Report No. 087557-RE002


Prepared for:

Inverness County • Port Hawkesbury • Richmond County
Strait - Highlands
Regional Development Agency

# Partners for Climate Protection

## Milestone 2 Final Report

December 2008

CBCL LIMITED
Consulting Engineers

ISO 9001
Registered Company

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| Issued for 100% Submission | | 5-Dec-08 | |
| Issued for Review | David Lea | 31-Oct-08 | Anthony Hlahatsi |
| ***Issue or Revision*** | ***Reviewed By:*** | ***Date:*** | ***Issued By:*** |

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# EXECUTIVE SUMMARY

The Strait Highlands Region, consisting of the Municipalities of Inverness and Richmond, as well as the Town of Port Hawkesbury, became a member of the Partners for Climate Protection (PCP) programme in 2004. Like all member communities to the PCP programme, the Strait Highlands Region's municipalities have committed to combating climate change through strategies that reduce greenhouse gases (GHGs). The PCP programme is led by the Federation of Canadian Municipalities (FCM) and the International Council for Local Environmental Initiatives (ICLEI) - Local Governments for Sustainability. The PCP programme is a network of many Canadian municipal governments, all of whom have committed to GHG emission reductions in their municipal operations/facilities and in the wide communities that they serve.

The PCP programme GHG emissions reduction framework is comprised of five milestones as follows:

Milestone One: Creation of GHG emissions Inventory and Forecast
Milestone Two: Setting a Target for GHG emissions reduction
Milestone Three: Development of a Local Action Plan (LAP)
Milestone Four: Implementation of the Local Action Plan
Milestone Five: Measurement of Progress and Reporting Results

PCP recommends reduction targets of 6% for communities and 20% for corporate (municipal) emissions below the base year GHG emission levels. For the Strait Highlands Region, 2005 was selected to be the base year, while 2015 is the target year when it is expected that the region will have developed and implemented action items arising from the Local Action Plan in order to meet GHG emission reduction targets.

This report forms the conclusion of Milestone Two, which sets GHG emission reduction targets for the Strait Highlands Region community and the three municipalities. The work involves the review of community and municipal inventories compiled in Milestone One. Where additional information that was not available by the completion of Milestone One has become available since that time, this information was used to verify the GHG emissions inventories and forecasts that were released in Milestone One.

Inventory review and verification allows for more accurate forecasts under various emission scenarios. In order to set reasonable GHG emissions reduction targets, work was done to estimate the resources available in the region, as well as the opportunities that both the community and the municipalities can deem feasible for supporting and completing within the available means. This exploration of possibilities was conducted through audits, review of energy asset mapping for the region, assessment of demand side management opportunities and consultations with the communities and municipal leaders. The results revealed that some progress has been made in certain areas since 2005 through the Strait Highlands Green Action and other combined community and municipal activities. Furthermore, there are several other potential programmes, projects and policy improvements that are in the plans for implementation in the near future.

Assessment of the potential for regional GHG emission reductions led to the setting of the Community GHG Reduction Target for the entire community of the Strait Highlands Region, as well as individual reduction targets for each of the Municipalities.

Under a realistic scenario, the Strait Highlands Region Community has ample opportunity to reduce GHG emissions by 18% below their 2005 baseline emissions. **It has been recommended that the Strait Highlands Region Community adopts a GHG emissions reduction target of 18% below their 2005 baseline GHG emissions level**.

Recommended Corporate GHG emission reduction targets for the three Municipalities within the Strait Highlands Region are summarised as follows:

| MUNICIPALITY | REDUCTION TARGET |
|---|---|
| **Inverness** | **21%** |
| **Richmond** | **20%** |
| **Town of Port Hawkesbury** | **20%** |

# 1 REVIEW OF MILESTONE ONE

The main purpose of Milestone One was to create a greenhouse gas (GHG) emissions inventory as well as a forecast of future emissions for the Strait Highlands Region. A forecast of future GHG emissions was made based on three potential scenarios; Business-As-Usual (BAU), Optimistic and Realistic. Additionally, statistics on energy use were incorporated into the Milestone Two report in order to determine what areas offered the greatest potential for GHG emission reductions.

Due to the fact that no detailed studies on energy use and GHG emissions had been conducted in the study area prior to joining the Partners for Climate Protection, there was a general lack of available information that could be used to form a comprehensive inventory and corresponding forecast. As a result, previous studies and research from similar areas was relied upon and used in conjunction with extrapolation to determine energy usage and GHG emissions data. Since then, much work - mainly in the form of additional residential and commercial/institutional building energy audits - was undertaken in order to get a more accurate representation of the situation regarding energy use and GHG emissions. This was done through verification of the extrapolated data. Therefore, where energy usage and emissions data in this Milestone Two analysis differ from those in Milestone One, the Milestone Two report findings will prevail and serve to provide a verification means for the previously released reports in this PCP framework.

## 1.1 Community Inventory

The community inventory is presented for the combined non-municipal activity amongst the three regions of Inverness County, Richmond County and the Town of Port Hawkesbury. It is intended that due to similarities between these three communities, there will be only one local action plan (with minor possible variations). Figure 1 recaps the region's community emissions inventory for 2005. The commercial and small industrial (C&I) sector consists of conventional commercial establishments and small industrial businesses which are mostly in the fishing industry.

Large industrial businesses or large final emitters (LFEs) in Point Tupper are not included in the commercial and small industrial sector. The rationale for their exclusion in this framework was due to several reasons:

- The level and manner of the energy consumed by the community has very little or no direct impact on that used by the LFEs; and
- The scale, nature, and length of operation cannot be guaranteed by neither the municipalities nor the community, thus making it difficult to set emission reduction targets. For example, if a large plant such as NewPage or NSPI power plant were to double in size or shutdown completely by 2015, the set target would either not be achievable, or be surpassed instantly in the respective outcomes without the control of or contribution from the community and its municipality.

