Review of EMGC's Recommendations for a Renewable Portfolio Standard for Nova Scotia

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Abstract

The Electricity Marketplace Governance Committee's Second Interim Report includes a series of recommendations regarding the generation of electricity from renewable energy sources, including a proposal for a provincial renewable portfolio standard or RPS. RPS is legislation meant to ensure that a minimum amount of renewable energy is included in the portfolio of the electricity resources serving a jurisdiction (such as a province or state). Many jurisdictions adopt RPS as a way of addressing environmental issues such as SO_2 or greenhouse gas emissions.

This paper's examination of the proposed recommendations for renewables and a provincial RPS shows that they will have a negligible impact on either Nova Scotia's renewable energy industry or its greenhouse gas emissions. The paper proposes a RPS that would make significant inroads into Nova Scotia's greenhouse gas emissions, at the same time encouraging a provincial renewable energy industry.

1 Introduction

The Nova Scotia Energy Strategy's Electricity Marketplace Governance Committee (EMGC) devotes eleven pages of its Second Interim Report to a discussion of how electrical generation from renewable sources can be promoted. The driving force (or motivation) for this promotion, taken from the provincial Energy Strategy [10], is summarized in the Second Interim Report as follows:

> *The Energy Strategy states as a principle that renewable energy sources will play an increasingly important role in electricity generation in Nova Scotia. Increased use of renewable energy will provide new business opportunities, increase the efficiency of the electricity system, and contribute to Nova Scotia's commitment to a sustainable energy future.* [Page 8]

Although many people hope that "*renewable energy sources will play an increasingly important role in electricity generation in Nova Scotia*", it is an open question whether the "*increased use of renewable energy will*":

- *Provide new business opportunities.*

  The Second Interim Report recommends a very small percentage be included in the supply of electricity from new sources of renewable energy. The number of "*new business opportunities*" will be limited to a small group of individuals and organizations.

- *Increase the efficiency of the electricity system.*

  Neither the Energy Strategy nor the Second Interim Report explains how renewables will accomplish this.

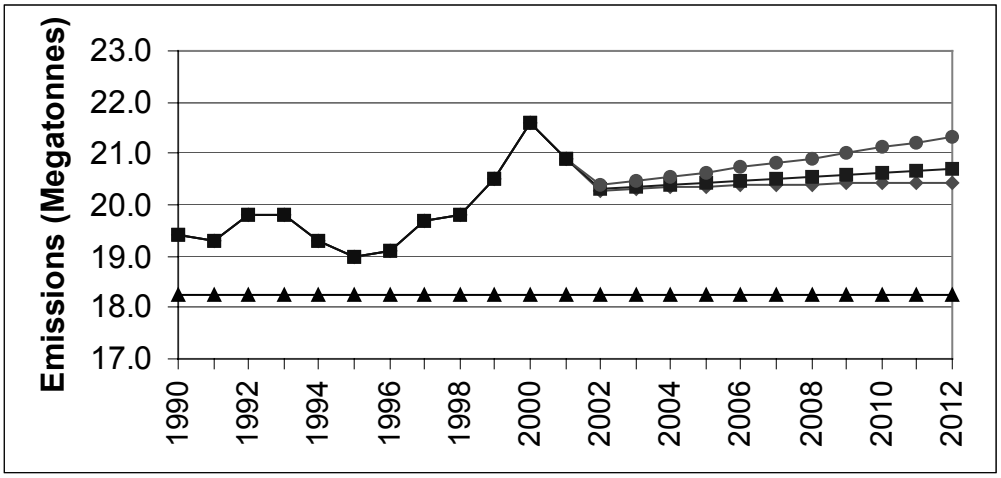
  When efficiency is discussed in the Second Interim Report, it is in terms of restructuring the electrical industry and competitive market openings that "*will exert pressure on producers to increase efficiency and keep costs down*". How this relates to renewables in Nova Scotia is unclear, given the size of the market, the limited commitment to renewables, and the Energy Strategy's decision, "To phase in competition in the Nova Scotia electrical industry" [10].

- *Contribute to Nova Scotia's commitment to a sustainable energy future.*

  The term "*sustainable energy*" is defined in neither the Energy Strategy nor the Second Interim Report. Although many may argue that the definition of "sustainable energy" is self-evident, a provincial definition would have clarified Nova Scotia's "*commitment*".

Another, perhaps more pressing driving force for the adoption of renewable energy in Nova Scotia is the fact that the Canadian federal government ratified the Kyoto protocol in December 2002. Should the protocol come into force, Canada will be committed to reducing its greenhouse gas emissions to 94% of 1990 levels by 2012. The Second Interim Report makes no mention of either Kyoto or greenhouse gas emissions reduction.

