

Environmental Implications

Renewable Energy Scenarios in Nova Scotia

Prepared by Janis Rod, P.Eng.
Environmental Consultant

Prepared for Faculty of Management
Dalhousie University

As part of Scenario Development and
Stakeholder Consultation Process
to Increase Renewable Energy
Investments in Nova Scotia

Prepared October 2009

Contents

1	Introduction	1
1.1	Approach.....	1
2	Scenario 1 – “Blowing in the Wind”	2
2.1	Environmental Effects.....	2
2.2	Mitigative Measures	3
2.3	Risks and Opportunities	4
3	Scenario 2 – “Big Wind and Big Biomass”	4
3.1	Environmental Effects.....	5
3.2	Mitigative Measures	5
3.3	Risks and Opportunities	6
4	Scenario 3 – “Displacement and Tech Push”	6
4.1	Environmental Effects.....	7
4.2	Mitigative Measures	7
4.3	Risks and Opportunities	8
5	Scenario 4 – “Diversified Portfolio / Smart Grid”	8
5.1	Environmental Effects.....	8
5.2	Mitigative Measures	9
5.3	Risks and Opportunities	9
6	Relative Comparison from Environmental Perspective	10
6.1	Evaluation Matrix.....	10
	Table 1: Scenario Evaluation Matrix – Environmental Considerations.....	10
7	Best Practices	11
7.1	Policy Tools to Promote Diversity	11
7.2	Multilevel Stakeholder Engagement.....	11
7.3	Strategic Environmental Assessment.....	12
7.4	Clear Direction from Government	12
7.5	Encourage Partnerships	12

Appendix A – Bibliography

1 Introduction

This paper conceptually presents the potential environmental costs and benefits of the renewable energy scenarios that were constructed by stakeholders during the initial consultation session on September 10, 2009. This is part of the overall scenario development and stakeholder consultation process to meet Nova Scotia's renewable energy target of 25% by 2015. From an environmental perspective, mitigations, risks and associated opportunities are presented for each conceptual scenario. Best management practices are recommended for delivery of renewable energy targets in Nova Scotia based on past studies and research, including references to models from other jurisdictions.

As the scenarios are illustrative not predictive, these four scenarios exist at a conceptual level. Assumptions were broadly made within the scenarios to ensure the comparison of like features. While these assumptions are somewhat subjective given the conceptual level scenarios, they are required for comparison. Key assumptions are mentioned as appropriate throughout this paper.

1.1 Approach

To allow for comparison between the scenarios, an approach typical of Environmental Impact Assessments (EIAs) was used to allow systematic comparison from an environmental perspective. This analysis was completed at a level of "50,000 feet" and is not meant to be either a strategic or a project level EIA.

An EIA typically uses Valued Environmental Components (VECs) for a rigorous assessment of ecological and socio-economic components. In this case, the specific VECs were broadly assessed in groupings related to atmospheric environment, aquatic environment, terrestrial environment and communities.

Valued Environmental Component (VEC)	Key Indicators
Atmospheric Environment	Air quality Climate Noise
Aquatic Environment	Freshwater Species and Habitat Marine Species and Habitat Species at Risk Water Quality
Terrestrial Environment	Avian Species Biodiversity Fauna Flora Species at Risk Wetlands
Communities	Archaeological resources Health and safety Land use Landscape aesthetics Natural resource uses Recreation Traditional use by aboriginal peoples

Although social and environmental issues are addressed specifically in two other expert papers, issues relating to communities are included from a broad socio-economic perspective as per typical EIA scoping. From an environmental lens, this allows issues to be included, such as natural resource uses (e.g., potential risk to marine fishery, etc.) to landscape aesthetics (e.g., potential impact on views from wind turbines). The indicators are generally in accordance with the definition by the Environmental Choice Program for renewable, low impact electricity.

Where cumulative effects are identified in this conceptual review, their potential effects are noted relative to each scenario. The broader issue of cumulative effects is also addressed in review of best practices.

These scenarios were not compared with the base case of the status quo (i.e., the “do nothing” scenario). Meaning the benefits of meeting the renewable energy target was assumed constant and is not included in this assessment.

2 Scenario 1 – “Blowing in the Wind”

Achieving the 2015 renewable target primarily with wind energy will require more than an order of magnitude increase in the number of wind turbines now operating in Nova Scotia¹. Based on the comments at the stakeholder session on September 10, 2009, offshore wind is not a feasible alternative by 2015. Accordingly, all wind development is assumed to be land based by 2015. Marine related implications of offshore wind are mentioned briefly as part of Scenario 3.