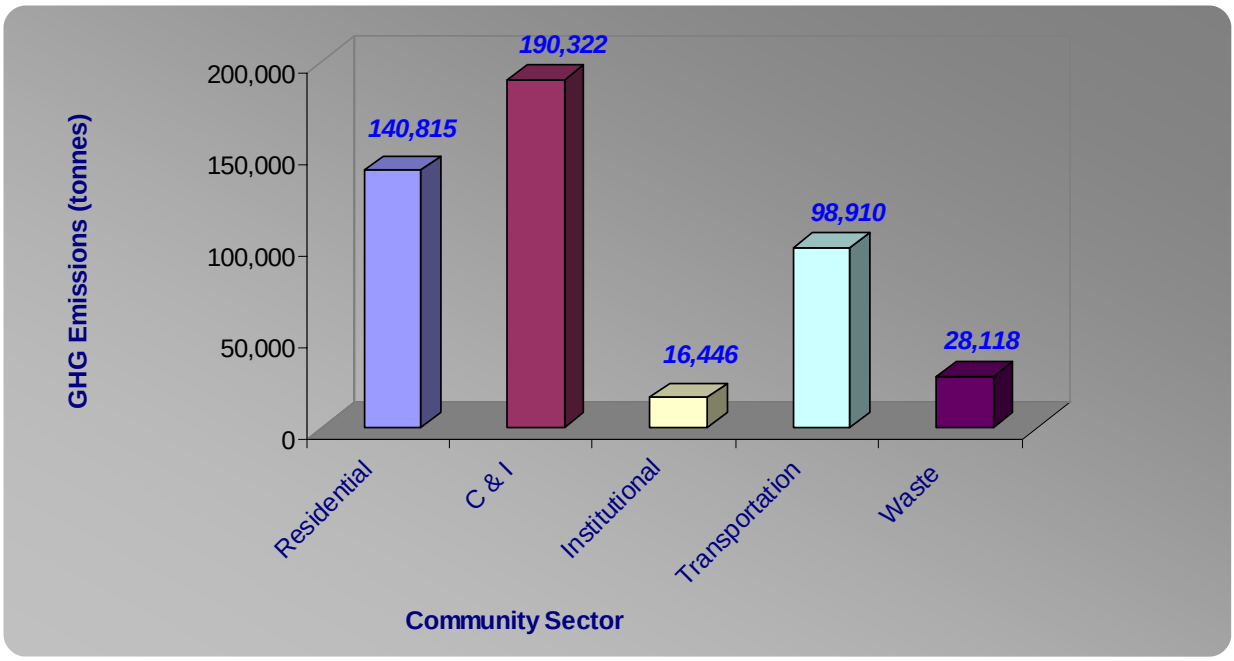
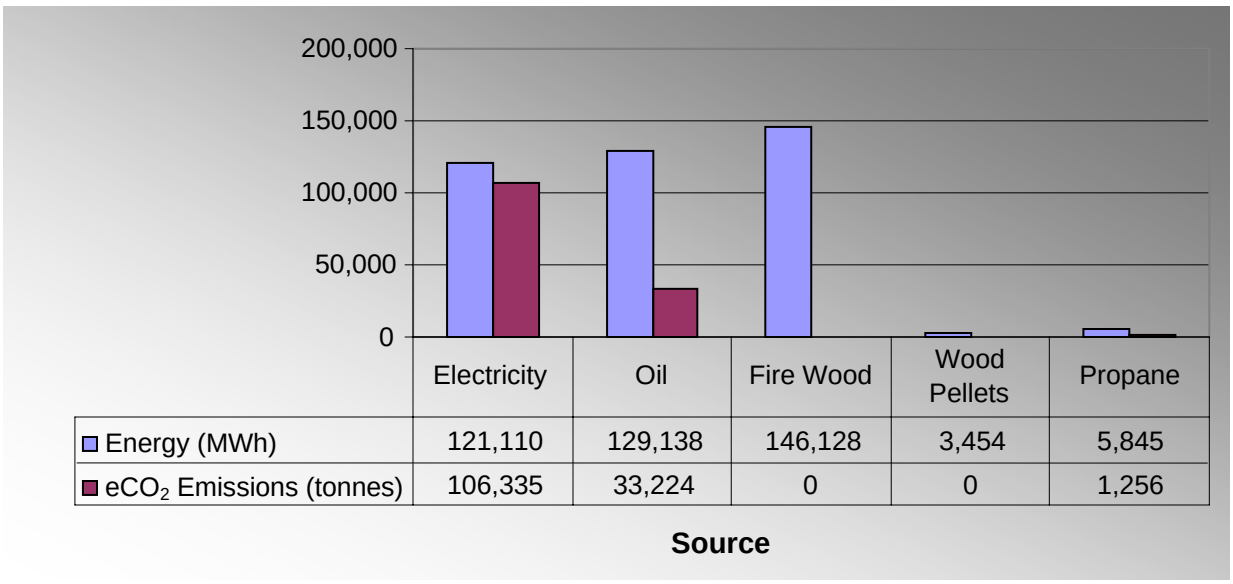



**Figure 1. 2005 Combined Community Emissions**

### *1.1.1 Residential*

The charts below portray residential GHG emissions that were obtained from the information gathered during the home energy audits. This information will assist in setting a GHG emissions reduction target for the Strait Highlands Region. The 2005 GHG emissions are summarised in Figure 2 and Figure 3 by energy source and residential type respectively.




| | Electricity | Oil | Fire Wood | Wood Pellets | Propane |
|---|---|---|---|---|---|
| Energy (MWh) | 121,110 | 129,138 | 146,128 | 3,454 | 5,845 |
| $eCO_2$ Emissions (tonnes) | 106,335 | 33,224 | 0 | 0 | 1,256 |

**Figure 2. 2005 Residential Energy Use and Corresponding GHG Emissions**

As shown in Figure 2 above, even though less than 30% of the residential energy used in the Strait Highlands Region was in the form of electricity, electricity usage was responsible for 75% of the residential GHG emissions in the area.

Furthermore, a significant amount of energy (almost 40% of the total residential energy use) was derived from fire wood and wood pellets. However, these sources of energy are considered carbon neutral because the carbon dioxide they emit is no more than that which was taken out of the atmosphere during the growth of the trees. Therefore, wood is a carbon neutral source of local energy that does not contribute to climate change as long as the trees are harvested in a sustainable manner.

