpopular and seem unnecessary until considered over the long term.

The lack of political will is reflected in the consultation paper—which is why the province needs a new energy strategy.

7.2 Towards a new energy strategy

The focus of Nova Scotia's "renewed" energy strategy remains much the same as it did in the original energy strategy of 2001—natural gas and electricity, with a few token gestures towards climate change. The consultation paper reads as if nothing happened between 2001 and 2007. But clearly things have changed—countries like China and India are now major energy players, the declining number of oil exporting countries, coupled with the growing resource nationalism in the few remaining exporting one like Venezuela, Russia, and Iran, makes access to energy supplies more problematic, and the lack of significant oil finds over the past decade means that production is struggling to keep up with demand.

As shown in this paper, Nova Scotia, like most countries in the world, relies heavily on insecure, high-carbon sources of energy. As demand for these energy sources continues to increase, prices will rise and shortages can be expected to occur. Nova Scotia's present energy strategy and its consultation report fail to address these issues.

Nova Scotia needs a new energy strategy—one that focuses on more than the dreams of instant riches from offshore natural gas. The new energy strategy must recognize the twin

threats facing Nova Scotia: the woeful state of energy security in the province and the lack of any meaningful plans to either mitigate or adapt to climate change. The 2001 energy strategy is outdated and must be replaced—starting with a new vision for Nova Scotia's energy future.

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In select hearings on the offshore held at the Nova Scotia legislature in early autumn, when asked about the future of the offshore, a natural-gas economist from Dalhousie University quoted Jiminy Cricket, a Disney character from the 1950s, saying that sometimes "your dreams come true."

A more appropriate quote comes from Proverbs, "Where there is no vision, the people perish."

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Appendix I: Responses to the 2001 Energy Strategy

The following appendix contains the summary sections of two submissions to the 2001 Energy Strategy, responding to the government's 2001 *Powering Nova Scotia's Economy* consultation document.

Submission 1

The following is from *An Examination of the Data Quality in "Powering Nova Scotia's Economy"* by Larry Hughes, dated 26 April 2001 (Hughes L. , 2001a):

Summary

- *The energy strategy document is heavily biased towards oil and gas with little interest being shown in renewable energy technology.*
- *The data supplied in the document is insufficient for anyone to determine the different fuel types used in each sector of the economy.*
- *Provincial energy data has been misrepresented in favour of oil and gas.*
- *The potential impact of the rising cost of energy on Nova Scotians has been overlooked.*
- *The amount of off-shore natural gas, although significant in terms of frontier regions, is small when compared to Canada's overall natural gas reserves.*
- *The potential for employment in the oil and gas sector is optimistic and based upon old ideas.*

In conclusion, it is the author's belief that the entire provincial energy strategy is flawed. What the province needs is an energy policy *to address issues such as transportation, climate change, renewable energy, sustainable energy, conservation, the role of independent power producers, and energy efficient practices. Instead, what is being presented as an energy "strategy" is a plan for promoting the province's limited oil and gas resources.*

Submission 2

The following is from *Greenhouse Gas Emissions and the Nova Scotia Energy Strategy* by Larry Hughes, dated 31 May 2001 (Hughes L. , 2001b):

Summary and Recommendations

From reading "Powering Nova Scotia's Economy", it is clear that the Nova Scotia government is more interested in oil and natural gas than they are in the problem of greenhouse gas emissions and climate change. Despite this lack of interest, there is an underlying problem that will not go away—the price of fossil-fuel based energy is rising and will continue to rise in step with increasing world demand [15]:

- *The cost of home heating fuel is rising and affecting many Nova Scotians on fixed income.*
- *The cost of gasoline is rising and affecting Nova Scotian motorists and the cost of shipping goods to and from Nova Scotia.*

The most obvious way of solving this problem is to decarbonize Nova Scotia's economy. If Nova Scotians were to reduce their consumption of fossil-fuels using the measures outlined in this report, not only would they be 'saving money' (by using energy more efficiently), they would also be 'saving the environment'.

Despite what has been said about off-shore oil and natural gas, it will not last forever. To build an 'energy strategy' on these fuels is folly. What is needed is a sustainable energy policy that will ensure the energy future for all Nova Scotians, such a policy would:

- *foster the growth of a renewable energy industry in Nova Scotia by adopting a Renewable Portfolio Standard.*
- *require all existing thermal stations (coal and oil) to convert to combined heat and power.*
- *offer low-cost loans to communities that wish to take advantage of combined heat and power.*
- *institute a provincial transportation scheme, consisting of community buses (operating in rural communities), regional buses (connecting rural communities to regional centres), and intercity buses and trains (connecting regional centres).*
- *remove all tractor-trailers from provincial highways and put the goods they presently carry on the railway; local distribution can be handled by local trucking firms.*
- *reimplement the energy efficiency projects and programmes formerly operated by the provincial government.*

- *introduce zoning laws that would require all new buildings to maximize their reliance on solar energy.*
- *require the Auditor General to present an annual report on the province's progress towards a sustainable energy future.*

By developing a policy such as the one described above, Nova Scotians will become leaders in the field of sustainable energy, gaining knowledge and expertise that could be shared with the world. And, by the way, will reduce their greenhouse gas emissions.