To stabilize the resource and/or supplement the renewable energy produced by wind, imports are required. This will minimize the starting and stopping of existing thermal units which provide base load. The sources of imported renewable energy are varied (e.g., hydro from Quebec or Newfoundland, etc.). For purposes of the evaluation, only land based transmission of imports are considered as with Scenarios 3 and 4 (i.e., effect of underwater cables, etc. are not considered). In part, this is due to the variance of sources for imported energy and the understanding that energy from the Lower Churchill project is not expected to be available by 2015 (based on output from September 10th consultation session).

Storage of energy produced by wind turbines can offset the intermittent nature of wind energy (i.e., allowing energy to be stored during periods of high production / low demand for generation during low production / high demand periods). There are many storage technologies that are being researched and developed². Because of the multiple options for storage, uncertainty of extent that storage will be applied, and associated variance of environmental effects, these are not explicitly considered in scenario evaluation.

2.1 Environmental Effects

The potential environmental effects for Scenario 1– relative to other scenarios – are listed below under the VEC groupings. Where there are gaps due to uncertain deployment or best management approaches, these uncertainties are noted.

¹ While there are varying opinions on the feasibility of development of wind to this extent by 2015, it is presented for comparison.

² One such project is a hydro/wind facility in Cape Breton, which is currently under environmental impact assessment.

Atmospheric Environment

- Depending on transmission grid, imports and storage capacity, the intermittent nature of wind energy could require “starting and stopping slow-response thermal units (some of these units may take days to shut down and restart)” (Hatch, 2008). There is a currently a high level of uncertainty on effect to both air quality and climate³; therefore, this is considered a moderately negative risk.
- Noise is defined as unwanted sound. By this very nature, it is subjective though there is a measureable effect on the physical environment (i.e., dbA) which can effect nearby communities and fauna in some cases. Given the magnitude of “push” required for wind energy development in this scenario, noise is considered a moderate risk if siting is not completed with this consideration in mind.

Aquatic Environment

- As effects of storage and imports are not considered in this analysis, there are no linkages. Depending on alternatives, both could negatively impact marine or freshwater species and habitat.
- There is potential effect on water quality and perhaps aquatic habitat due to construction of wind farms; however, with standard management practices during construction and appropriate siting, any effect is expected to be insignificant.

Terrestrial Environment

- Avian species (e.g., birds and bats) could be negatively impacted from operating turbines if siting is not done with sensitivity (e.g., migratory bird and raptor flight paths, bat hibernacula, etc.). With appropriate studies and siting, effect is expected to be minor or insignificant; however, cumulative effects needs to be considered in the assessment process.
- There is potential negative effect on other terrestrial indicators due to construction of wind farms (e.g., species at risk, wetlands); however, with appropriate siting and standard management practices during construction, any negative effect is expected to be insignificant.

Communities

- Impacts on land use (e.g., concerns of nearby residences including noise, shadow flicker, etc.) and landscape aesthetics (i.e., view plane) can be an adverse effect of wind farms. With appropriate siting, this should be avoided; however, with the magnitude of “push” required for wind energy development in this scenario, this is considered a moderate risk (i.e., if siting inappropriate as discussed for noise).
- There is potential effect on other community issues due to siting of wind farms (e.g., archaeological resources, recreation, traditional uses by aboriginal peoples); however, with appropriate siting, negative effects are expected to be insignificant.

2.2 Mitigative Measures

To offset the environmental effects, three broad initiatives would be required to enable success of Scenario 1. The very nature of these three recommended enablers emphasizes consultation. Because of the strong focus of wind in Scenario 1 and its inherent relationship with local community, this is key to its success. These initiatives are:

³ This process may produce emissions (e.g., carbon dioxide, sulphur dioxide, nitrous oxides, particulate, mercury, etc.) to the air from existing generating plants which may not occur under other renewable energy scenarios.

- Promote a mixture of size, location, etc. of wind farm developments to balance integration into the grid, but also balance ecological and community effects; this can be achieved by diversity of contractual and financial mechanisms to encourage both “big” and “small” wind.
- Build on existing initiatives⁴ with specific guidance on siting; this could be achieved by evaluating options for wind farms at the strategic level, such as with strategic environmental assessment (SEA).
- Provide an objective resource for wind energy information which would include information for developers, communities and community developers.