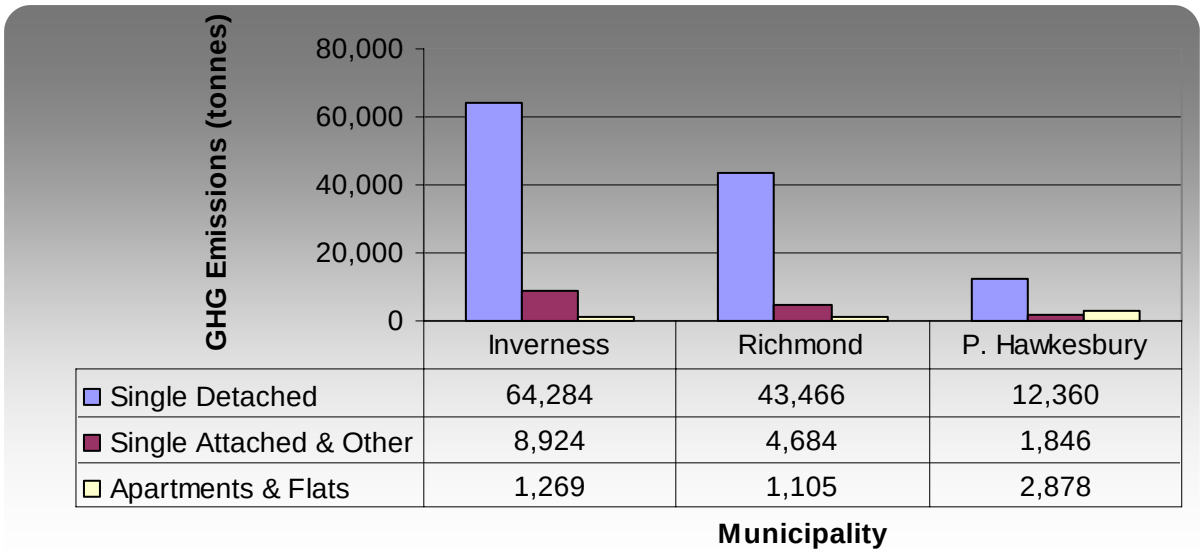
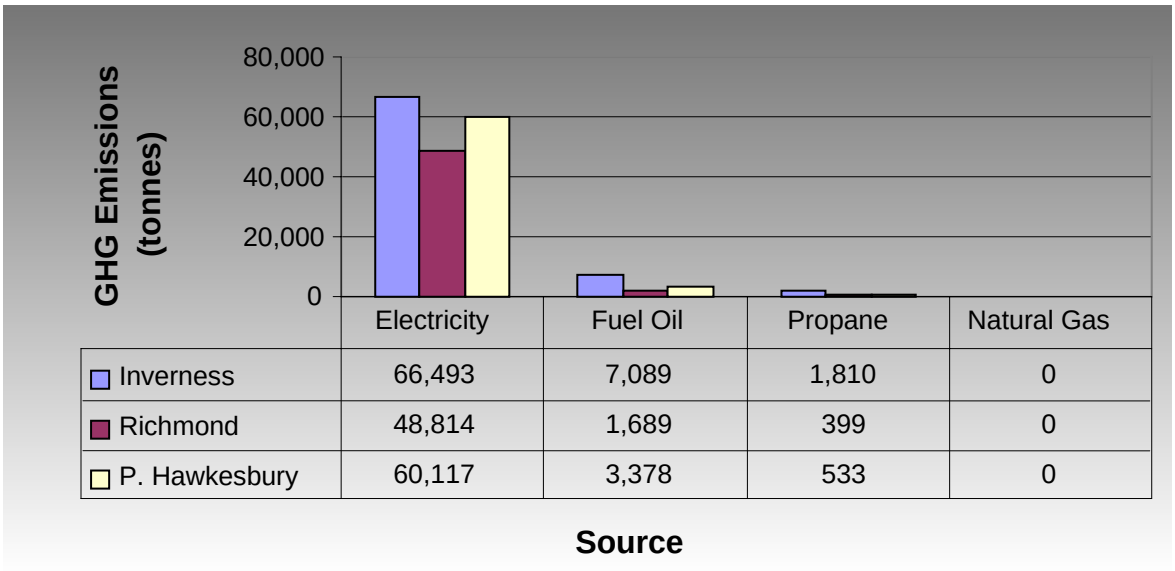



**Figure 3. 2005 Residential GHG Emissions by Dwelling Type**

Additional audits of the Residential Sector were conducted for verification during the execution of this Milestone Two process as described earlier. The GHG emission analysis resulted in the emissions quantities being the same as was previously established using audits from Milestone One. Very minor differences existed but were not material since they only altered the proportions of emissions from various energy sources, but did not affect the overall emissions totals in the Residential Sector. Therefore, these proportions as seen in this report are different from those published in the Milestone One report.

### *1.1.2 Commercial and Small Industrial (C&I)*

Figure 4 is a summary of the 2005 greenhouse gas emissions from the commercial and small industrial sector in the region. Emissions are presented by energy source for each community.



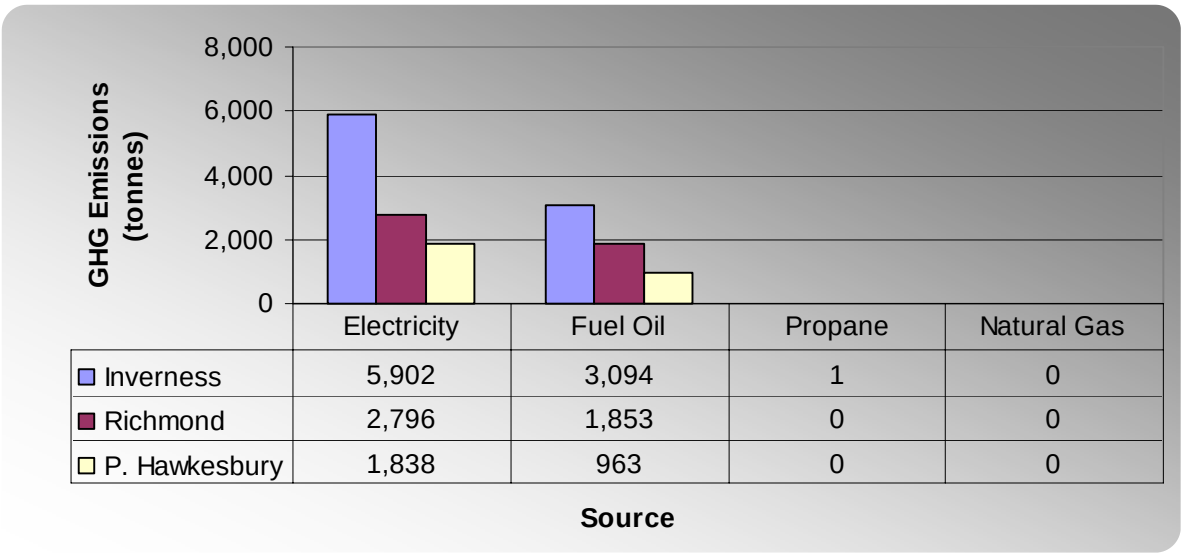

| | Electricity | Fuel Oil | Propane | Natural Gas |
|---|---|---|---|---|
| Inverness | 66,493 | 7,089 | 1,810 | 0 |
| Richmond | 48,814 | 1,689 | 399 | 0 |
| P. Hawkesbury | 60,117 | 3,378 | 533 | 0 |

