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Nova Scotia's energy strategy: Energy security for Nova Scotians

Response to
The Nova Scotia Department of Environment's Discussion Paper
An Approach to Regulating
Electricity Sector Greenhouse Gas and Air Pollutant Emissions in Nova Scotia

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Executive summary

In 2007, with its Environmental Goals and Sustainable Prosperity Act (or EGSPA), the Nova Scotia government set an ambitious target of reducing its greenhouse gas emissions by 10 percent below 1990 levels by 2020. Since Nova Scotia's 2001 energy strategy failed to address greenhouse gas emissions adequately, in 2007 the province embarked on a round of public consultations to "renew" the energy strategy. After more than a year, two documents were released in January 2009, one from the Department of Energy describing the "renewed" energy strategy, and the other from the Department of Environment outlining the climate change "action plan". In February, the province released its plans for regulating greenhouse gas emissions in the electricity sector; again, calling for public responses.

This report is a response to the province's call for public input to its plans for regulating greenhouse gas emissions. It examines the province's proposed greenhouse gas reduction plan and concludes that:

- The proposed plan to reduce NSP's greenhouse gas emissions is extremely optimistic and assumes that the necessary energy supplies will be available when needed between 2010 and 2020. All three replacement energy sources being promoted by the province face significant challenges: wind (economic), natural gas (supply), and the Lower Churchill (construction and interconnection).
- Little, if any, thought has been given to improving energy security in Nova Scotia—other than helping NSP attempt to diversify its energy sources. By failing to recognize the need to improve Nova Scotia's energy security, the province is putting the future health and economic well-being of all Nova Scotians at risk.
- Changing the province's emissions data to suit the requirements of the Environmental Goals and Sustainable Prosperity Act calls into question the entire energy strategy.

The report also highlights the state of energy security in Nova Scotia. Many of Nova Scotia's energy imports are from politically unstable regions or from regions where production is in decline. Since all energy importing countries are "in the same boat", the report argues that it is vital that Nova Scotia act now to protect itself against inevitable energy shortages and unstable energy prices.

The purpose of the 2009 Energy Strategy was to help Nova Scotia meet the targets for 2020 set out in the Environmental Goals and Sustainable Prosperity Act. By failing to recognize the importance of improving Nova Scotia's energy security, the province is ensuring that Nova Scotia will neither be sustainable nor prosperous.

Nova Scotia's energy strategy: Energy security for Nova Scotians

Larry Hughes

1 Introduction

In 2007, with its Environmental Goals and Sustainable Prosperity Act (EGSPA) (EGSPA, 2007) the Nova Scotia government set an ambitious target of reducing its greenhouse gas emissions by 10 percent below 1990 levels by 2020. Since Nova Scotia's 2001 energy strategy failed to address greenhouse gas emissions adequately, in 2007, the province embarked on a round of public consultations to "renew" the energy strategy. (NS Energy, 2007). After more than a year, two documents were released in January 2009, one from the Department of Energy describing the "renewed" energy strategy (NS Energy, 2009), and the other from the Department of Environment outlining the climate change "action plan" (NS Environment, 2009b). A month later, the province released its plans for regulating greenhouse gas emissions in the electricity sector (NS Environment, 2009a); again, calling for public responses.

Nova Scotia's 2020 emissions reduction target is about five megatonnes (Mt).[1] This is an ambitious target and, given the limited success of Kyoto reduction targets in Annex I countries, will require significant changes to the way Nova Scotians live and consume energy.

This report is a response to the province's call for public input to its plans for regulating greenhouse gas emissions and examines:

- The proposed approach to regulating greenhouse gas emissions in the electricity sector.
- The need for the province to understand and develop policies that address energy security.
- The contradictory data used by the province in its reports.

2 Regulating greenhouse gas emissions

Nova Scotia's five Mt greenhouse gas reduction target is to be achieved by reducing emissions in a number of sectors in the provincial economy. The "electricity sector" (i.e., Nova Scotia Power) will be responsible for a 2.5 Mt reduction in emissions between 2010 and 2020 (NS

[1] The two reports are inconsistent, with values varying from 5 Mt in the Department of Energy's report (NS Energy, 2009) to 5.2 Mt in the Department of Environment's report (NS Environment, 2009b).

Environment, 2009b). The province has set annual compliance targets that NSP is required to meet—exceptions are allowed, but the overall target is a 2.5 Mt reduction by 2020. A penalty of $500,000 per day could be applied if NSP fails to achieve the target (NS Environment, 2009a).

Each year (between 2010 and 2020), NSP will have an emissions cap; for example, the cap for 2010 is 9.7 Mt, while the cap for 2020 is 7.5 Mt (see Figure 1).

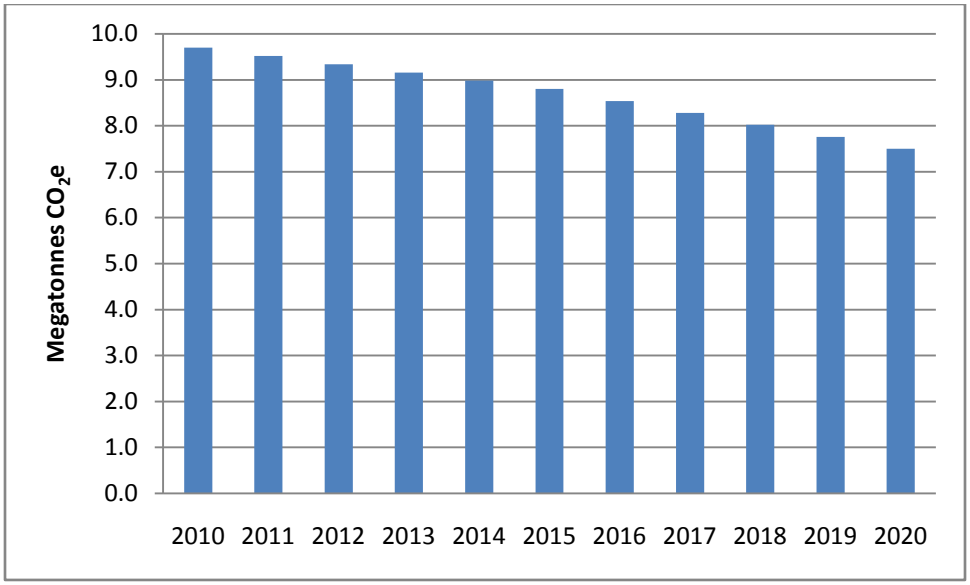

Figure 1: NSP's annual emissions cap (data from (NS Environment, 2009a))

Although not clear from the figure, the emissions cap decreases by specific amounts each year; Figure 2 shows the annual reduction in the emissions cap.