Appendix II: The three 'R's of energy security[10]

Review

In order to develop a meaningful, long-term energy security policy, it is necessary for the jurisdiction to consider all aspects of its energy system; this involves reviewing the following:

- Existing sources, suppliers, and supplies of energy. Ideally, all energy requirements should be met from local sources; however, in most jurisdictions, one finds that some energy supply comes from non-domestic sources. In either case, it is necessary to determine the lifetime of these sources and whether there are existing or potential supply problems caused by geopolitical issues or physical supply constraints.
- Existing demand. A review of the jurisdiction's existing energy demand, classified by the type of energy (e.g., fuel oil, coal, natural gas, electricity) and how it is used rather than the total energy used in each sector. Such a review means that usage patterns can be identified, thereby allowing changes to energy consumption within or between sectors. For example, knowing that a residential sector consumes 100 petajoules per year is not as useful as knowing that 30 PJ of natural gas are used for residential space heating.
- Potential domestic energy sources. Meeting demand from domestic energy sources can reduce the reliance on imported energy; however, before this can be done, it is necessary to know what domestic energy sources are available.
- Existing energy infrastructure. By reviewing the energy infrastructure presently in place, the strengths and weaknesses of the system can be identified. Knowing the supply and demand situation, this information allows for the judicious application of funds to infrastructure.

With this review in place, it is then possible to develop an energy security policy tailored to meet the jurisdiction's energy requirements.

Reduce

One way of improving energy security is to reduce energy consumption for a given activity.

[10] This Appendix is based upon work done by Larry Hughes and Niki Sheth.

Broadly speaking, this can be accomplished through:

- Energy conservation. Energy conservation implies reducing consumption, leading to a reduction in the activity associated with the consumption. Examples of conservation include turning down a thermostat to reduce the energy needed to heat a space, driving an automobile at a slower speed, and turning off lights when a room is empty.
- Energy efficiency. Energy efficiency means a reduction in consumption without a corresponding reduction in the activity associated with the consumption. Examples of energy efficiency include insulating a building to reduce heat loss thereby allowing the consumer to maintain the building's temperature while using less energy, abandoning one mode of transport for another, less energy intensive one, and replacing incandescent bulbs with lower wattage compact fluorescents bulbs or light emitting diodes.

Of the two, energy efficiency is more heavily promoted, as it requires little or no change in "lifestyle". Despite this, there is a growing body of evidence that suggests that due to the rebound effect, energy efficiency does not necessarily lead to the levels of energy reduction claimed by its proponents (Gottron, 2001; Sorrell, 2007). To improve energy security, policies must ensure that actual energy reduction takes place.

Rising energy prices may induce energy reduction, as individuals and organizations looks for ways to reduce their energy costs. Reduction can be allowed to occur through market forces resulting in "demand destruction", or it can be addressed through policies that encourage reduction before rising energy prices make serious impacts on society.

Depending upon the jurisdiction, reduction may also include the upgrading of existing infrastructure. The types of infrastructure in question range from the electrical transmission and distribution system to the transportation network—upgrading public transportation to allow modal shifts.

Replace

Although reduction is an essential component in any energy security policy, its impact is limited by the fact that society requires a minimum level of energy to function. Therefore, in addition to reduction, improving energy security also requires the replacement of imported energy

supplies with domestic sources. Replacement requires an analysis of the demand to ensure its appropriateness. This implies that there need not be a like-for-like match, in fact, in many cases, it could not be; consider, for example, finding a replacement for furnace oil, without local sources, other domestic energy sources, such as solar thermal or biomass combustion, might be required. Domestic energy sources are considered to include non-traditional supplies such as wind and solar.

To be effective, replacement policies must take into account the energy requirements of all sectors of the economy and then match them with the most appropriate energy source(s).

Although it is possible to have an energy security policy based on reduction or replacement alone, policies based on both may be more effective:

- Reduction without replacement may reduce demand, but if much of the demand is still being met from imported energy sources, improvements in energy security may be limited.
- Replacement without reduction may offset the use of imported energy; however, the lack of reduction may mean that the domestic supplies are being used ineffectively. This may result in the jurisdiction attempting to make up the difference with imported energy, limiting any improvements in energy security.