**Figure 4. 2005 Commercial GHG Emissions by Energy Source**

Figure 4 further portrays the fact that the majority of GHG emissions from the C&I sector in the Strait Highlands Region comes from electricity usage. This is not surprising given the high average carbon emission factor for electricity in Nova Scotia of approximately 878 grams per kilowatt-hour (0.878 kg/kWh). As such, it is likely that GHG reduction opportunities exist through measures that aim to lower dependency on electricity as a source of energy. As in the Residential Sector, additional audits of the C&I sector were conducted for verification as well prior to completion of the analysis in this Milestone Two report. The GHG emission analysis resulted in emissions estimates remaining the same as those recorded in the Milestone One report.

#### *1.1.3 Institutional*

Additional schools and other institutions (hospitals) were audited within the Strait Highlands Region to verify the work accomplished in Milestone One. These additional audits did not reveal any significant differences in emission quantities reported in the Milestone One inventories. A summary of the institutional GHG emissions for 2005 were reported as shown in Figure 5.

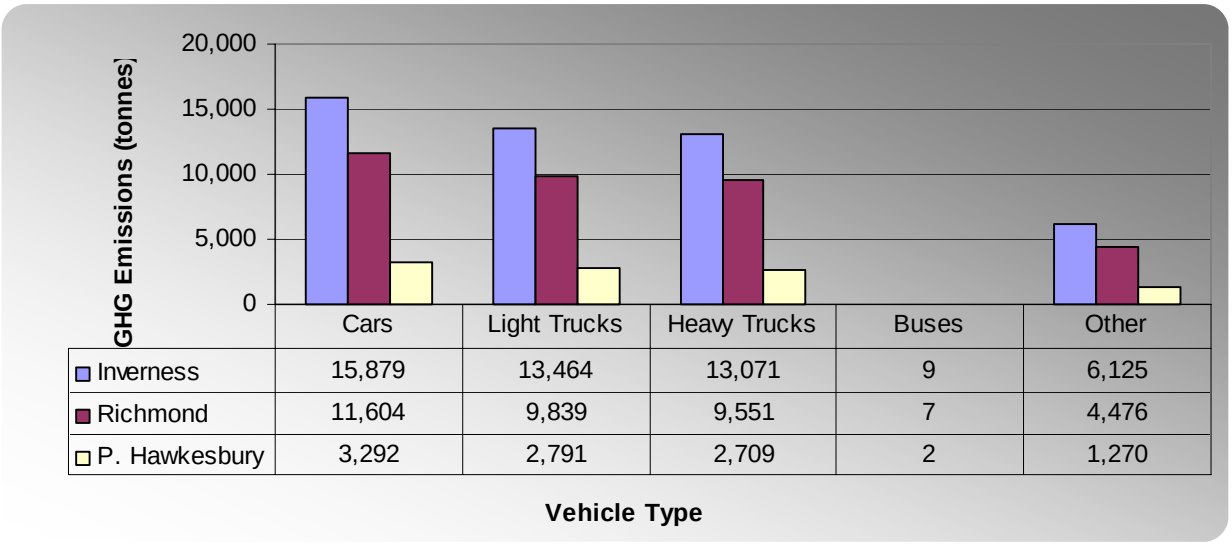



| | Electricity | Fuel Oil | Propane | Natural Gas |
|---|---|---|---|---|
| Inverness | 5,902 | 3,094 | 1 | 0 |
| Richmond | 2,796 | 1,853 | 0 | 0 |
| P. Hawkesbury | 1,838 | 963 | 0 | 0 |

**Figure 5. 2005 Institutional GHG Emissions by Energy Source**

### *1.1.4 Transportation*

While there are numerous approaches for enumerating transportation-related emissions, which depend mostly on the type of information and statistics available for the region, emissions for the Strait Highlands area were estimated from vehicle kilometres travelled (VKT) by vehicles registered in the region. The transportation emissions results for 2005 are summarised for each region and by vehicle type in Figure 6.




| | Cars | Light Trucks | Heavy Trucks | Buses | Other |
|---|---|---|---|---|---|
| Inverness | 15,879 | 13,464 | 13,071 | 9 | 6,125 |
| Richmond | 11,604 | 9,839 | 9,551 | 7 | 4,476 |
| P. Hawkesbury | 3,292 | 2,791 | 2,709 | 2 | 1,270 |

**Figure 6. 2005 Transportation Emissions by Vehicle Type**

### *1.1.5 Community Waste*

Software was used to estimate emissions from community solid waste in the region. Even though these landfills were decommissioned in the base year (2005), the software took into account the decay nature of organics in the landfill resulting in methane. Carbon dioxide is the most abundant gas by weight in the landfill gas. However, methane has been proven by scientists to have approximately twenty-one (21) times more global warming potential (GWP) than carbon dioxide. Therefore, methane is the largest contributor of GHG emissions from landfill gas as can be seen in Figure 7.