2.3 Risks and Opportunities

There are risks associated with a strong “push” of wind energy:

- Opposition to projects that are seen as negative to environment – whether atmospheric, aquatic, terrestrial or community. The strong push for wind may result in projects proposed (or perhaps constructed) with undesirable results. This could be a showstopper for other wind energy developments (i.e., ultimately slow or even stop planned projects). Poorly planned projects will affect the wind industry as a whole, not just the one project.
- Where there is uncertainty in expectations or the regulatory process is unpredictable, the developers have high risks to invest in a project that may not succeed, and stakeholders do not have a clear path for contributing to the process.
- On the contrary, regulations or bylaws can also be showstoppers when they are too constraining. For example, a limiting set-back bylaw can effectively remove many candidate sites from consideration, where in many cases, adverse effects could be mitigated / avoided.

In short, poor consultation and unclear governmental guidance are risks. They are risks to all scenarios; however, Scenario 1 is especially sensitive because of the single focus on one resource.

There are several benefits of Scenario 1 in relation to other three scenarios. Effects of wind energy are fairly well understood due to international experience with wind energy and maturing experience locally. There are virtually no effects on terrestrial and aquatic environs (based on simplistic assumptions noted) where appropriate studies, siting and industry standard construction techniques are used (e.g., avian studies as per Canadian Wildlife Service requirements). As this scenario relies heavily on one energy resource, consultation can be seen as simple due to the relative uniformity of wind energy as the renewable energy solution.

3 Scenario 2 – “Big Wind and Big Biomass”

In relation to the prior scenario, half of the wind energy would be required; this would be supplemented by combustion of forest biomass⁵. Biomass provides a backup to wind (i.e., reducing need for storage, thermal load, etc.). It can to some extent replace coal in existing thermal power plants.

⁴ In Nova Scotia, these include the Nova Scotia Wind Atlas, Model Wind Turbine Bylaws and Best Practices for NS Municipalities, EIA guidance document for wind turbines and birds by Canadian Wildlife Services, and Nova Scotia Environment’s Proponent’s Guide to Wind Power Projects.

⁵ Scenarios 3 and 4 assume contribution from both forest and non-forest biomass, whereas Scenario 2 illustrates only forest biomass via conventional harvests on forested lands in Nova Scotia, not including treetops and branches.

Extent of sustainable use of forest biomass as a renewable energy source in Nova Scotia is highly controversial. This is due to the existing gaps in knowledge on capacity of existing forestry in Nova Scotia and public concerns with encouraging unsustainable forestry practices⁶. There are no specific assumptions made on the forestry practices used; rather the existing knowledge gap is identified as a risk. Work is underway in Nova Scotia to understand the availability of sustainable forest biomass for use in existing coal fired power plants and other uses as renewable energy.

Further, there valid questions about the most appropriate role of biomass in the energy mix (e.g., electricity production, residential heating, etc.). Integrating biomass into combined heat and power (CHP) projects serves to address this concern. Though CHP was not explicitly defined in Scenario 2, it is noted in this review of environmental implications.

3.1 Environmental Effects

The potential environmental effects for Scenario 2 – relative to other scenarios – are listed below under the VEC groupings. These are additional issues to those identified in Scenario 1; however, cumulative effects are reduced (e.g., noise, birds / bats, land use, aesthetics). As discussed in Scenario 1, these potential adverse effects of wind can be successfully mitigated (Section 2.2). Where there are gaps in knowledge due to uncertain deployment or best management approaches for use of forestry biomass, these uncertainties are noted.

Atmospheric Environment

- Potential exists for air quality effects, such as particulate, nitrous oxides, etc. from combustion of forestry biomass (i.e., as compared to other scenarios with little or no combustion).
- There is some debate on carbon neutrality; this is a function of forestry management.

Aquatic and Terrestrial Environments

- Terrestrial biodiversity (e.g., flora, fauna, species at risk, etc.) has potential for impact from any additional harvesting that may occur; appropriate study is required in Nova Scotia.
- Potential exists for negative effects on water quality and wetlands. Via compliance with existing regulations, suitable protection will be in place such that expected effect is expected to be insignificant.

Communities

- Potential effect on uses of crown or private lands where any additional biomass is harvested; this could adversely impact natural resource use, recreation and traditional uses by aboriginal peoples.