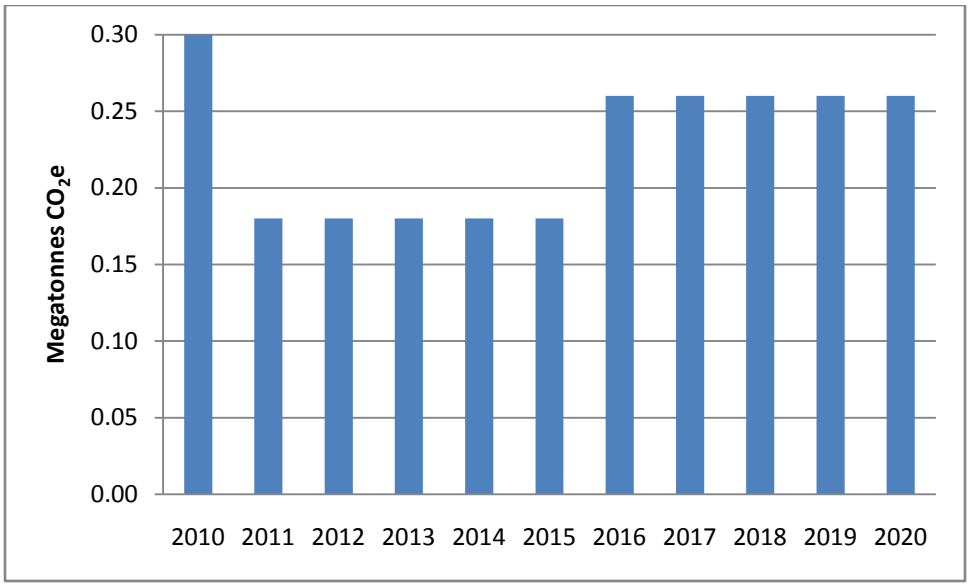

Figure 2: NSP's emission reduction schedule (data from (NS Environment, 2009a))

The cumulative emissions reduction from Figure 2 between 2010 and 2020 is 2.5 Mt. It is necessary to assume that NSP had emissions of 10.0 Mt in 2009 in order that the cap of 9.7 Mt produces a 0.3 Mt reduction. Whether NSP will have emissions of 10.0 Mt in 2009 is anyone's guess. How long it will take to obtain the annual emission totals and how accurate they will be is another issue altogether. For example, the province's discussion document released in February 2009 states, "NSPI's GHG emissions were **about** 10.15 million tonnes of CO_2e in **2007**." The provincial government will need timely, accurate, and verifiable data on NSP's emissions if the caps are to have any meaning.[2]

The projected decrease in greenhouse gas emissions does not necessarily translate into a decline in consumption of electricity, which means that meeting these caps will depend upon(Hughes, 2008a):

- Whether NSP's consumers **reduce** their consumption of electricity from carbon-intensive sources.
- Whether NSP can **replace** existing carbon-intensive fuels (notably coal, petcoke, and oil) with lower-carbon fuels (notably natural gas and renewables).
- Whether NSP's generation to meet new demand can be **restricted** to lower-carbon fuels.

[2] The problem of verifiable emissions data will be revisited in section 4.

2.1 Reduced consumption of carbon-intensive sources

The consumption of electricity may fall in the province for a number of reasons. First, the rising cost of electricity will force many consumers to use less through conservation (i.e., cessation of consumption) or reduced energy intensity (i.e., using less electricity to perform the same task). It is also reasonable to expect that companies will fail because of the economic downturn, leading to a decline in electricity consumption. It is possible that consumption may well increase (or decrease less than expected) because of the demand for more electric services, as well as the rebound effect (Sorrell, 2007).

A tax on electricity consumption is already in effect in the province, generating revenues intended to pay for electricity-related demand side management (DSM) projects in the residential sector. The major component of this program is to reduce the energy intensity of low-income households. The province's DSM program is intended to reduce electricity consumption by some 3,097 GWh by 2020—an amount equivalent to about one-quarter of Nova Scotia's present demand (Hatch, 2008).

Another way of reducing electricity the consumption from high-carbon sources is to charge consumers more for electricity from high-carbon sources and less for electricity from low-carbon sources. This requires recording both the consumer's consumption at regular intervals, typically every hour with smart meters,[3] and matching the hourly consumption with the electricity supplier's hourly production. With "smart appliances" and forward-thinking electricity suppliers, appliances (such as storage heaters, washing machines, and water heaters) can be programmed to operate when there is a supply of low-carbon electricity available (Hughes, 2008b).

At present, the province is aware of interval metering technology; however, rather than embracing it as part of their greenhouse gas reduction strategy, they are instead choosing to study the possibility of their implementation (NS Energy, 2009).

Regardless of what the province opts to do in the way of energy reduction programs, the fact remains, energy, especially electricity, and economic growth are linked. With new houses built

[3] Smart meters are also referred to interval meters and time-of-use meters.

to use electric heating and a growing market for electric vehicles, it is folly to assume that there will not be growth in electricity consumption.

In short, the province's expectation of obtaining about 1.7 Mt of reduction (of the province's total 5 Mt) from energy reduction (NS Energy, 2009) is extremely optimistic.

2.2 Replacement and restriction of carbon-intensive sources

For as important as it is, the simple fact remains, energy reduction from both conservation and energy intensity can be easily reversed by consumers increasing their consumption (Steg, 2008). As a result, the energy supplier must find ways of generating electricity from low-carbon or non-carbon sources. There are two possible approaches: first, replacing existing carbon-intensive fuels with lower-carbon fuels and second, restricting new generation to lower-carbon fuels.

For the most part, the low-carbon energy sources available for electrical generation in Nova Scotia, and being discussed in the strategy, are limited to wind, natural gas, and electricity imports; there is little untapped hydroelectricity left in the province.

2.2.1 Wind

The generation of electricity from wind is often promoted as a means of reducing greenhouse gas emissions because it is considered to be carbon-free. Despite this benefit, incorporating wind into an energy supplier's mix can be a challenge because the availability of wind is difficult to forecast, making it hard to dispatch. This makes the traditional demand-driven approach to electricity supply difficult to implement. To address this, many energy suppliers adopt practices that, for example, limit the amount of wind that can be connected to the grid or incorporate quick-response reserve (i.e., hydroelectricity or gas-turbines).

Denmark, which obtains over 15 percent of its electricity from wind, is often used as "proof" that large-scale penetration of wind into NSP's energy mix is possible. Denmark achieves this high penetration because it is interconnected with Norway, Sweden, and northern Germany, where it has access to electricity from hydroelectric, nuclear, and thermal sources. In this larger network, Denmark's percentage of wind falls to less than one percent, making its variability easier to handle.

Nova Scotia's Renewable Energy Standard (RES) requires that by 2010, five percent of Nova Scotia's electricity supply come from "new" renewable energy sources (i.e., those constructed after 31 December 2001 or having undergone a major retrofit), rising to 10 percent by 2013. The standard also applies to the electricity purchased from non-NSP sources by the province's municipal electricity suppliers.

In 2008, the province released its wind integration report, which examined the impact of implementing the RES with wind into NSP's generation mix (Hatch, 2008). Table 1 lists some of the findings from the report.