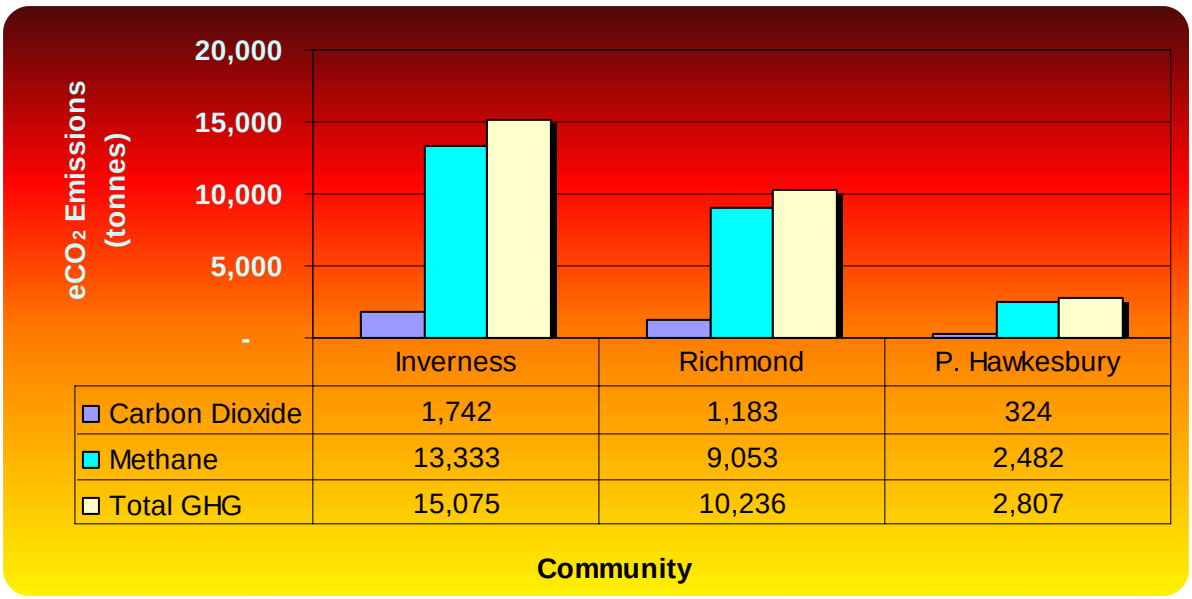
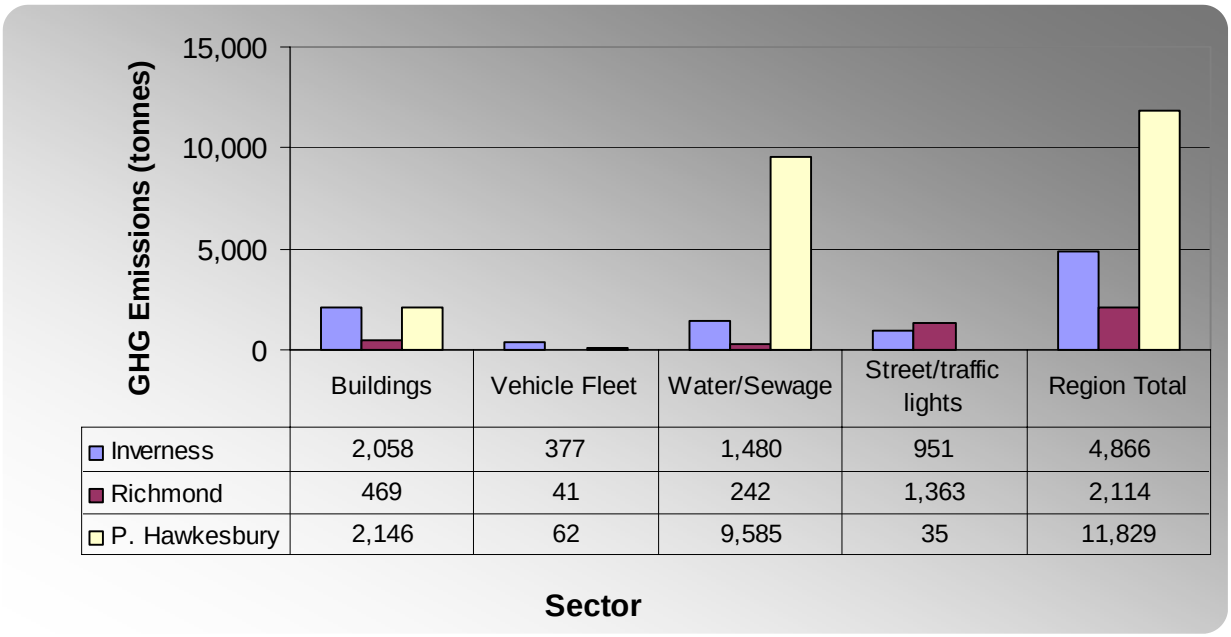



**Figure 7. 2005 Emissions from Community Solid Waste**

## 1.2 Corporate Inventory

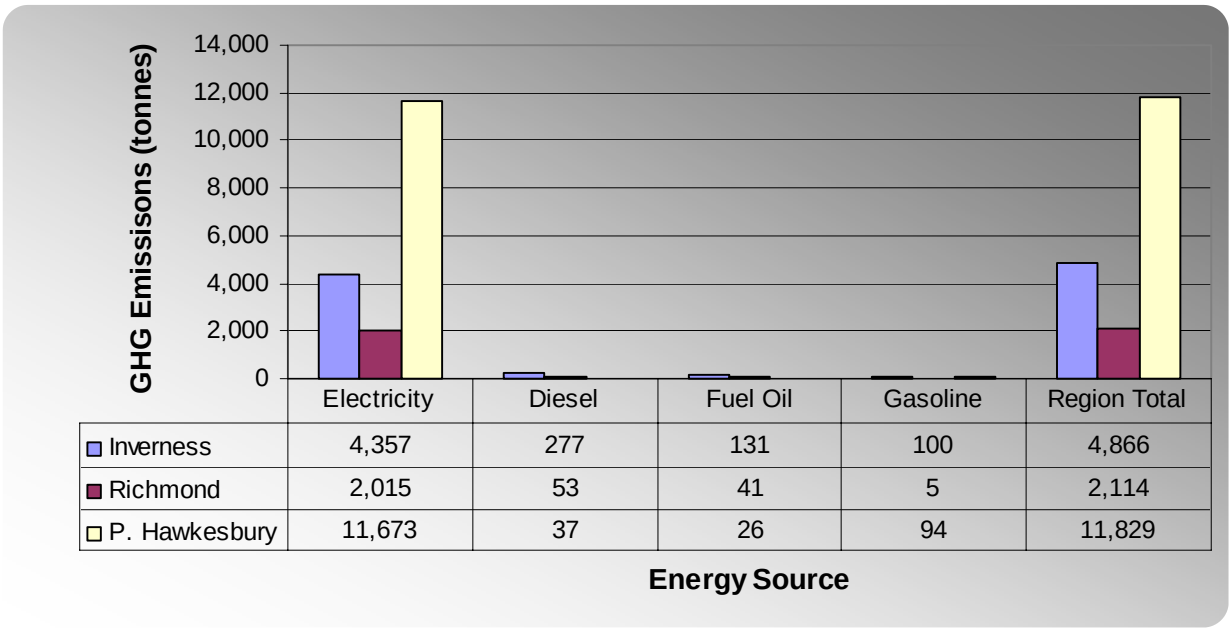
Corporate emission inventories will be reported so that they reflect specific ramifications for each of the municipalities. This is contrary to the Community presentation where emissions from the three jurisdictions are combined for the entire region. Due to a strong ability by municipalities to influence municipal operations within their jurisdiction, it was felt that each municipality should be able to have a separate picture of its energy consumption and inherent emissions to enable municipal staff and Council to take full control of the destiny of their municipality from the energy consumption and greenhouse gas emissions perspective. Even when one chart or table is used to present results, each item will still be clearly labelled as Inverness Municipality, or Richmond Municipality or the Municipality of the Town of Port Hawkesbury. Figure 8 presents GHG emissions from the base year 2005 by municipality and by municipal sector.