Nova Scotia's greenhouse gas emissions have increased since 1990 [12]. The following graph shows Nova Scotia's actual greenhouse gas emissions for the period 1990 to 2001, its projected emissions for 2002 to 2012, and its Kyoto target:



The emission target (about 18.2 megatonnes of CO_2-equivalent) appears across the bottom of the graph as a line of triangles. In 2001, Nova Scotia was about 2.7 megatonnes over the target. By 2012, emissions are expected to be between 2.2 and 3.1 megatonnes over the target, depending upon population growth (these projections are derived, in part, from Statistics Canada's population growth for Nova Scotia -- low: 950,800; high: 991,400 [13]). If Nova Scotia is to meet the 18.2 megatonne target by reducing emissions, it will have to do so by making changes in its energy sector[1]. Given that 44 percent of the province's emissions comes from electrical generation [12], developing policies to reduce these emissions would be a good place to start.

One approach being adopted by many jurisdictions in the United States is a "renewable portfolio standard" or RPS. RPS programmes are typically legislated by local governments, requiring their utilities to supply a small percentage of their power as renewables; this percentage increases each year until it reaches a maximum, which must be maintained by the utility. In the United States, RPS is being adopted for a number of reasons, notably improving local air quality and encouraging the development of green energy industries.

This paper examines the EMGC's proposals for renewable energy and a provincial RPS. The next section reviews the Second Interim Report's proposal for generating electricity from renewable sources. The third section proposes a RPS that would make significant reductions in Nova Scotia's greenhouse gas emissions. This is followed by a set of alternate recommendations for a provincial RPS that would help develop a local renewable energy industry as well as produce a significant reduction in Nova Scotia's greenhouse gas emissions. The paper is concluded with a summary of this work.

Statements from the Second Interim Report are presented in *italics* followed by the associated page number, while section headings examined are presented in ***bold-italics***. For brevity, all references to "Report" refer to the Electricity Marketplace Governance Committee's Second Interim Report.

2 Review of Section 3 - Promoting Generation from Renewables

Part of the introduction to the Report's third section states:

> *Policies are needed to promote increased electricity generation from renewable resources because many such resources, such as wind or solar power, are more costly than conventional power sources. Increasing their use requires either mandatory policies that set standards, or voluntary policies that allow consumers who choose to do so, to pay a premium to reduce environmental impacts.* [Page 8]

[1] Nova Scotia's energy sector includes Stationary Combustion Sources (notably, Electricity and Heat Generation, Fossil Fuel Industries, Manufacturing Industries, Commercial & Institutional, and Residential), Transportation Combustion Sources, and Fugitive Sources [12].

The Report overlooks a third, non-policy driven way in which renewables can be adopted by requiring:

- The unit energy cost of the renewable technology to become competitive with the unit energy cost of conventional power sources [17].
- Vision, on the part of a utility, to recognize the long-term commercial benefits of renewable energy, coupled with a commitment to integrating renewable sources into its operating environment [1].

The first of the above conditions is being met by some technologies (such as biomass cogeneration) and is close to being met by others (notably wind). The second requirement has yet to be met in Nova Scotia.

Section 3.1 Renewables and Electricity Restructuring **[Pages 8-9]**

Section 3.1 discusses the impact of moving away from traditional electrical supply monopolies, listing the known negative impacts and the perceived positive impacts:

- *On the negative side, as markets become increasingly price-competitive, cost-driven, electricity suppliers are no longer able to roll the added cost of renewables into their overall cost of service.* [Page 8]

  Most utilities, including NSPI, charge classes of customers a common rate for any electricity purchased, regardless of the fuel used to generate the electricity. This allows a utility to include expensive forms of generation (such as natural gas and some renewables) in its cost-of-service base, with the lower-cost fuel sources offsetting the higher costs.

  Although NSPI already does this and probably would do it with renewables in the future, the market model proposed by the EMGC runs counter to this approach. Interestingly, the Energy Strategy admits that if NSPI's current Green Power programme were to be "rolled into NSPI's regulated cost-of-service base and be applied to the electricity rates of all Nova Scotia electricity consumers … such an increase would … be less than one-half of one percent" [10].

- *From a positive standpoint, when consumers get greater choice in electricity supply, as occurs with competitive retail markets, they often choose a source of supply with lower environmental impacts, such as renewables, though consumers pay a premium price.* [Page 8]

  In competitive retail markets, most consumers opt for the lowest price items, as has been shown in the deregulation of the telephone and airline industries. Although some consumers may be willing to pay a premium per kilowatt-hour, sustaining a renewable electricity industry from the sales of premium price electricity is questionable. For example, the U.S. National Renewable Energy Laboratory has completed a study showing that voluntary programmes could increase renewable energy generation from 2 percent of electricity demand in 2001 to less than 3 percent of demand by 2010 [9].

On the other hand, a number of studies have shown that electrical generation from renewables in the United States could meet 10 percent of electrical demand by 2010 and as much as 20 percent by 2020, if the cost were shared by all customers [7].

Section 3.3 Definition, Certification and Monitoring **[Pages 9-12]**

Section 3.3 examines how a generator can be defined as 'renewable', then considers ways in which the generator can be certified (for 'green tags'), and finally, how the generator's output can be monitored.

The Report focuses on the EcoLogo definition of renewable energy since it is:

> *… now widely accepted in Canada, is sanctioned by Environment Canada and administered by a private firm, TerraChoice.* [Page 9]

The Report notes the comprehensiveness of the EcoLogo definition; no other competing definitions are discussed.