Table 1: Summary of wind integration study findings (Hatch, 2008)

Target year	Wind capacity	Impact
2008	61 MW	System stability not an issue
2010	311 MW	System stability not an issue 0.55 Mt CO_2e reduction/year
2013	581 MW	System stability may be an issue Some system upgrades required 1.3 Mt CO_2e reduction/year
2020	781 MW 981 MW	System stability is an issue Grid upgrade required Regional interconnection required Technological innovations required 1.88 Mt CO_2e reduction/year (781 MW) 2.65 Mt CO_2e reduction/year (981 MW)

For as impressive as the emission reduction numbers are, they are based on a long list of assumptions, including the market price of CO_2, the modeled behaviour of the wind, the demand for electricity, the availability of backup energy supplies, the upgrading of Nova Scotia's grid, and NSP's willingness to participate in a regional grid.

The wind integration report expects that by 2013, with wind capacity at about one-quarter of NSP's current capacity, system stability may become an issue, in large part because of intermittency and the problems associated with slow-response thermal generation facilities. One solution to this will be to upgrade the grid (the "Green-grid Initiative" (NS Energy, 2009)) and increasing the size of the interconnection with New Brunswick and New England. Opening

the grid this way will offer more than system stability, it will also allow the large-scale export of so-called green electrons to the New England states which are required by law to increase their consumption of electricity generated from low- or non-carbon sources. Although the discussion paper acknowledges the potential for electricity price increases due to the cost of the Green-grid (NS Environment, 2009a), it fails to recognize that NSP's electricity rates could well be set by the price of electricity in New England.

At present, the wind industry in Nova Scotia is in a state of turmoil. This is being driven by a number of factors, including the contracts being offered by NSP to Independent Power Producers (IPPs), the difficulty in obtaining equipment, the cost of equipment, the cost of capital, and the world's economic downturn. All of these factors may well lead to NSP failing to meet its emission reduction targets in the future.

In addition to the grid and the state of the wind industry in the province, there is another factor that will dictate the success of the province's commitment to achieving the proposed penetration of wind into Nova Scotia's market, and that is the availability of quick-response reserve. As it stands, NSP's limited hydroelectric facilities are being used to "backstop" the wind—if the wind fails to appear, hydroelectricity can be used instead. There will be a need for more backstop capacity in the province—the two sources the province is betting on are natural gas and electricity imports.

2.2.2 Natural gas

Natural gas is a low-carbon alternative that can be used to generate electricity, meet industrial requirements, and heat buildings. It can be used as a replacement fuel (that is, given the proper infrastructure, can replace fuels like oil and coal) or it can be used as a means to restrict consumption to low-carbon fuel.[4] The province is putting a great deal of faith in natural gas as it will be vital to allowing NSP to integrate wind into its mix (as discussed in section 2.2.1, above).

[4] The province has mistakenly defined "natural gas conversions" (i.e., converting a building from, for example, fuel oil to natural gas) as a means to reduce energy consumption, listing it under "energy efficiency/conservation" (NS Energy, 2009). If a building converts from fuel oil to natural gas and upgrades the furnace to a higher efficiency one, then it is the furnace upgrade that reduces the energy consumption, not the use of natural gas. If both fuels use furnaces with the same efficiency, the same amount of energy will be needed in both cases. A "natural gas conversion" is therefore a replacement not a reduction.

The province is also suggesting that natural gas can be used for the cogeneration of electricity and heat (NS Energy, 2009). Cogeneration has been discussed for years in Nova Scotia; for example, a 15 MW cogeneration unit was to have been the justification for bringing natural gas from Dartmouth under the harbour to Halifax (Environment Canada, 2005)—the project failed, but natural gas was still brought to Halifax.

When discussing any energy source, it is also necessary to talk about its associated infrastructure. In the case of natural gas, consumers must have access to a natural gas pipeline before they can use it. Very few Nova Scotians will ultimately get access to natural gas simply because of the absence of infrastructure.

The remainder of this section considers sources of natural gas in Nova Scotia.

2.2.2.1 Sable and Deep Panuke

The Sable Offshore Energy Project (SOEP) is Nova Scotia's sole, commercially active offshore natural gas play, while the Deep Panuke project is due to begin production in 2010. Despite the fanfare surrounding SOEP) in the late 1990s, the project has never lived up to expectations, both from reserve size and production numbers. Although the royalties and revenues generated by forfeitures from SOEP have proven substantial (NS Energy, 2009), they are expected to end within the next three or four years. In the case of Deep Panuke, the royalties obtained over the lifetime of the project are expected to equal Sable's royalties for 2008.

Figure 3 illustrates the state of these two projects, with the actual and projected production from Sable as well as the expected production from Deep Panuke.

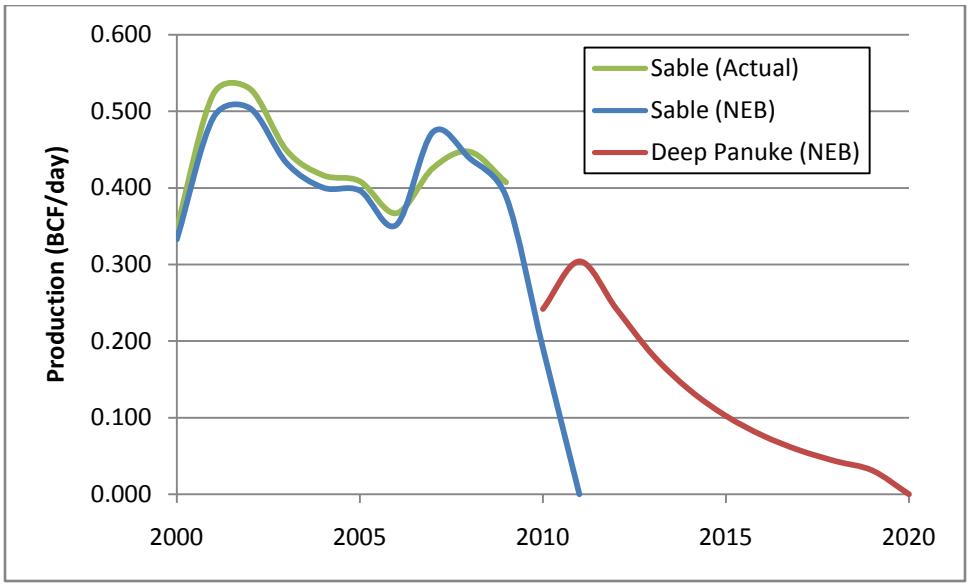

Figure 3: Sable and Deep Panuke production (NEB, 2007; CNSOPB, 2009)[5]

Since almost all of Sable's production has been exported and the same will happen with Deep Panuke (Reuters, 2009), neither of these projects can contribute in any meaningful way to the province's planned greenhouse gas emissions targets.