3.2 Mitigative Measures

In addition to the enablers specific to high roll out of wind energy in Scenario 1 (i.e., promote a mixture of projects, build on existing initiatives and provide information resources), mitigative measures specific to Scenario 2 (i.e., forest biomass) include:

⁶ Independent agency, CRA, completed polling on behalf of Nova Scotia Power on renewable energy; biomass showed relatively low support based on polled NSP customer panel (i.e., 32% approval versus 99% approval for wind)

- A Nova Scotia specific study on ability to sustainably harvest, in terms of volumes, species, and practices, including harvesting and reforestation. Ecosystem services must be considered in the evaluation. Many lessons can be learned from abroad, but a Nova Scotia specific study is required at an ecosystem level.
- With standard industry practices, including compliance with regulations, potential adverse effects on air quality, watercourses, etc. can be mitigated (e.g., appropriate combustion controls to reduce air emissions, etc.).
- Regulations and guidelines can ensure sustainable harvesting and forestry management; these can be based on guiding principles (e.g., Forest Stewardship Council, etc.); however, the defined recommendations must be eco-region specific.
- As with Scenario 1, it is important to consult with stakeholders at all levels, from forestry companies to concerned citizens to environmental groups. Through this transparent consultation process, information can be shared. This should be part of the study on ability to sustainably harvest forest biomass. Given information gaps on volume of sustainable harvest in Nova Scotia, sharing of information is especially important for Scenario 2.

3.3 Risks and Opportunities

There is a risk of insufficient ecosystem availability of forest biomass in the volume required for this scenario. Similarly if volume exists for a sustainably harvest, but suitable practices are not followed (e.g., lack of standards, or lack of enforcement), additional projects will not easily proceed, if at all. The main opposing factor would be public opposition as very strong concerns exist about potential loss of ecological diversity and services if large volumes of biomass are “clear cut”. This pressure can indeed stop or slow projects; therefore, transparent dialogue is needed about ongoing and further studies on use of forest biomass for electricity production. There must also be a holistic review of best uses of forestry biomass in terms of energy production as a whole (e.g., electricity versus heat).

By combusting biomass, there is a base load power that can more easily offset other renewables as required by the existing grid; this reduces the need for fossil fuel base load power as noted for Scenario 1. Use of CHP or other “spin off” technology (e.g., wood pellets, cellulosic biofuels, etc.) has an added benefit of reducing fossil fuel for heat. By adding biomass to Scenario 1 and reducing amount of wind turbines, cumulative effects of wind alone are reduced.

4 Scenario 3 – “Displacement and Tech Push”

The concept behind Scenario 3 is focused application of renewable energy technologies that are now confined to small scale or in research and development phases. That is, this scenario is a commercial “push” behind innovative technologies using resources of ocean energy, solar energy and non-forest biomass; these account for about one third of the target in this scenario. Displacement of energy use also accounts for 20% whereas wind and forest biomass each account for 10% of the new renewable mix.

Because the impetus of this scenario is both “diversity” and the “unknown”, there are associated risks and benefits. Further, the review is more challenging due to uncertainties (e.g., type of non-forest biomass, additional ocean energy technology, etc.). Accordingly, gaps or assumptions are identified as appropriate.

4.1 Environmental Effects

The potential environmental effects for Scenario 3 – relative to other scenarios – are listed below under the VEC groupings. Because of the diversity of the renewable energy technologies and the use of ‘novel’ technologies, it would be more difficult to predict the cumulative effects – as compared to Scenario 1 or 2.

Atmospheric Environment

- Potential negative atmospheric effects noted in prior scenarios (wind and forest biomass) are minor. This is more than offset by reduced emissions from fossil fuel combustion due to displacement at 20%.
- Non-forest biomass effects are considered negligible with standard emission control – especially when coupled with potential reduction in other greenhouse gases and increased energy efficiency.

Aquatic Environment

- Adverse effects to marine species and habitat are possible due to tidal power projects. A SEA was completed and monitoring is underway on Fundy demonstration projects (OEER Association, 2008); however, this scenario pushes the development of tidal above planned implementation which increases risks (i.e., due to reduced timeframe for environmental effects monitoring, consultation, etc.).
- Other potential effects to marine environment from other ocean technologies (e.g., offshore wind, wave energy, etc.). Sufficient staged studies would be required similar to Fundy tidal power.
- Potential other impacts may occur to water quality (e.g., biomass harvesting and handling, metals in solar technologies, etc.). With proper environmental management practices, this is not considered likely; however, due to uncertainty and diversity, cumulative effects will be difficult to identify.