The cost associated with EcoLogo is listed as a concern, as is the fact that tidal and wave power are not included in the EcoLogo definition. Whether EcoLogo's competitors have a lower cost or include tidal and wave power is not discussed.

The Report notes that "*it was feared that the cost could become prohibitive for some generators*", prompting the EMGC to contact TerraChoice[2] for information on the cost of obtaining and maintaining EcoLogo certification. The following paragraph and table highlight the EMGC's fears:

> *The table below shows the costing information obtained from Terrachoice. Because initial and annual fees have a fixed component, the cost of EcoLogo® as a fraction of total revenues is relatively higher for smaller facilities, as the table shows. A calculation in the table assigns a value to CO2 emissions credits, which the facility probably could not get without EcoLogo® certification. The calculation shows that the credits recover about a fifth of the EcoLogo® costs for the smallest generator while rapidly scaling upward to more than cover the EcoLogo® costs for the larger generators.* [Page 10]

EcoLogo®
Verification, Auditing and Annual Licensing Costs

Size (kW)	*Initial Audit Cost*	*Annual Revenues ($k)*	*Annual Licensing Cost*	*Annual Total Cost*	*Cost as % Revenue*	*Value of CO2 Credits*
100	*1500*	*18*	*1000*	*1150*	*6.4%*	*234*
1000	*1500*	*180*	*1080*	*1230*	*0.7%*	*2344*
10000	*1500*	*1802*	*6802*	*6952*	*0.4%*	*23437*

[2] TerraChoice is the company chosen by Environment Canada to have exclusive rights to certify facilities that meet EcoLogo criteria.

Notes:
1. Initial audit costs waived if facility qualifies for ISO 9000 or 14000
2. Annual revenues calculated at $.06 per kWh at 35% capacity factor
3. Annual total cost is annual licensing cost plus 1/10 of initial audit cost.
4. CO2 credits calculated at $3 per ton for 0.78 kg per kWh displaced.

Both the paragraph and the table require clarification:

- The data under the column labeled "*Annual Revenues ($k)*" are incorrect. According to Note 2, the annual revenues are "*calculated at $.06 per kWh at 35% capacity factor*".

  The annual revenues should be calculated as follows:

  Size x 8760 hr/yr x Capacity factor (35%) x $0.06 per kWh

  For example, a generator of 100 kW would have annual revenues of:

  100 kW x 8760 hr/yr x 0.35 x $0.06 /kWh or $18,396

  The actual revenues are anywhere from $396 (100 kW) to $37,600 (10,000 kW) higher than presented.

  These amounts are significant, as will be shown below.

- The data under the column labeled "*Value of CO2 Credits*" are incorrect. The CO_2 credits listed in the table are actually the number of tonnes of CO_2 that would be avoided if renewable electricity replaced non-renewable at a ratio of 0.78 kg CO_2 per kWh (the ratio used in Note 4). For example, consider the annual electrical output of a 100 kW generator:

  100 kW x 8760 h/yr x 0.35 or 306,600 kWh/yr

  In this case, at 0.78 kg CO_2 per kWh, the annual CO_2 displacement would be:

  306,600 kWh x 0.78 kg CO_2/kWh or 239,148 kg or about 239 tonnes

  At $3 per ton, the value of the CO_2 credits are actually three-times that shown in the table, ranging from $717 (100 kW) to $71,744 (10,000 kW).

- Note 2 refers to a "*35% capacity factor*". The Report should have made it clear that this is the capacity factor used for wind generators.

- Note 3 lists the annual total cost as the "*annual licensing cost plus 1/10 of initial audit cost*". According to TerraChoice, the annual licensing cost is determined as follows [15]:

  - 0.6% on up to $1 million in sales
  - 0.1% between $1 million and $5 million in sales
  - The minimum annual fee is $1,000

  TerraChoice makes no mention of "*plus 1/10 of initial audit cost*", although the initial audit costs start at $1,500.

- Note 4 refers to "*$3 per ton*". It is unclear why the Report used the standard/Imperial "ton" rather than the metric "tonne". Furthermore, the Report gives no reason for choosing $3 per ton for the cost of CO_2.
- Note 4 refers to "*0.78 kg per kWh*". This appears to be an average of the CO_2 emissions associated with different fuel types (for example, coal's emissions are taken to be 1 kg per kWh [6]).
- The statement "*The calculation shows that the credits recover about a fifth* [20%] *of the EcoLogo® costs for the smallest generator while rapidly scaling upward to more than cover the EcoLogo® costs for the larger generators*" is incorrect. In the worst case (100 kW generator) the CO_2 credits actually recover over 60% of the EcoLogo costs:

  Credits / Costs or $717 / $1150 or about 62%

- The statement "*the EMGC recognized that EcoLogo® certification was unlikely to be economic for very small generators but for those of relatively modest size, it could have a positive impact*" depends upon the definition of "*very small generators*". If 100 kW is taken as a "*very small generator*", one finds:

	EMGC data	Corrected data	Additional revenue
Annual revenues	$18,000	$18,396	$396
Value of CO_2 credits	?	$717	$717
Total	-	-	$1,113

  By taking the corrected annual revenues and the correct value of the CO_2 credits, the additional revenue comes to $1,113. This is $37 less than the "Annual Total Cost" of $1,150 shown in the EMGC table. EcoLogo certification is both economic and sensible for "*very small generators*", especially if the value of CO_2 credits were to rise.