2.2.2.2 Georges Bank

With SOEP and Deep Panuke offering little in the way of natural gas production to Nova Scotians, the province is touting Georges Bank as Nova Scotia's next major offshore play (NS Energy, 2009). Although there is no evidence of commercial quantities of natural gas in Georges Bank, the province heralds the fact that the 25-year exploration moratorium is scheduled to be reviewed in 2012, implying that Nova Scotians will benefit from the yet-to-be-discovered natural gas.

If Nova Scotians are to benefit from Georges Bank, the following will be required:

- The lifting of the moratorium
- Exploration that yields commercially extractable quantities of natural gas
- A connection from the field(s) to Nova Scotia

[5] Sable's production figures for 2009 include production for January and February only.

There is no guarantee that any of the above will come to fruition. In fact, should the first two prove successful, there is little guarantee that the natural gas would be pumped to Nova Scotia. With no natural gas infrastructure anywhere southwest of Halifax, the chances are that any natural gas found would be sent to Maine where the infrastructure already exists. There is a precedent for this in the province—almost all of Sable's output has been sent to New England.

2.2.2.3 Liquefied Natural Gas imports

Last summer, the premier visited Qatar, a small Middle Eastern country with the world's third largest proven reserves of natural gas (after Russia and Iran) and the world's largest exporter of LNG (BP, 2008). Although the premier was secretive about the purpose of the trip, it was generally agreed that he was in search of a supply of natural gas for Keltic's proposed petrochemical plant at Guysborough (CBC News, 2008). Despite the premier's promise of this being a "great opportunity" for Nova Scotia, he came back empty-handed, in large part because of the construction backlogs caused by the long list of countries wanting access to Qatar's natural gas.

The province should not pin its hopes on LNG. Anadarko's Bear Head project failed because it was unable to find a supplier and it appears that Keltic will go the same way. And even if LNG could be supplied to the province, with no appreciable distribution infrastructure, the chances are it would be exported to New England or Quebec before it was used here.

2.2.3 Electricity imports

Wind and natural gas by themselves will not allow Nova Scotia to meet its EGSPA emissions reduction target (Hughes, 2008a). If the province wants to meet the target, it must find other sources of electricity—the one being quietly pursued is to have NSP interconnect with Newfoundland and Labrador Hydro's Lower Churchill hydroelectric project.

The Lower Churchill is one of the last remaining major hydroelectric sites in North America. It is located downstream from Churchill Falls and will consist of two dams: Muskrat Falls and Gull Island; together they are expected to produce 3,000 MW. Jurisdictions from Rhode Island to Ontario want access to this electricity.

Buried deep inside the province's strategy is a reference to the Lower Churchill hydroelectric power project and NSP's plans to connect with it by subsea cable from Newfoundland (NS Energy, 2009). It would not be an exaggeration to say that the entire strategy depends upon this electricity, as these imports are what will allow NSP to meet its greenhouse gas reduction targets; however, there is no guarantee that the Lower Churchill will be built by 2015 or that the electricity will flow directly to Nova Scotia. The importance of the Lower Churchill coming on-line in 2015 is apparent from the graph in Figure 2—the increase in the emissions cap from 0.18 Mt/year to 0.26 Mt/year occurs in 2016.

As with Georges Bank, the chances of electricity from the Lower Churchill reaching Nova Scotia depend upon a number of factors, the most obvious being—will the project proceed during these economic times when capital and material will be in short supply? And even if it does, will it be completed on time? And last, but certainly not least, will Newfoundland and Labrador interconnect with Nova Scotia, Quebec, Prince Edward Island, or the United States directly?

As discussed above, the strategy also calls for the development of a "Green grid" as a means of allowing more grid access for independent power producers (IPPs). However, there is more to the proposed grid than simply emissions reduction—if connected to New Brunswick, it will allow the Lower Churchill, NSP, and Nova Scotia's IPPs to sell electricity to New England. Although electricity exports may benefit some Nova Scotians, there is a danger that once connected to New England, electricity produced in Nova Scotia will leave the province in much the same way as crude oil, natural gas, and wood pellets have done in the past and continue to do now.

2.2.4 Other replacement and restriction alternatives

Other possible replacement and restriction alternatives include:

- Biomass. NSP may co-fire wood chips and pellets with coal in order to reduce its greenhouse gas emissions.
- Tidal. The potential for, and benefits of, tidal, like most other energy sources in Nova Scotia, have been overstated; the energy strategy report says as much, "Tidal technology is only in its infancy and needs time to develop" (NS Energy, 2009). Despite this, a month later, the

province stated, "Tidal power is anticipated as an option for achieving post-2013 greenhouse gas emissions reductions" (NS Environment, 2009a).

- Nuclear. In all likelihood, NB Power will proceed with a second reactor at Point Lepreau. NSP has all but rejected participating in the project, saying that it will consider purchasing electricity from Lepreau when necessary. Recently, Maine and New Brunswick announced a plan for a 1,500 MW grid to New England, meaning that if NSP wants to purchase electricity from Lepreau, its customers will be paying prices set in New England.
- Other sources, such as solar and geothermal, will be small, niche suppliers of electricity for homeowners and hobbyists, as cost and scalability will restrict their adoption for meeting anything other than a fraction of the province's electrical demand.

3 Energy security

Few countries in the world can claim to be "energy independent"—the vast majority are dependent on imports from energy exporting countries or regions. Until recently, reliance on foreign suppliers was simply an accepted fact of life; however, this is now changing, as political and geological factors are the source of supply problems or price spikes, or both. As a result, many major energy importing jurisdictions are developing energy security programs to ensure that their citizens and economies have access to affordable and uninterrupted supplies of energy.

The 2009 Energy Strategy says it will "enhance our energy security" by focusing on electricity because this will mean "we will use less imported coal, and more diverse sources of clean, local, and renewable energy" (NS Energy, 2009). These statements are wrong for a number of reasons. First, it is unlikely that the province will use less imported coal simply because NSP is required to burn low-sulphur coal, which must be imported since Nova Scotia's coal has a high sulphur content. Second, as shown in the previous section, if the province and NSP have their way, much of the province's "clean, local" electricity will be imported from the Lower Churchill. Third, for as important as electricity is, it is a distant second to petroleum products such as gasoline, fuel oil, and diesel (see Figure 4).