Terrestrial Environment

- Effects on terrestrial environment from a lower dependence on forest biomass (i.e., 10%) are considered to be insignificant assuming appropriate management techniques.
- There is an uncertainty on feedstock for non-forest biomass (i.e., 20%) and its potential impacts on terrestrial environment. Additional information is needed; however, impacts are expected to be minor with appropriate environmental management practices.

Communities

- Communities may have concerns associated with traditional uses by aboriginal peoples and natural resource uses (e.g., concerns about lobster fishery associated with ocean technologies), in addition to the concerns associated with other renewable energy projects identified in prior scenarios. Given the diversity in Scenario 3, the community effects may also be more diverse; however, there is still a disproportionate effect on rural communities (as with other scenarios).

4.2 Mitigative Measures

As Scenario 3 involves pushing evolving technologies forward, this can only be achieved by appropriate environmental assessment with associated follow up monitoring for effects. Follow up monitoring is especially important with emerging technologies where effects are more difficult to predict.

Specific mitigative measures will be as diverse as the renewable energy technologies selected.

Determination of these enablers will be determined in the environmental planning and assessment process.

Similar to other scenarios but perhaps with a slightly different emphasis for Scenario 3, there is a strong need for well crafted policies and guidelines to support the final strategy and a multi-level and multi-sector consultation program which adeptly seeks and shares information on the diverse technologies / projects.

4.3 Risks and Opportunities

There is a significant risk with the strong push of high tech / unproven renewable energy generation; that is, there is a concern related to developing renewable energy projects at a speed that does not suit the maturity of the technology. If this push occurs without the appropriate environmental review at all stages from planning to implementation, it is a risk.

If the requisite environmental effects monitoring shows that a technology, approach, or a specific project is showing significant environmental effects, this will jeopardize the type of projects or technology. Due to diversity in the renewable energy portfolio, this may not jeopardize the entire scenario if other technologies prove to be successful.

As with all other scenarios, ineffective regulations (either constraining or without suitable protective measures) and strong stakeholder opposition are risks to successful implementation of Scenario 3.

The main benefits of Scenario 3 in relation to other three scenarios are:

- displacement of traditional energy (e.g., CHP, etc.) and associated fossil fuel reduction;
- increased efficiency via development of new technologies / eco-efficiencies; and
- associated reduction in GHGs via displacement, technology and reduced methane (e.g., landfill gas).

5 Scenario 4 – “Diversified Portfolio / Smart Grid”

Scenario 4 is a moderated version of the latter scenario; this is, resources are developed in proportion to their perceived capacity. Approximately three quarters of the target is comprised of wind (35%), imports (20%) and forest biomass (20%), the “high tech” renewables proceed at a slower pace (i.e., ocean, solar and non-forest biomass) and displacement remains a part of the mix as per Scenario 3. The addition of the “smart grid” reduces peak power load requirements.

This scenario is less of a technological “push” than Scenario 3; therefore, there is an appearance of less risk of unplanned environmental impact. Like Scenario 3, this scenario is also “diverse”; however, there are less “unknowns”. Still there are challenges to defining the scenario for the review of environmental implications. Accordingly, gaps or assumptions are identified as appropriate

5.1 Environmental Effects

The potential environmental effects for Scenario 4 – relative to other scenarios – are listed below under the VEC groupings. Impacts are varied; they consist of a combination of effects from three prior scenarios, but in reduced magnitude. Because effects are varied, cumulative effects are difficult to predict (like Scenario 3); however, unlike Scenario 3, there are less unknown technologies and increased “traditional” technologies (i.e., wind, forest biomass).

Atmospheric Environment

- Noise from turbines is still a potential issue but with less intensity from Scenarios 1 and 2; therefore, it should be feasible to reduce effects with key mitigations for wind developments.
- Emissions from biomass combustion are also reduced from Scenario 2 and would be expected to be insignificant with appropriate mitigations.
- Use of “smart grid” technologies is expected to shave peak loads instead of adding capacity; accordingly, reduced emissions from combustion of fossil fuels result. This benefit is further enhanced as Scenario 4 includes displacement (as per Scenario 3).

Terrestrial and Aquatic Environment

- Potential effects are as per those listed in other scenarios (e.g., marine fishery, avian species, etc.); however, effects are expected to be minimal with appropriate mitigations (e.g., appropriate siting, environmental effects monitoring and followup, etc.) as there is reduced “push” of novel technologies in Scenario 4.

Communities

- Potential effects on communities is expected to be diverse – both in terms of type of impact and in terms of location. These are expected to be insignificant with application of best practices.