The corrected and expanded version of the EMGC EcoLogo table is shown below:

Size KW	Annual kWh	Annual revenues	Tonnes CO_2	Value of credits	Total Revenues	Initial audit	Annual license	Annual total cost	% of revenue
100	306,600	$18,396	239	$717	$19,113	$1,500	$1,000	$1,150	6.0%
1,000	3,066,000	$183,960	2,391	$7,174	$191,134	$1,500	$1,147	$1,297	0.7%
10,000	30,660,000	$1,839,600	23,915	$71,744	$1,911,344	$1,500	$6,911	$7,061	0.4%

Recommendation 2-6

This recommendation relates to the definition of renewable low-impact electricity (TerraChoice's name for electricity generated from renewable sources [16]):

> *The EMGC recommends that, for all public policy purposes relating to electricity supply, Nova Scotia adopt the EcoLogo® definition of renewable low-impact electricity.* [Page 11]

The selection of EcoLogo is based upon the EMGC's assumption that, with the exception of "very small generators", EcoLogo certification would have a "*positive* [economic] *impact*".

Although the underlying numbers used by the EMGC for this recommendation are clearly incorrect, the selection of the EcoLogo definition of low-impact electricity seems reasonable. However, it is not clear whether Nova Scotia can use EcoLogo's definition of "renewable low-impact electricity" without permission.

Recommendation 2-7

Recommendation 2-7 deals with technologies not covered by TerraChoice:

> *The EMGC recommends that the Province of Nova Scotia participate in a process to identify renewable resources of wave and tidal power and other new technologies as renewable low impact electricity under the EcoLogo® definition.* [Page 11]

A reasonable recommendation, as long as Nova Scotia is not expected to pay for participating in the process.

Recommendation 2-8

Although the preamble to this recommendation says that it is "*to identify a monitoring agency*", it deals with the certification of generators only. The preamble includes the following discussion on "*definition*" and "*standard*" (underlining by the authors):

> *The EMGC agreed that the adoption of the EcoLogo® definition for policy purposes did not mean that all renewable generators had to be certified as meeting the EcoLogo® standard, only that they met the Nova Scotia definition. The EMGC also agreed that the EcoLogo® definition was preferred, as an off the shelf tested and accepted definition…* [Page 11]

The recommendation is then presented as (underlining by the authors):

> *The EMGC recommends that, for all public policy purposes in Nova Scotia, the Nova Scotia government authorize agencies to certify that generation facilities meet the Nova Scotia standard.* [Page 11]

The "*Nova Scotia standard*" is not defined, although it presumably means the definition of "*renewable low-impact electricity*" from Recommendation 2-6.

Recommendation 2-9

This recommendation deals with monitoring a certified renewable generation source:

> *The EMGC recommends that, for all public policy purposes in Nova Scotia, the Nova Scotia government authorize agencies to monitor that facilities continue to meet the Nova Scotia standard and that*

> *sales levels of complying electricity do not exceed production supply levels.* [Page 12]

As with Recommendation 2-8, it is assumed that the "*Nova Scotia standard*" refers to "*renewable low-impact electricity*" from Recommendation 2-6.

The second part of this recommendation, "*sales levels of complying electricity do not exceed production supply levels*", is taken directly from the TerraChoice web site description of "Alternative Source Electricity Generation" [14]. It is intended to ensure that the number of kilowatt-hours claimed by a renewable energy generator actually comes from the generator's certified source.

Section 3.4 Renewable Portfolio Standard **[Pages 12-13]**

Section 3.4 defines RPS, explains the province's approach, and justifies the EMGC's role in recommending a provincial RPS.

The Report reiterates the "go-slow" three-year approach to developing the RPS as outlined in the Energy Strategy:

> *The Province would work with NSPI to implement a voluntary target for 2005, amounting to 2.5% of NSPI's current generating capacity, to come from independent power producers using new renewable resources. The Province and NSPI will monitor the voluntary target for three years, before deciding whether to move to a longer-term mandatory renewable portfolio standard.* [Page 12]

The Report also states why the EMGC should be allowed to provide advice on RPS policies:

> *The Energy Strategy did not assign the EMGC a role in designing these programs. However, since the EMGC is a multistakeholder group working on electricity market issues, it determined that it could make a useful contribution to the government by providing advice on the development of RPS policies, and its recommendation on the timing and scope of an RPS for Nova Scotia.* [Page 12]

Section 3.5 Mandatory Long-term RPS **[Pages 13-16]**

Section 3.5 addresses the cost of the proposed RPS and how its requirement (starting date, annual increment, and target date) should be defined.