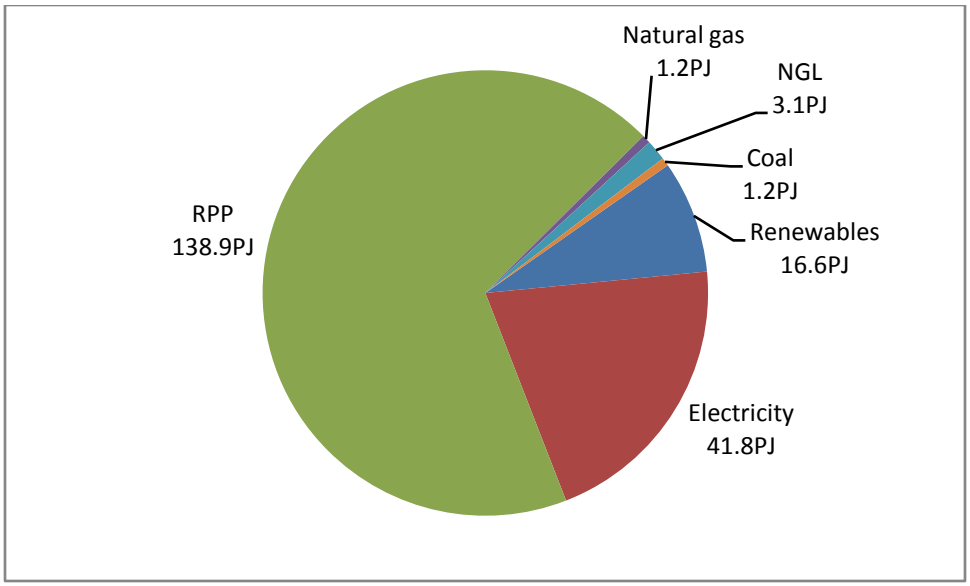

Figure 4: Secondary energy consumption in Nova Scotia (Hughes, 2007a)

Nova Scotia imports between 80 and 85 percent of its energy, most of which is carbon intensive, as shown in the security-emissions graph in Figure 5.

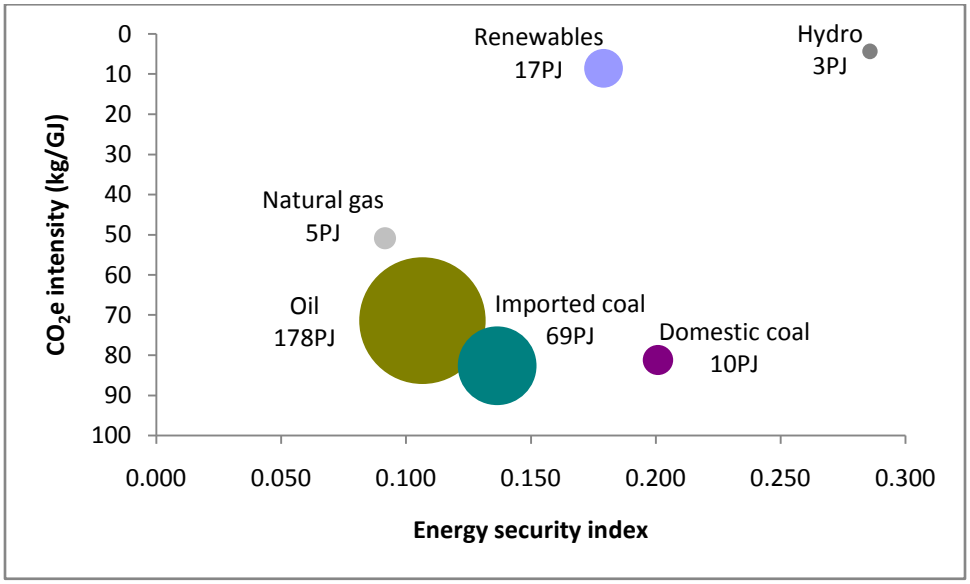

Figure 5: A security-emissions graph for Nova Scotia (Hughes & Sheth, 2008)

Each circle represents one of Nova Scotia's primary energy sources and its size is equivalent to the amount of energy it supplies to the province, expressed in terms of petajoules (PJ).[6] The vertical axis in Figure 5 shows the CO_2e intensity, the larger the value, the more greenhouse gas

[6] A petajoule is the amount of energy found in about 28 million litres of gasoline.

emissions associated with the energy source. The horizontal axis is the energy security index, which is a weighting applied to each energy source; energy sources further to the right are considered to be more secure. In Nova Scotia, hydroelectricity is very secure and has low emissions, but it is in limited supply. Electricity is not shown as, with the exception of hydroelectricity and nuclear, it is considered to be a secondary energy source, produced from the primary energy sources shown in the graph.

Much of Nova Scotia's imported energy comes from politically unstable regions, such as Venezuela (oil), Colombia (coal), and the Middle East (oil), while others come from locations where the oil reserves are in decline, notably the UK and Newfoundland and Labrador. Nova Scotia cannot rely on the rest of Canada to make up any energy shortfall because of its limited energy links and Canada's lack of strategic storage (Hughes, 2007a; IEA, 2000).

Nova Scotia's overwhelming reliance on oil products, many of which come from insecure sources, should be of concern to all Nova Scotians. Even if the security aspect is ignored (as the provincial strategy does), there is a general consensus amongst many energy analysts that within the next decade or so, world oil production will start to decline. Figure 6 is taken from a presentation given by Nobel-prize winner and now U.S. Secretary of Energy, Dr. Stephen Chu, in 2005—the figure shows expected world oil production peaking in 2010.

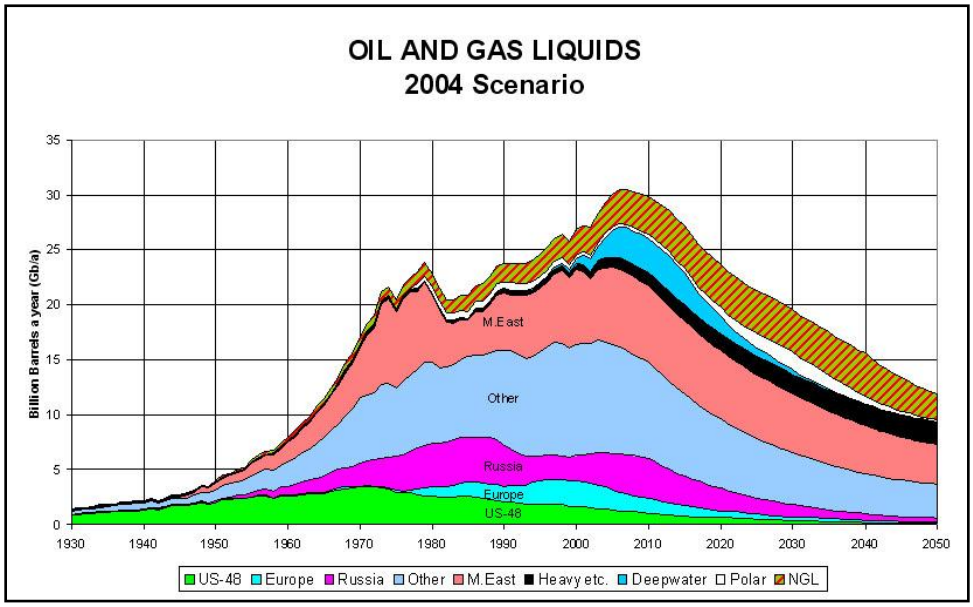

Figure 6: World oil and natural gas liquids production (Chu, 2005)

When world oil production goes into terminal decline, jurisdictions such as Nova Scotia will be faced with the prospect of fluctuating prices and uncertain supplies. Fortunately, the world economic downturn has lowered the price of energy and there are excess supplies for the moment. The longer-term prognosis is not as bright, as many companies are spending less on exploration and development, meaning that when the world's economy begins to recover, supplies of energy will not be available to sustain the recovery, causing another downturn.