| | Buildings | Vehicle Fleet | Water/Sewage | Street/traffic lights | Region Total |
|---|---|---|---|---|---|
| Inverness | 2,058 | 377 | 1,480 | 951 | 4,866 |
| Richmond | 469 | 41 | 242 | 1,363 | 2,114 |
| P. Hawkesbury | 2,146 | 62 | 9,585 | 35 | 11,829 |

**Figure 8. 2005 Corporate GHG Emissions by Sector**

While Figure 8 shows the municipal emissions by sector, these emissions can be broken down by source of energy used by each municipality in 2005 as estimated in Figure 9 below.




| | Electricity | Diesel | Fuel Oil | Gasoline | Region Total |
|---|---|---|---|---|---|
| Inverness | 4,357 | 277 | 131 | 100 | 4,866 |
| Richmond | 2,015 | 53 | 41 | 5 | 2,114 |
| P. Hawkesbury | 11,673 | 37 | 26 | 94 | 11,829 |

**Figure 9. 2005 Corporate GHG Emissions by Energy Source**

# 2 BUSINESS-AS-USUAL (BAU) FORECASTS

Under the PCP program, members are encouraged to meet a preset GHG emissions reduction target within the first ten years of their membership. The municipalities have until 2015 to develop and implement emissions reduction programmes, policies and projects to achieve their set GHG emission reduction targets. Most of the initiatives that have been explored in this report for target achievement are expected to be fully implemented by 2015. This is a bit of a change from Milestone One which had developed forecasts for the year 2012. The year 2012 is also unique because it is the year of GHG reduction compliance for those countries who have ratified the Kyoto Protocol (includes Canada).

In this section, the 2015 BAU forecast gives projections of what the Strait Highlands Region's expected annual GHG emission levels will be under a business as usual (BAU) scenario. Forecasting principles are based on the same indicators that were used in Milestone One for making the future estimates. These indicators include provincial and respective county statistics for population, registered vehicles, labour force, and commercial establishments. The BAU forecasts exclude GHG reduction measures that were implemented any time after 2005. Those will be accounted for under "Current" and "Planned" measures respectively depending on the status of their implementation and completeness.

## 2.1 Community

This section summarises the inventoried greenhouse gases (GHGs) for the entire community of the Strait Highlands for 2005 as shown in Section 1. The 2005 emissions are then compared with the emissions projected ten years later in 2015. The figures attempt to give comparison graphics that make it easier for the reader to visually observe changes in trends. Table 1 and Table 2 respectively give summaries for 2005 and 2015, with GHG emissions subtotals and totals for each year.

**Table 1. Strait Highlands Community GHG Emissions Summary for 2005 (tonnes of $eCO_2$)**

| REGION | RESIDENTIAL | C & I | INSTITUTIONAL | TRANSPORTATION | SOLID WASTE |
|---|---|---|---|---|---|
| **Inverness** | 74,477 | 75,392 | 8,996 | 48,548 | 15,075 |
| **Richmond** | 49,255 | 50,902 | 4,649 | 35,477 | 10,236 |
| **P. Hawkesbury** | 17,083 | 64,029 | 2,800 | 10,063 | 2,807 |
| **Subtotals** | 140,815 | 190,322 | 16,446 | 94,089 | 28,118 |
| **Community Total** | **469,789** | | | | |

**Table 2. Strait Highlands Community Emissions Forecast Summary for 2015 (tonnes of $eCO_2$)**

| REGION | RESIDENTIAL | C & I | INSTITUTIONAL | TRANSPORTATION | SOLID WASTE |
|---|---|---|---|---|---|
| **Inverness** | 68,794 | 76,913 | 9,178 | 43,250 | 13,978 |
| **Richmond** | 44,606 | 51,929 | 4,743 | 32,489 | 9,300 |
| **P. Hawkesbury** | 16,117 | 68,106 | 2,979 | 9,914 | 2,670 |
| **Subtotals** | 129,517 | 196,948 | 16,900 | 85,654 | 25,948 |
| **Community Total** | **454,967** | | | | |

### *2.1.1 Residential*

As shown in Figure 10, residential GHG emissions are lower in 2015 than in 2005 across all municipalities. This is due to the fact that the area is undergoing out-migration as residents often leave the region to secure employment elsewhere. However, population out-migration results in GHG emissions reduction of only about 3.2% through the 10-year period from 2005 to 2015.