5.2 Mitigative Measures

The enablers required for Scenario 4 are a collection of broad mitigative measures from the other three scenarios. Because Scenario 4 is a diversified, balanced portfolio, a comparable mix of enablers is required. These enablers have been common to the scenarios though required at various levels and with different focuses. They include: a mixed bag of policy tools; broader environmental planning, assessment and follow up; meaningful consultation, including two-way information sharing; and government guidance on framework for renewable project development. These broad recommendations are presented in further detail in Section 7.

5.3 Risks and Opportunities

From an environmental perspective, this diversified energy generation portfolio cannot be achieved without appropriate environmental review at all stages from planning to implementation and monitoring of environmental effects to determine if a technology, approach, or a specific project is showing significant environmental effects. There is a significant risk in pushing forward any renewable energy scenario without meaningful consultation of stakeholders as opposition can be a showstopper as with all other scenarios.

Relative to all four scenarios, there are significant benefits to Scenario 4. There is an expected reduction in fossil fuel combustion via “smart grid” and displacement, as well as potential for increased eco-efficiencies (as per Scenario 3). A balance of more “traditional” technologies (e.g., wind, biomass) with novel technologies (e.g., ocean technology, solar) increases overall understanding of potential environmental effects within this scenario. This diversity likely also reduces the cumulative effects (as per Scenario 3).

6 Relative Comparison from Environmental Perspective

This high-level review includes a relative comparison of the scenarios from an environmental perspective. In order to provide a comparative snapshot, an evaluation matrix was prepared using the environmental impact criteria (i.e., VECs).

It was assumed that the environmental implications of each scenario are based on the typical “industry standards” for implementation of the renewable energy; that is, current approaches in Nova Scotia for project development are assumed. These include project level EIAs, information sharing with communities, and standard environmental management approaches in project construction and operation.

Where there are not yet “industry standards” in Nova Scotia for a particular aspect of a scenario, the potential risks are identified as potentially negative impacts. Accordingly, a lower ranking is not an indication of likelihood of negative effect, but rather an indication of potential risk or information gaps.

6.1 Evaluation Matrix

The matrix was prepared to semi-quantitatively present the evaluation of the four scenarios from an environmental lens.

The ratings are based on application of standard environmental best management practices (e.g., typical emission control for biomass combustion, etc.). In terms of the relatively new experience with renewable energy projects in Nova Scotia, many best practices are evolving as our collective knowledge improves; that is, suggested enablers are not yet assumed to be “enabled”. As such where uncertainty is high for an adverse effect, this will increase the negative aspect of the rating accordingly.

For each criteria category, i.e., VEC or issue grouping, the effect is rated on a scale of 1 to 5, where 1 implies a major risk of adverse effect, 2 implies a moderate risk of adverse effect, 3 implies an insignificant or no expected effect, 4 implies an expected moderately positive effect and 5 implies an expected majorly positive effect. Where no linkages are expected between the scenario and the VECs, or the potential effect is unknown based on uncertainty of conceptual level scenarios, a neutral rating of 3 is provided.

Table 1: Scenario Evaluation Matrix – Environmental Considerations

	Scenario 1 <i>Blowing in the Wind</i>	Scenario 2 <i>Big Wind and Big Biomass</i>	Scenario 3 <i>Displacement Plus Tech Push</i>	Scenario 4 <i>Diversified Portfolio / Smart Grid</i>
Atmospheric	2	2	4	5
Aquatic	3	3	2	3
Terrestrial	2	1	3	3
Communities	2	2	2	3

The attempt is not to provide a total score for each alternative, but rather to compare across scenarios for a variety of groupings of VECs and issues. Again, recall that the ranking is relative across the scenarios and does not include benefits of the constant in each scenario, which is meeting the 25% renewable energy target and the associated improvements to atmospheric environment.

7 Best Practices

When renewable energy development is compared to the “do nothing” scenario, a net benefit can almost always be argued; however, specific risks exist – to the atmosphere, aquatic and terrestrial species and habitat, and / or communities. These can often be avoided or mitigated with best practices. Through these broad recommendations for best practices, environmental risks can be mitigated and potential opportunities can be maximized. Indeed, renewable energy provides opportunities for Nova Scotia and its citizens from environmental, social and economic perspectives (e.g., sustainable use of biomass can increase competitiveness of industries), that is truly sustainable prosperity.