The state of Nova Scotia's energy security is perhaps best illustrated by a heating emergency scenario in which there are shortages of fuel oil supplies for home heating (Hughes, 2009a). In this situation, Nova Scotians would be forced to turn to other sources of energy to meet their heating needs—the most convenient being electricity. The demand on the electrical system could reach the point where NSP would be unable to meet people's needs, leading to brownouts and blackouts (Hughes & Ron, 2009). If heating demand could not be met from sources other than electricity, any coal-fired plants that NSP had mothballed to meet the emissions reduction targets might be called back into service.

This extremely narrow focus of the province's energy strategy is putting the health and well-being of Nova Scotians, not to mention the economy of Nova Scotia, in jeopardy because it has failed to address the need for energy security in Nova Scotia. By placing so much emphasis on reducing greenhouse gas emissions from electrical generation, the province has done a great disservice to Nova Scotians. Nova Scotia needs an energy strategy that addresses both energy security and greenhouse gas emissions.

If a jurisdiction such as Nova Scotia is to improve its energy security, it is necessary to adopt long-term policies that identify systematic actions. One approach that can be applied to households and jurisdictions alike is the four 'R's of energy security (Hughes, 2009b): review (understanding the problem), reduce (using less energy), replace (shifting to secure sources), and restrict (limiting new demand to secure sources).

Perhaps without realizing it, many Nova Scotians have already adopted replacement strategies to handle NSP's inability to offer reliable supplies of electricity during the winter months. Many individuals, families, and businesses now have gasoline and diesel generators ready when NSP's

grid fails. As this example shows, there is more to energy security than supply—reliable infrastructure is also needed.

The next section examines ways in which Nova Scotia could improve its security of energy supply for space and water heating.

3.1 Example: Rapid adoption of renewable energy for space heating

A review of Nova Scotia's primary energy consumption shows that not only is the province heavily reliant on carbon-intensive fuels, it is also requires energy imports, much of which can be considered insecure. The relationship between energy security and CO_2 emissions is shown in Figure 5, above.

Nova Scotians must do everything possible to increase their reliance on secure energy sources. The first step is to review: existing sources, suppliers, supplies of energy, and infrastructure; energy services and energy intensities; and potential secure energy supplies. Central to the review process is the identification of the energy services; that is, the end-uses of energy, such as transportation, space heating, process heating, motors, and lighting. The designers of the province's energy strategy failed to understand this as they focused on energy supply (i.e., electricity) rather than energy services. Figure 7 shows Nova Scotia's energy services.

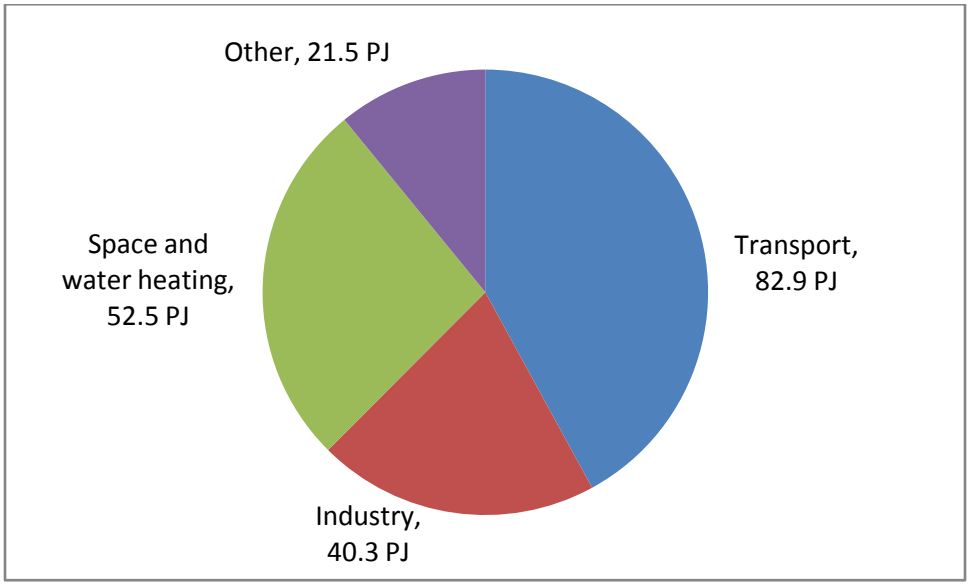

Figure 7: Nova Scotia's energy services (Hughes, 2007a)

The single largest energy service in Nova Scotia is transportation; the next most demanding is space and water heating. Heating demand in the province is met by fuel oil (63%), electricity (23%), wood (12%), and other sources including propane and natural gas (2%) (OEE, 2007b). The vast majority of Nova Scotia's space and water heating is supplied by non-domestic sources, some of which are from regions with political or geological problems—these same sources, that is, fuel oil and electricity, are major contributors to the province's greenhouse gas emissions.

The province must address the critical issue of space heating with short-term policies to protect people during heating emergencies (Hughes & Ron, 2009) and longer-term policies addressing reduction, replacement, and restriction (Hughes, 2007a).

Energy wedges are a means whereby long-term energy security policies can be introduced over time. They allow targets and funding to be allocated to specific energy services. An example of reduction, replacement, and restriction wedges using renewable energy sources for Nova Scotia's space and water heating is shown in Figure 8, starting in 2005 and ending in 2020.

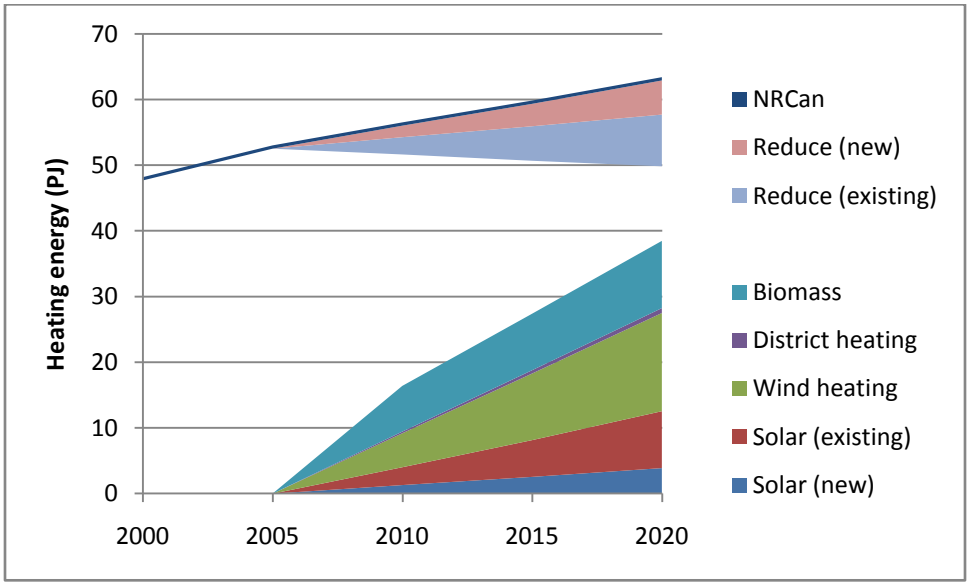

Figure 8: Space and water heating energy wedges for Nova Scotia (Hughes, 2007a)

In this example, the wedges are applied to NRCan's residential and commercial space and water heating demand (top line) (NRCan, 2006). The top two wedges are reduction wedges, reducing energy demand, first in new buildings, then in existing buildings. In this example, there are five

replacement wedges, from solar heating in new buildings to biomass.[7] This is an example of an aggressive crash program and already almost five years out-of-date—meaning that the province is facing greater challenges now that world oil production is nearing its peak. The interested reader should examine the CCPA publication, "Energy Security in Nova Scotia," for more details (Hughes, 2007a).