The cost of the RPS is summarized in the following paragraph:

> *The cost of an RPS, based upon the model proposed by the EMGC would be determined by the amount of new certified renewable energy that is brought to the market. If new green energy is added to the generation available in Nova Scotia below the amounts required under the mandatory RPS, the cost of the RPS would be high, equal to the penalty cost of non-compliance by distribution utilities. If new green energy is added to the generation available in Nova Scotia more quickly than stipulated by the RPS, the costs*

> *would be low, as a function of the competitive nature of more supply than demand.* [Page 13]

This paragraph is interesting for a number of reasons:

- It now refers to "*green energy*" rather than "*renewable low-impact electricity*". The reason for this change is unclear.
- It refers to "*the penalty cost of non-compliance*", although nowhere in the Report is there any mention of penalties for failing to meet RPS targets.
- Claiming that "*if new green energy is added to the generation available in Nova Scotia more quickly than stipulated by the RPS, the costs would be low*" implies that utilities will be willing to purchase renewable electricity before they are required to do so. This could drive the price down, although it could also drive some of the generators out of business if they were unable to find purchasers.

The Report also explains the rationale for the RPS target:

> *The EMGC discussed how the RPS requirement should be set. If it was to grow at half the rate of load, and was to be tied to load in each year of the program, in some years there could be problems meeting it, since load growth in Nova Scotia can be "lumpy". The system is small, and new industrial customers can bring a significant percentage increase to the system in one year. If the RPS must track the actual load, a sudden requirement for new generation from renewables could emerge. Consequently, the EMGC concluded that it preferred to state the RPS requirement in terms of a starting level and a requirement for 2010.* [Page 14]

The EMGC apparently considered only two approaches: making the RPS a percentage of the annual load or specifying a target in the final year.

A third approach, based upon the successful Texas RPS model, is to have annual energy-based purchase obligations [18]. In this method, the utility is required to purchase a certain number of kilowatt-hours of electricity from certified renewable generators annually. This has at least three benefits:

- The obligations can increase each year, to the target year, thereby ensuring the growth of a provincial renewable energy industry.
- The utility 'knows' its annual obligations and can prepare for them well in advance.
- The utility's consumers get the best price for renewable electricity, since a renewable electricity market is created with competition between generators, bidding to meet the utility's obligations.

Recommendation 2-10

The first RPS recommendation deals with the date at which the RPS is to start:

> *The EMGC recommends that the province of Nova Scotia adopt a mandatory RPS to take effect in 2006.* [Page 15]

No reason is given for selecting 2006 as the starting date.

However, the Energy Strategy stated that during the 2001-2005 period, it would "Create a short-term, voluntary, renewable energy target for new IPPs totalling 2.5% of NSPI's generation capacity, or approximately 50 MW. The government and NSPI will monitor the voluntary process for three years and then establish a longer-term renewable energy portfolio standard (RPS) target" [10].

It appears that the EMGC is in no rush to see the establishment of a longer-term RPS. Rather than taking 2005 as the starting date, the EMGC has simply taken the three-year requirement and added it to the completion year of the Report (2003), thereby making it a 2006 starting date.

Recommendation 2-11

This recommendation introduces the concept of renewable electricity "tags":

> *The EMGC recommends that electricity from renewable resources have tags that can be created and traded separately from the electricity itself. The tag is a certificate that a quantity of electricity has the attribute of coming from a certified renewable resource.* [Page 15]

The environmental benefits of electricity produced from renewable sources has resulted in two types of electricity:

- "Renewable low impact" electricity that is generated from certified, renewable sources (at a minimum, non-fossil and non-nuclear). This type of electricity is usually associated with a "tag", indicating that it has come from a renewable source. Tags can be measured in multiples of kilowatt-hours.
- "Null" electricity that is generated from non-renewable sources. "Renewable low impact" electricity is simply "null" electricity with a tag.

Tags are commodities that can be owned and traded. A generator of "renewable low impact" electricity can separate the tags from the electricity, selling them to the highest bidder (a unit of renewable low impact electricity separated from its tag becomes a unit of null electricity).

On the other hand, a utility can purchase tags (effectively making some of its null electricity renewable low impact electricity) rather than purchase renewable low impact electricity from a renewable generator. There are a number of reasons why a utility may chose to do this:

- there may not be sufficient renewable electricity generated in the utility's jurisdiction.
- the price of tags may be less expensive elsewhere.

Recommendation 2-12

How utilities can obtain tags is explained in Recommendation 2-12:

> *The EMGC recommends that entities responsible for acquiring electricity from renewable sources can acquire tags by contracting directly with a certified generator or by acquiring renewable tags.* [Page 15]

The EMGC is allowing "entities" (presumably load serving entities) to obtain their tags by purchasing them from:

- generators certified within the province, in the form of renewable low impact electricity.
- generators certified outside the province, in the form of certified tags.
- individuals or organizations, usually through carbon trading markets, such as the Chicago Climate Exchange [2].

Although not mentioned in the recommendation, utilities that self-generate certified, renewable electricity should be able to claim these tags as well.