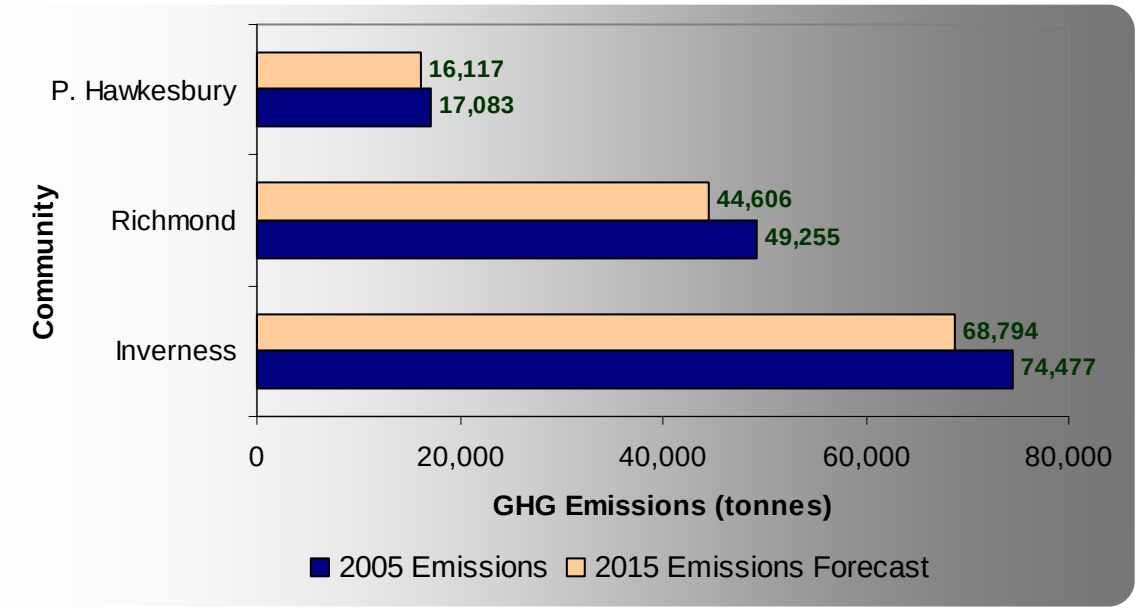



**Figure 10. Strait Highlands Residential Sector GHG Emissions Forecast for 2015**

### *2.1.2 Commercial and Small Industrial*

Contrary to the Residential sector, the Commercial and Small Industrial (C&I) sector has not experienced the decline in emissions; however, the rate of increase of the GHG emissions over ten years is quite shallow compared to other more urban communities in Canada. See Figure 11 for emissions comparison between the 2005 and the projected 2015 emissions.

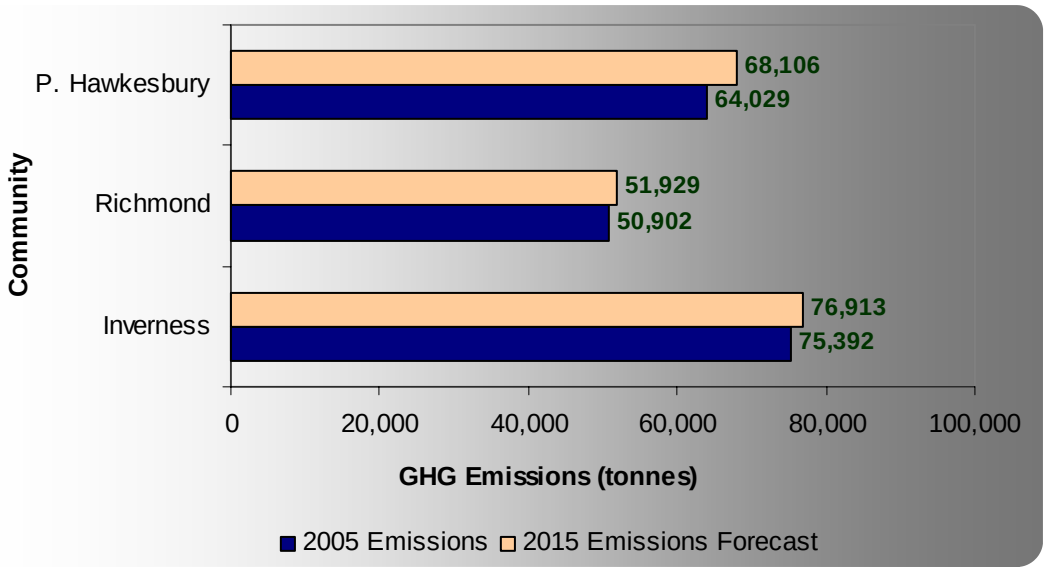



**Figure 11. Commercial and Small Industrial Sector GHG Emissions Forecast for 2015**

### *2.1.3 Institutional*

The Institutional sector also shows small emission increases by 2015 at almost the same rate as that for the C&I sector above. These emissions are captured in Figure 12.

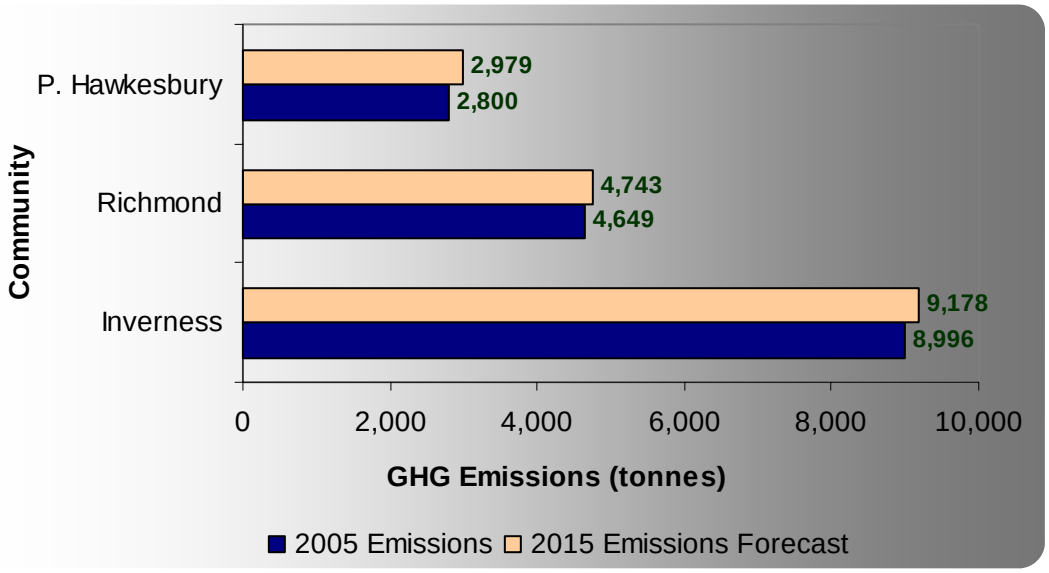



**Figure 12. Institutional Sector GHG Emissions Forecast for 2015**

### *2.1.4 Transportation*

Emissions from the Transportation sector have shown a very different trend compared with both the Residential and the C&I sectors. Projections are showing some shrinkage in the future transportation emissions for Inverness County, Richmond and Port Hawkesbury. For the Transportation sector, emissions are based on the number of vehicles registered within a municipality. Comparison of the 2005 and 2015 transportation emissions are presented in Figure 13.