7.1 Policy Tools to Promote Diversity

Numerous policy tools should be applied to promote diversity in projects, including combinations of feed-in-tariff (FIT) and modified request for proposals (RFP). From an environmental perspective, diversity reduces cumulative effect on one ecosystem, community or indicator. Diversity in terms of size, location, type and ownership of renewable energy projects reduces negative effects and maximize benefits – typically to the community.

Policy tools should emphasize both efficiency and displacement – regardless of their inclusion in the 25% target.

7.2 Multilevel Stakeholder Engagement

Stakeholder consultation can never be over emphasized. Stakeholders range from local residents to renewable developers to aboriginal communities. It needs to be multilevel and it needs to be meaningful. This project is the first step.

“Most countries which are considered leaders in RE development have (or used to have) a capacity building component as part of their RE policy frameworks. In many cases this was a clearinghouse and/or advice centre of some sort.”

(p.25, Lipp, 2008)

“Denmark’s success in installing so much wind-energy capacity has been attributed to numerous factors including (1) the relatively small size of wind projects (1-30 turbines), (2) cooperative ownership of many wind projects with direct benefits to local citizens, and (3) comprehensive planning and review in which localities directly participate.”

(p.184, Committee on Environmental Impacts of Wind Energy Projects, US National Research Council, 2007)

Beyond typical consultation (e.g., project “open house”), the stakeholders need to be truly engaged. This can be facilitated via various tools at the local or project specific level; however, the Province can facilitate this engagement via supporting capacity building. This may be: a clearing house operated by an objective non-governmental organization; local training for community groups interested in energy projects; or support to Regional Development Authorities, towns and municipalities in their regional energy planning.

7.3 Strategic Environmental Assessment

SEA is an EIA from the 10,000 ft level; meaning it is an EIA completed on plans or policies rather than specific projects. SEA was completed for the tidal energy development options in the Bay of Fundy; it set the framework around the project-specific EIAs (i.e., ground level) and makes policy recommendations. Similar SEAs could be completed for other specific resources, such as wind development, forest biomass, etc. Use of SEA as a planning tool allows cumulative effects to be assessed more clearly at the outset.

“SEA is a special future-oriented environmental assessment process that takes place before specific projects are considered. It provides opportunities for stakeholders to influence decisions relating to planning, policies, regulation and management, and is an effective tool to help decision-makers promote sustainable development. SEA is proactive rather than reactive, and focuses on defining goals and objectives and then evaluating alternative means of achieving them.”

(pp. 3-4, OEER Association, 2008)

“... there is a "one-stop-shop" approval procedure where the project developer collects all approvals (environmental, building, power production) from one entity: the local authority [or regional for larger developments]. Also the local authorities are responsible for pointing out locations suitable for wind power production as part of their physical planning. Similarly for offshore projects, the Energy Authority is responsible the siting for wind power and is the one-stop-shop approval authority.”

(p.25, Ea Energy Analyses, August 2008)

7.4 Clear Direction from Government

Where projects have clear expectations (e.g., baseline studies, levels of consultation, modeled parameters, etc.), developers and stakeholders have comfort in the process. Clear direction is required from government in terms of framework for development of renewable energy. This will increase transparency, reduce risk to developers, decrease barriers for smaller ownership, and increase acceptance. Smart policy and adoption of clear guidelines for application of these technologies is essential. Support of municipal government, e.g., perhaps through Statement of Provincial Interest or Municipal Government Act or via Union of Nova Scotia Municipalities, is key as municipalities are on the “front lines” of renewable energy development.

7.5 Encourage Partnerships

Finally, regardless of size, type and management of renewable energy projects, there are opportunities to partner. This may range from a formal agreement with Mi'kmaq First Nation communities or informal community liaison with local residents' groups. Partnership is not exclusive to ownership, though this should be part of the mix. The existing partnership between NS Community College and Nova Scotia Power is an excellent example.

“The Aboriginal Energy Partnerships Program seeks to maximize First Nations and Métis participation while helping to build the province's energy supply. The program will provide funding for many of the key developmental stages needed to bring projects on stream, including: community energy plans, feasibility studies, resource assessment, technical research, developing business cases and the creation of an Aboriginal Renewable Energy Network.”