Two other points overlooked in both 2-11 and 2-12 are:

- Most tags have a lifetime of no more than a year (typically a calendar or fiscal year). Utilities are required to prove that they have collected sufficient tags by the end of each year.
- Tags obtained from certifying agencies other than TerraChoice must be acceptable.

Recommendation 2-13

The RPS target percentage and date are given in this recommendation[3]:

> *The EMGC recommends that the province of Nova Scotia require each LSE to obtain tags certifying that the fraction of its electric energy from renewable sources by 2010 is equal to the actual base of renewable electric energy at 2001 plus 3.2%.* [Page 15]

The first part of this recommendation is confusing:

> *the fraction of its* [the LSE's] *electrical energy from renewable sources*

This appears to imply that the LSE must generate its own electricity from renewable sources. This runs counter to Recommendation 2-12 that permits LSEs to generate null electricity and purchase tags to meet its RPS target.

The second part is merely discouraging:

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[3] The term "LSE" refers to Load Serving Entity, commonly referred to as an electrical utility. The Report refers to LSEs rather than utilities.

by 2010 is equal to the actual base of renewable electrical energy at 2001 plus 3.2%

EMGC's proposed RPS target is 3.2 percent of electrical generation (as opposed to capacity) in 2001.

In 2001, the principal LSE in Nova Scotia was NSPI, with a total electrical generation of 10,906 GWh (gigawatt-hours) [5]. The RPS target of 3.2 percent is therefore about 350 GWh.

Based upon Recommendations 2-15 and 2-18 (below), over 40 percent of this target (153 GWh) will be met from the "short-term, voluntary, renewable energy target for new IPPs totalling 2.5% of NSPI's generation capacity, or approximately 50 MW" proposed in the Energy Strategy [10].

Furthermore, Recommendation 2-13 makes no mention of penalties that could be imposed on LSEs that fail to meet the 3.2 percent target. This omission may reflect the fact that the target is ridiculously small.

Recommendation 2-14

Recommendations 2-14 through 2-17 deal with renewable generation from "heritage facilities", defined by the EMGC as:

> *The physical electricity supply system in existence at the time of electricity restructuring. These physical facilities were acquired under a regime in which the owner was effectively granted a regulated rate of return. It can be argued that the benefit, if any, these facilities have after a move to a competitive market should belong to the customers, not to the owners, since the customers ultimately bore the risk.* [Page 35]

The Report raises the issue of heritage facilities since 8.5 percent of NSPI's electricity was from hydroelectric sources in 2002 (about 17 percent of NSPI's installed capacity) and hydroelectric is considered to be renewable. More specifically, EMGC is concerned about the possible financial benefits of a heritage facility, as stated in the preamble to Recommendation 2-14:

> *To deal with the potential for windfall profits, the task force recommended that the existing renewable generation be recognized as renewable, but that the renewable aspects be assigned to existing customers.* [Page 15]

This sentence fails to define or explain the following:

- "*Windfall profits*" - presumably by obtaining and then selling tags associated with the heritage facilities.
- "*Renewable aspects*" - presumably tags claimed by the LSE.
- "*Be assigned to existing customers*" - presumably the tags are sold each year and "*customers*" (undefined) share the profits.

Recommendation 2-14 states:

> *The EMGC recommends that the province of Nova Scotia recognize the heritage attributes of renewable generation extant at December 2001.* [Page 15]

This Recommendation raises a number of issues:

- It fails to mention that the "*renewable aspects be assigned to existing customers*" (discussed in the sentence before the Recommendation).
- It is unclear what is meant by "*recognize*" in this Recommendation. If "*recognize*" means to give generators with heritage attributes the status of "*renewable low impact electrical generators*", it runs counter to Recommendation 2-8.
- Furthermore, Recommendation 2-16 states that "*existing renewable generators be exempt from any certification requirements*". Without certification, generators cannot produce tags (Recommendation 2-11).

This Recommendation is particularly troubling since it suggests that heritage facilities which do not meet today's standards be granted renewable status and hence, become certified.

Recommendation 2-15

> *The EMGC recommends that the tags relating to the output of the heritage renewable generators (2001 generation plus NSPI constructed or contracted facilities to 2005), which will be the base electric energy at 2005, be assigned to LSEs as at the RPS implementation date in proportion to their load share.* [Page 15]

Recommendation 2-15 states that heritage renewable generators will be those generators built before 2001 as well as those constructed between 2001 and 2005. By this definition, renewable generators built between 2001 and 2005 need not, according to the EMGC, be certified (see Recommendations 2-14 and 2-16). These generators would therefore be unable to be used to meet the committee's RPS requirement of a 3.2 percent increase in renewable generation over 2001 levels since tags can only be obtained for energy from certified facilities (see Recommendation 2-11).

It makes little sense to define renewable facilities built between 2001 and 2005 as heritage. These should be treated as new facilities that are certified and monitored.

Recommendation 2-16

> *The EMGC recommends that existing renewable generators a) be exempt from any certification requirements by virtue of their heritage position; and b) that LSEs maintain their proportional rights to the tags from heritage generation* [Page 15].