3.2 A new energy strategy

Nova Scotia, like many other jurisdictions, is ill-prepared for the decline in world oil production and must change its energy strategy to focus on improving the province's energy security. In view of our dependence on inexpensive energy, adjusting to a world where energy will be much more prized than it is now will take decades (Hirsch, Bezdek, & Wendling, 2005).

Examples of some of the actions that the province can take now include:

- Replacing oil furnaces in public buildings with wood or dual-fuel (wood and another fuel) furnaces. This will create a provincial market for Nova Scotia's wood chips and pellets, it will bolster Nova Scotia's furnace-building industry, and it will mean that government buildings can be used as emergency shelters during heating emergencies (Hughes & Ron, 2009).
- Replacing part of the heating required in public buildings, including schools, with solar. As with the use of wood for heating, this will help Nova Scotia's solar industries and allow these buildings to be used during heating emergencies.
- Upgrade the provincial grid and introduce metering technology to allow intermittent supplies of electricity to meet the needs of services that can be supplied intermittently; for example, storage heaters and batteries (Hughes, 2008b).
- Reduce the use of liquid fuels for transportation by shifting the emphasis away from new road construction to enhancing public transportation, such as a provincial rail or bus network.
- Make the sale of buildings be contingent on ever more stringent energy-reduction standards. Similarly, whenever a building is sold, the seller should be required to show that

[7] Other replacement or restriction wedges not considered in this example but could be used include geothermal (earth energy) or heat pumps. In electrically heated homes, a heat pump can be a reduction technology, as it can reduce the overall consumption of electricity for heating.

the building meets an ever-increasing percentage of its energy from secure, preferably renewable, sources.

- Fund new educational programs in community colleges to train a new generation of technicians who can design, install, and maintain renewable energy systems including geothermal, solar, and wind.
- Examine existing policies and ask the question, "Does this help to improve Nova Scotia's energy security?" For example,
  - Should wood chips or pellets be co-fired with coal (at 25% efficiency) to let NSP reduce its greenhouse gas emissions or should they be made available to Nova Scotians for space and water heating (at 75% efficiency)?
  - Does exporting the province's renewable energy sources, such as wood-chips and pellets and wind-generated electricity improve Nova Scotia's energy security?
  - Where will the energy come from to heat new residential and commercial buildings (Wood & Hughes, 2008)?

For a detailed list of recommendations sent to the provincial government in late 2007 by the Energy Research Group in response to the government's call for inputs to its energy strategy, the interested reader should examine, "Towards a new energy strategy for Nova Scotia" (Hughes, 2007b).

4 Data quality

In 2007, the province's energy strategy consultation document included a graph showing Nova Scotia's projected emissions (see Figure 9).

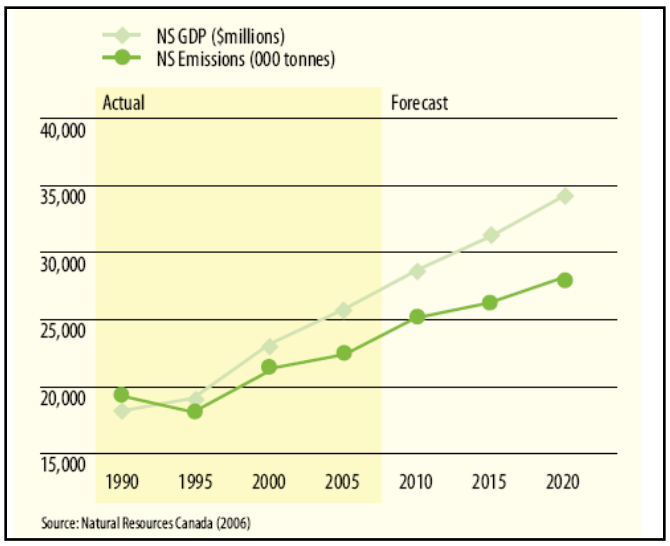

Figure 9: Nova Scotia's projected emissions in 2007 (NS Energy, 2007)

The emissions were taken from NRCan's emission projections for Canada, its provinces and territories (NRCan, 2006). According to NRCan, emissions for 1990 in Nova Scotia were 19.7 Mt and the 2020 emissions were projected to be 27.8 Mt. Using this data, Nova Scotia's 2020 EGSPA emissions target was 17.7 Mt (10 percent below 1990 levels). The total drop in emissions from 2020 (without reduction) to 2020 (with reduction) is just over 10 Mt or about 36 percent of Nova Scotia's total emissions. Short of a major upheaval in the life of every Nova Scotian or a massive economic downturn (or both), this would be a near-impossible figure to achieve in the timeframe proposed by the province (Hughes, 2008a).

By 2009, the province had made considerable changes to their emissions projections, as shown in the following figure from the action plan (see Figure 10).

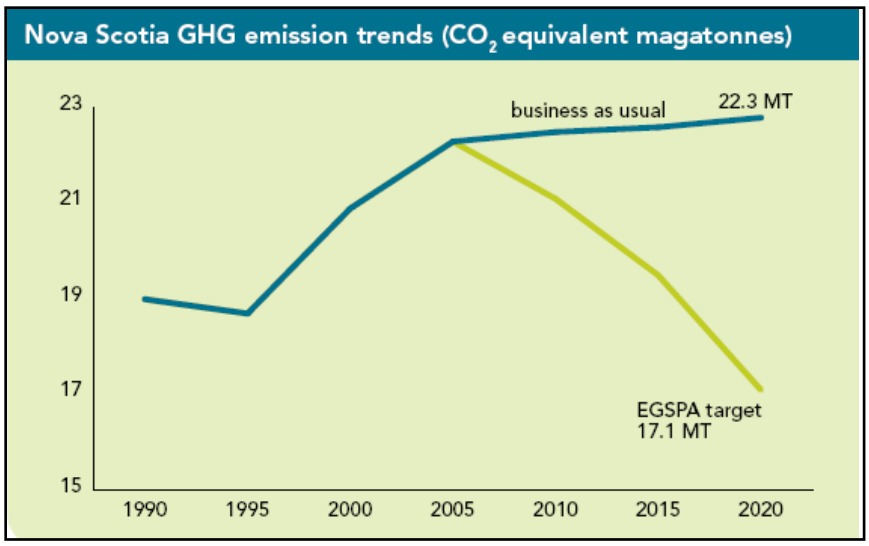

Figure 10: Nova Scotia's projected emissions in 2009 (NS Environment, 2009b)