(Ontario Power Authority, September 2009)

Appendix A – Bibliography

- Barry, J., Ellis, G., Robinson, C. (2008, May). Cool rationalities and hot air: A rhetorical approach to understanding debates on renewable energy. *Global Environmental Politics*. 8(2), 67.
- Bergmann, A. Colombo, S. Hanley, N. (2008, April). Rural versus urban preferences for renewable energy developments. *Ecological Economics*. 65(3), 616-625.
- Centre for Politiske Studier. September 2009. *Wind Energy – The Case of Denmark*.
- Committee on Environmental Impacts of Wind Energy Projects, National Research Council. 2007. *Environmental Impacts of Wind-Energy Projects*. The National Academies Press. Washington, DC.
- Dalhousie University. Faculty of Management. 2009. Draft for Comment - Nova Scotia Renewable Energy Strategy – Scenarios and Policy Options.
- Devine-Wright, P. (2005, February). Local aspects of UK renewable energy development: exploring public beliefs and policy implications. *Local Environment*, 10(1), 57-69.
- Devine-Wright, P. (2005, April-June). Beyond NIMBYism: towards an integrated framework for understanding public perceptions of wind energy. *Wind Energy*, 8(2), 125-139.
- Environment Canada. Canadian Wildlife Service. June 28, 2006. *Wind Turbines and Birds: A Guidance Document for Environmental Assessment*.
- Ea Energy Analyses. August 2008. *Large Scale Wind Power in New Brunswick - A Regional Scenario Study Towards 2025*. Prepared for the New Brunswick System Operator and the New Brunswick Department of Energy.
- Ecology Action Centre. December, 2008. *Forest Biomass Harvesting for Energy: Recommendations for Nova Scotia*.
- Energy Sustainability Partnership Joint Advisory Committee. June 2009. *The Partnership for Advancing Energy Sustainability – Findings from Stakeholder Consultations*.
- Electricity Marketplace Governance Committee. Final Report. Prepared for the Province of Nova Scotia.
- Environmental Choice^M Program. February 2006. Certification Criteria Document (CCD-003). Product: Electricity - Renewable Low-impact.
- Hatch Ltd. 2008. *Nova Scotia Wind Integration Study – Final Report*. Prepared for the Nova Scotia Department of Energy.
- Jacques Whitford. January 2008. *Model Wind Turbine By-laws and Best Practices for Nova Scotia Municipalities*. Prepared for Union of Nova Scotia Municipalities.

- Johansson, T.B. and W. Turkenburg. (2004). Policies for renewable energy in the European Union and its member states - an overview. *Energy for Sustainable Development*, VIII(1), pp. 5-24.
- Lipp, Judith. February 2008. *Achieving Local Benefits: Policy Options for Community Energy in Nova Scotia*. Prepared for Department of Energy.
- McLaughlin, J. Smith, M. (2002, September-October). Power of the people: Public awareness and involvement in renewable energy in Scotland. *Refocus*. 3(5), 26-29.
- Nova Scotia Department of Energy. January 2009. *Toward a Greener Future – Nova Scotia’s 2009 Energy Strategy*.
- Nova Scotia Department of Environment. May 2007 (Updated September 2009). *Proponent’s Guide to Wind Power Projects: Guide for preparing an Environmental Assessment Registration Document*.
- Nova Scotia Department of Environment. January 2009. *Toward a Greener Future – Nova Scotia’s Climate Change Action Plan*.
- Nova Scotia Power. nd. *Customer Energy Forum 2009 Booklet*.
- Offshore Energy Environmental Research Association. April 2008. *Fundy Tidal Energy Strategic Environmental Assessment Final Report*. Prepared for the Nova Scotia Department of Energy.
- Ontario Power Authority. September 2009. *OPA Initiatives – FIT Support Programs*.
www.powerauthority.on.ca
- Peel, Deborah & Lloyd, Michael Gregory (2007). Positive Planning for Wind-Turbines in an Urban Context. *Local Environment*, 12 (4), 343-354.
- Prest, D. Simpson, D. Forest. October 2009. *Biomass Energy Report II: Potential for Small-Scale, Community-Based Biomass Energy Projects in Nova Scotia*.
- Province of Nova Scotia. (April 13, 2007). Bill No. 146. Chapter 7 of the Acts of 2007: *An Act Respecting Environmental Goals and Sustainable Prosperity*.
- Public Works and Government Services Canada. 2004. *Strategic Environmental Assessment – The Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals*.
- Rogers, J.C. Simmons, E.A. Convery, I. Weatherall, A. (2008, November). Public perceptions of opportunities for community-based renewable energy projects. *Energy Policy*, 36(11), 4217-4226.
- Simpson, J. October 28, 2009. *Forest Biomass Energy Report I: Forest Sustainability – Submission to Dr. Wheeler and team*.