Recommendation 2-16 sends a confusing message. It recommends that heritage generators need not be certified while also recommending that the tags from the heritage generators go to the load serving entities (LSEs).

However, according to TerraChoice, the company that administers the "Green Leaf" tags, "[tags] must be generated by the electricity from an approved electricity generation facility" [16]. In order for a facility to be approved it "must either be certified by the Environmental Choice Program for generating renewable low-impact electricity, or meet the requirements specified in the Green Leaf TRCs Technical requirements for Electricity Generation Facilities" [16]. One can assume that if the facility is not certified by the Environmental Choice Program it must be certified by another agency in order to meet the specified requirements and receive tags. Either way, the heritage renewable generators will only receive tags if they are certified.

Furthermore, recommending that "*LSEs maintain their proportional rights to the tags from heritage generation*" overlooks what was stated in the preamble to Recommendation 2-14, notably "*the renewable aspects be assigned to existing customers*".

Recommendation 2-17

> *The EMGC recommends that heritage facilities be able to create and sell new tags to meet RPS requirements only upon becoming certified as renewable. The new tags would come from either a) incremental increases in production based upon expansion or technology upgrades; or b) the output of a facility that was significantly rebuilt in lieu of facility retirement.* [Page 16]

Tags should only be assigned to heritage facilities for any renewable electricity generated that exceeds a facility's maximum historical electrical output. The purpose of this is quite simple -- the electrical generation from a heritage facility is not being used to offset emissions from existing, non-renewable generation facilities. Only new renewable generation that exceeds heritage renewable generation can be considered to be causing an offset in emissions.

This recommendation implies that new tags would be additional to ones that the facility would get before being certified. As stated previously, according to TerraChoice, it is not possible to obtain tags for uncertified facilities.

Recommendation 2-18

> *The EMGC recommends that new renewable generators within Nova Scotia, on-line after December 2001, be eligible to sell tags to LSE's* [sic] *as the method of meeting the RPS targets* [Page 16].

The purpose of this recommendation is unclear, since all renewable generators with recognized certification and monitoring should be able to sell their tags to anyone, including local LSEs, as specified in Recommendation 2-11.

3 Meeting Nova Scotia's Kyoto commitments using RPS

In 2002, NSPI generated about 73 percent of its electricity from coal-fired thermal power stations or about 8,862 GWh of electricity [5]. As shown in the first section of this paper, Nova Scotia will be between two and three megatonnes over its Kyoto target by 2012, with the primary source of CO_2 emissions being electrical generation. In order to meet part of our Kyoto commitment, it will be necessary to make reductions in emissions from electrical generation.

A renewable portfolio standard is one way in which Nova Scotia can meet part of its greenhouse gas emissions target.

However, the EMGC's proposed RPS target of 3.2 percent of 2001 emissions is, at best, a modest goal. Under Recommendation 2-13, it was shown that 3.2 percent of 2001 emissions is about 350 GWh; amounting to roughly 0.35 megatonnes of CO_2 (see Appendix I). This is between 11 and 17 percent of Nova Scotia's projected emissions reduction to be met by 2012.

Another way of approaching this problem is to consider what type of impact would be made if the RPS target were a one-megatonne of CO_2 reduction by 2012 (the Kyoto compliance date).

To achieve a one-megatonne reduction would require Nova Scotia to replace 1,000 GWh from coal by 1,000 GWh from renewable sources (see Appendix II). The proposed RPS would require that, at the target date, LSEs produce tags amounting to 1,000 GWh of electricity (1,000 GWh is equivalent to the output of a single 115 MW power station running at 100 percent capacity, that is, continuously).

In order to achieve such a target by 2012 (i.e., the Kyoto deadline), it would most appropriate to introduce the renewables in a staged fashion. For example, starting in 2003 and ending in 2012 -- a total of 10 years -- would mean that 100 GWh of renewables would have to be added each year:

Year	GWh added	Total GWh
2003	100	100
2004	100	200
…	…	…
2012	100	1,000

As an example, 100 GWh of annual generation can be achieved by operating a single 30 MW wind farm at 35 percent capacity factor. (NSPI is presently pursuing an agreement for the supply of 100 GWh per year of wind power from an independent power producer [5].)

Each year the LSE(s) would issue a call for 100 GWh of certified, renewable, low-impact electricity. Potential generators would then bid for a multi-year contract (say 10 years, with an option to renew) that would guarantee a rate of return in exchange for the renewable low impact electricity (that is, the LSE would obtain the tags).

A common complaint about renewable electricity is that it is intermittent and is not necessarily available to meet the demand. It has been demonstrated in Denmark that by combining good meteorological forecasting and wind technology with biomass cogeneration, the intermittent nature of wind can be handled [8]. With this in mind, it would be advisable to incorporate a mix of renewable generation sources each year.

4 Recommendations for a Nova Scotia RPS

The following recommendations should be put in place for a provincial RPS:

- The RPS target should be for a one-megatonne reduction in CO_2 emissions.