In the 2009 energy strategy, the province had abandoned the NRCan data and had switched to data from Environment Canada. The Environment Canada data is used by the federal government in its annual submission to the UN on the state of Canada's greenhouse gas emissions; this data consists of estimates of the emissions from each province and territory. In Nova Scotia, the most recent Environment Canada data is for the years 1990 through 2006. The Nova Scotia government opted to use this data: in 1990 the estimated emissions were 19 Mt, while in 2005, they were 21.7 Mt (Environment Canada, 2008). From this data, the province's emission reduction target became 17.1 Mt (10 percent below 1990 levels of 19 Mt).

The selection of the 2020 emissions level was based upon two assumptions, first that the province would see little or no population growth during this period and that there would be a two percent annual growth increase in electrical demand (NS Environment, 2009b). Population projections by Statistics Canada and changes in demand in energy sources other than electricity were ignored. These assumptions led the province to conclude that a "business-as-usual" (BAU) growth would result in emissions of 22.3 Mt by 2020. The total drop in emissions between 2020 (without reduction) to 2020 (with reduction) was 5.2 Mt or about 23 percent of Nova Scotia's total emissions. Although this is considerably less than the previous target, it still exceeds reductions achieved by most, if not all, countries that have attempted to meet their Kyoto targets (short of economic collapse as in Eastern Europe and the former Soviet Union).

The 2007 and 2009 graphs are shown together in Figure 11.

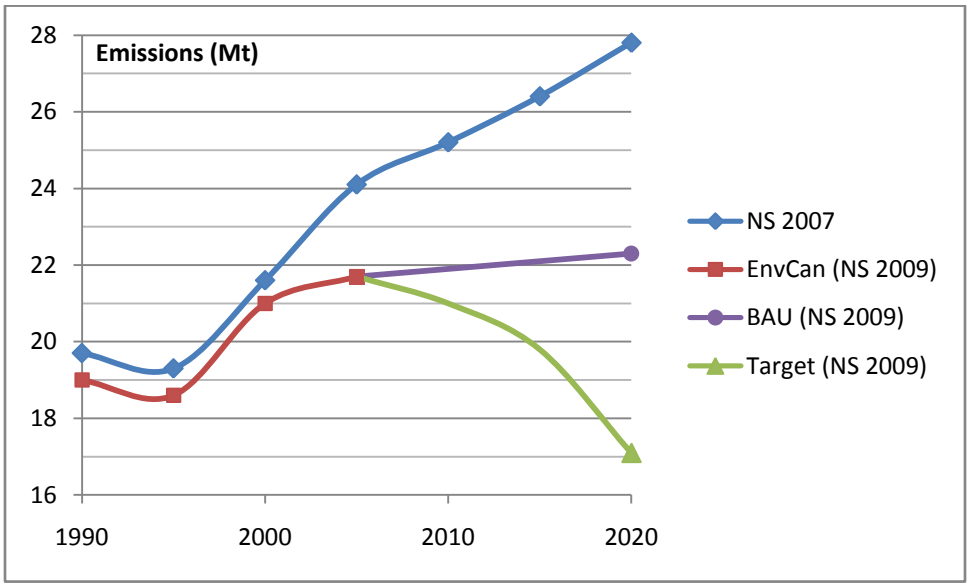

Figure 11: Emissions differences between the 2007 and 2009 reports

There is no explanation given in the 2009 reports about why the province opted for the Environment Canada data instead of NRCan's. The most obvious reason would appear to be that had they kept the NRCan projections, the province would have faced the impossible task of reducing emissions by over 10 Mt by 2020 (from 27.8 Mt to 17.7 Mt). Dropping the projected 2020 business-as-usual emissions to 22.3 Mt, produces the goal of a 5.2 Mt reduction by 2020 which is presented as being achievable. Even this value could be optimistic as the province, by omitting emissions growth from non-electrical sources, may have underestimated 2020 figures.

The province's decision to make these changes raises a number of questions:

- Why was NRCan's data chosen in the first place? At the time the 2007 report was written, Environment Canada had published its data for 1990-2004 (Environment Canada, 2006), which the province could have used and extrapolated to 2020.
- If the province had not found a more suitable set of data (that is, from Environment Canada), would they have continued to use NRCan's? One could argue that the availability of more favourable data played into the province's hands.

- If Environment Canada lowers Nova Scotia's 1990 emissions levels, will the province reduce its EGSPA target again? On the other hand, if business-as-usual emissions for 2020 are found to be higher, will the total emissions the province is to achieve be increased?

The actions of the province suggest that without a verifiable emissions audit done by certified, independent auditors, all emissions data published by this government must be considered questionable.

5 Concluding remarks

This report has examined Nova Scotia's plan to reduce its greenhouse gases by 10 percent below 1990 levels by 2020, and has shown that:

- The proposed plan to reduce NSP's greenhouse gas emissions is extremely optimistic and assumes that the necessary energy supplies will be available when needed between 2010 and 2020. All three replacement energy sources being promoted by the province face significant challenges: wind (economic), natural gas (supply), and the Lower Churchill (construction and interconnection).
- Little, if any, thought has been given to improving energy security in Nova Scotia—other than helping NSP attempt to diversify its energy sources. By failing to recognize the need to improve Nova Scotia's energy security, the province is putting the future health and economic well-being of all Nova Scotians at risk.
- Changing the province's emissions data to suit the requirements of the Environmental Goals and Sustainable Prosperity Act calls into question the entire energy strategy.

The report also highlighted the state of energy security in Nova Scotia. Many of Nova Scotia's energy imports are from politically unstable regions or from regions where production is in decline. Since all energy importing countries are "in the same boat", it is vital that Nova Scotia act now to protect itself against energy shortages and unstable energy prices. To this end, Nova Scotians need answers to the following questions:

- When will the provincial government develop programs and policies that address the need to improve energy security in Nova Scotia for Nova Scotians?

- Why should Nova Scotia Power be given provincial resources and funds to help offset its greenhouse gas emissions when energy security is about to become the most pressing issue facing Nova Scotians?
- What is the province's plan should the Lower Churchill fail to proceed or Nova Scotia not have an interconnection to the project?
- Who will audit Nova Scotia's greenhouse gas emission reductions?

The purpose of the 2009 Energy Strategy was to help Nova Scotia meet the targets for 2020 set out in the Environmental Goals and Sustainable Prosperity Act. By failing to recognize the importance of improving Nova Scotia's energy security, the province is ensuring that Nova Scotia will neither be sustainable nor prosperous.

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