  A one-megatonne reduction will require an annual growth of 100 GWh in renewables each year, starting in 2003 and continuing to 2012. One-megatonne will meet between one-third and one-half of the provincial reduction target.

- There should be a single-buyer market.

  A single-buyer market (each LSE buys electricity from renewable generators for sale to its customers) simplifies the overall design since it is a simple extension of what already exists today. Competition between generators exists, since each LSE is required to issue a call for their part of the 100 GWh of renewable electricity each year.

  A benefit of the single-buyer market is that competitive bidding will allow the LSEs to obtain the best-priced tags, thereby minimizing increases in the cost of electricity for their customers.

  The cost of the renewable electricity is to be rolled into the LSE's cost-of-service base.

- All LSEs must obtain sufficient renewable low impact electricity from provincial generators to meet their proportional fraction of the 100 GWh. LSEs can generate their own renewable low impact electricity to meet part or their entire fraction.

- LSEs that fail to meet their proportional fraction of the 100 GWh will be penalized at twice the average provincial tag value in the annual compliance period for each missing kWh.

- Heritage facilities should not be included in the RPS.

  These facilities were in place before the RPS, meaning that they cannot be considered to be offsetting any emissions from existing, non-renewable generation facilities.

- NSPI's Green Power Program must be modified to accommodate the proposed RPS.

  NSPI's Green Power Program allows customers to purchase blocks of 125 kWh of "green" power per month at a cost of $5.00 per block [11]. This translates into an extra four cents per kWh in order to "support" electricity

generated from renewable resources in Nova Scotia. This conflicts with TerraChoice's tags programme, where "the electricity from which Green Leaf™ TRCs [tags] came can in no way be represented or sold as 'green', as renewable low-impact or as having low environmental impacts" [16]. As already mentioned in Recommendation 2-11, when tags are separated from the electricity to be sold or to be used to meet a RPS requirement, that energy is then considered "null".

When the provincial RPS comes into force, NSPI must give its Green Power customers the tags, otherwise they would be profiting twice from the renewable energy - an action that goes against TerraChoice's policy.

5 Concluding Remarks

The EMGC's Second Interim Report makes a number of recommendations to do with renewables and a provincial Renewable Portfolio Standard. The driving force behind these recommendations came from the Energy Strategy's belief that renewables would provide new business opportunities, increase the efficiency of the electricity system, and contribute to Nova Scotia's commitment to a sustainable energy future. These beliefs cloud the true benefits that the province could achieve by considering the environmental benefits associated with renewable energy.

The recommendations pertaining to renewables are based entirely upon material obtained from TerraChoice. In some cases, there appears to be confusion over terminology, while in others, for example, a complete misunderstanding of what is meant by CO_2 credits.

The proposal for a provincial Renewable Portfolio Standard selected a starting date (2006) and target (3.2 percent) that fall far short of anything that would benefit either Nova Scotia's renewable energy industry or help the environment. In addition to this, the recommendation that heritage facilities should be used for emissions credits runs counter to the purpose of emissions credits and, based upon TerraChoice's definitions, is questionable whether the facilities would even qualify.

Perhaps the most disturbing aspect of the entire RPS recommendations is the fact that the EMGC appears to be aware of only two approaches to developing the RPS: making the RPS a percentage of the annual load or specifying a target in the final year. As shown in the paper, basing the RPS on the Texas model of annual energy-based purchase obligations offers numerous benefits to the generator, the LSE, and the consumer.

Part of this problem stems from the EMGC's push for competition by opening access to the grid by generators other than NSPI. Separating grid access from the development of the RPS would enable the province to meet a large portion of its Kyoto commitments.

The paper has showed that by using the Texas RPS model, an annual target could be established, allowing the orderly growth of renewables in Nova Scotia.

A target of 1,000 GWh would offset one-megatonne of CO_2 emissions from coal fired facilities. Such a proposal is achievable over a 10-year period, starting now, and incrementing in steps of 100 GWh.

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Appendix I. CO_2 emissions offset from 350 GWh

The CO2 emissions offset from 350 GWh of renewable energy can be calculated as follows:

- 1 kg CO_2 is produced for every 1 kWh of electricity from a coal-fired power station [6].
- 350 GWh is 350 x 10^9 Wh or 350 x 10^6 kWh
- Since 1 kWh produces 1 kg CO_2, 350 x 10^6 kWh produces 350 x 10^6 kg
- 350 x 10^6 kg is 0.35 megatonnes

Appendix II. Gigawatt-hours to Megatonnes

This appendix shows how many gigawatt hours it takes to produce one Mt CO_2 from a coal-fired generating station.

- 1 kg CO_2 is produced for every 1 kWh of electricity from a coal-fired power station [6].
- 1 Mt CO_2 is 10^6 tonnes CO_2 or 10^9 kg CO_2
- 10^9 kg (1 Mt) CO_2 is produced for every 10^9 x 1 kWh or 10^{12} Wh
- 10^{12} Wh is 1 TWh (terawatt-hour) or 1000 GWh

In other words, 1,000 GWh will produce 1 Mt of CO_2.