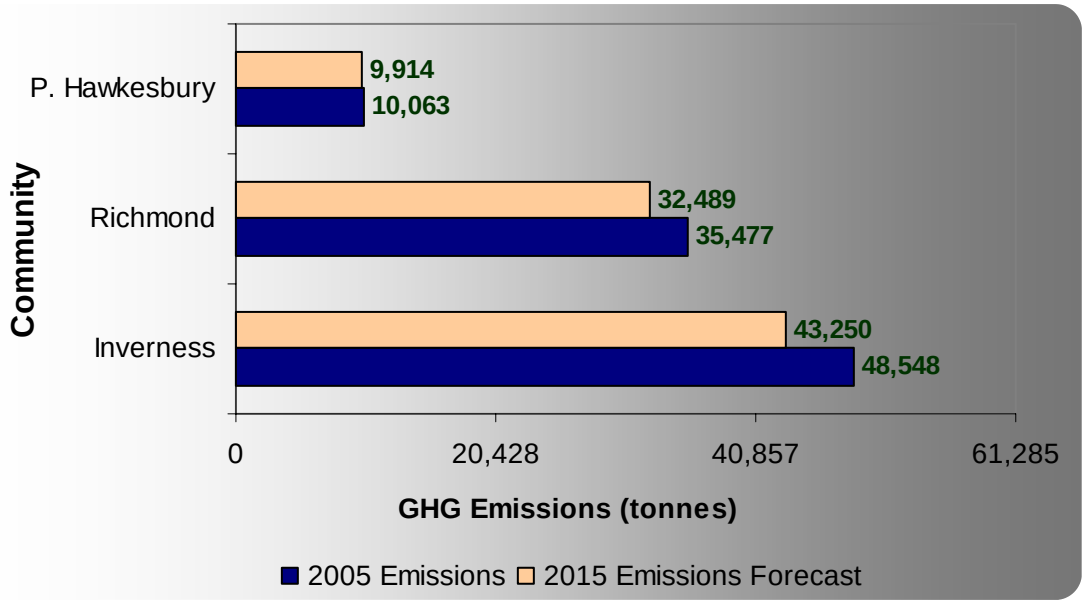



**Figure 13. Transportation GHG Emissions Forecast for 2015**

### *2.1.5 Community Waste*

Emissions from community solid waste show a downward trend between 2005 and 2015. This is mainly the result of the population out-migration from the region; it is not the result the initiation of community solid waste transfer from the Strait Highlands Region to the second generation landfill in Guysborough County. Emissions from this waste are included in the GHG inventory.

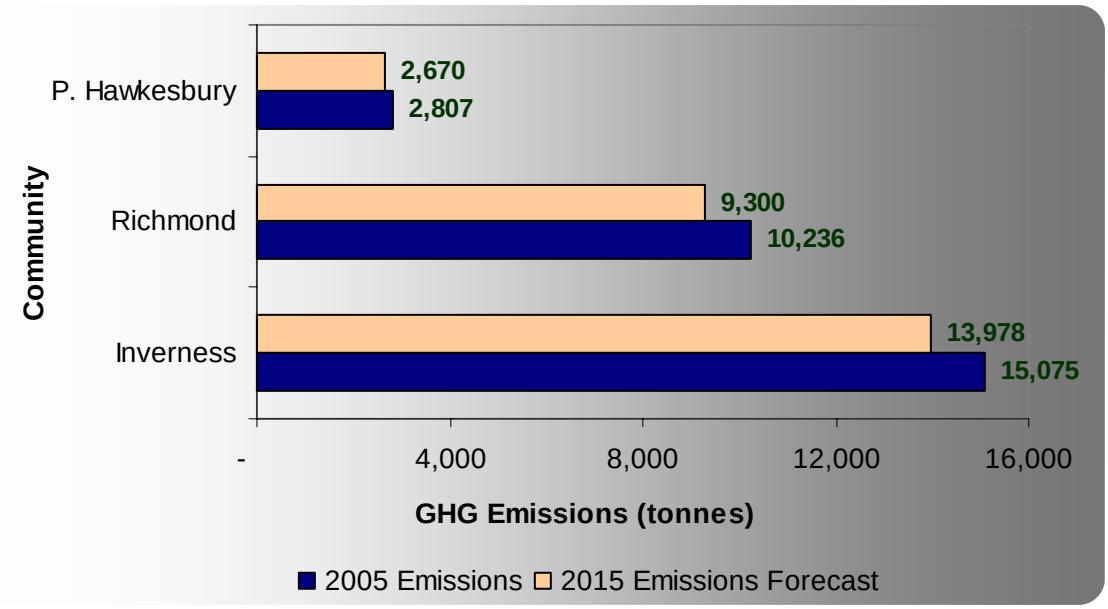



**Figure 14. Solid Waste GHG Emissions Forecast for 2015**

## 2.2 Corporate

Municipal emissions have been compiled by municipality as shown in Figure 15. The chart shows 2005 emissions and two future emissions scenarios; the business-as-usual (BAU) scenario and the recommended emissions scenario.

The "2015 BAU Forecast" scenario estimates what future GHG emissions would be in the absence of any deliberate intervention. Forecasting the rate of emission change for the Strait Highlands Municipalities was very challenging. This was due to the fact that the Team which collected information from the municipalities compiled historic energy use data for only one fiscal year (2005/2006). With only a single point to work with, forecasting or back-casting requires other more reliable indicators. Therefore, the forecasts for the three municipalities were done on the basis of our observations in the past studies for other semi-rural communities in Nova Scotia (e.g. Municipality of Clare). The GHG emissions forecasts in these municipalities is based on the increasing annual services expansion and energy use at the rate of about one fifth of a percentage point (0.2%), even if there is a local population net out-migration such as that seen both in Clare and in the Strait Highlands Region.

The "2015 PCP Recommended" levels are the maximum emission levels allowed by the municipalities in order to achieve the minimum reduction expected from PCP members (formerly known as the 20% Club).

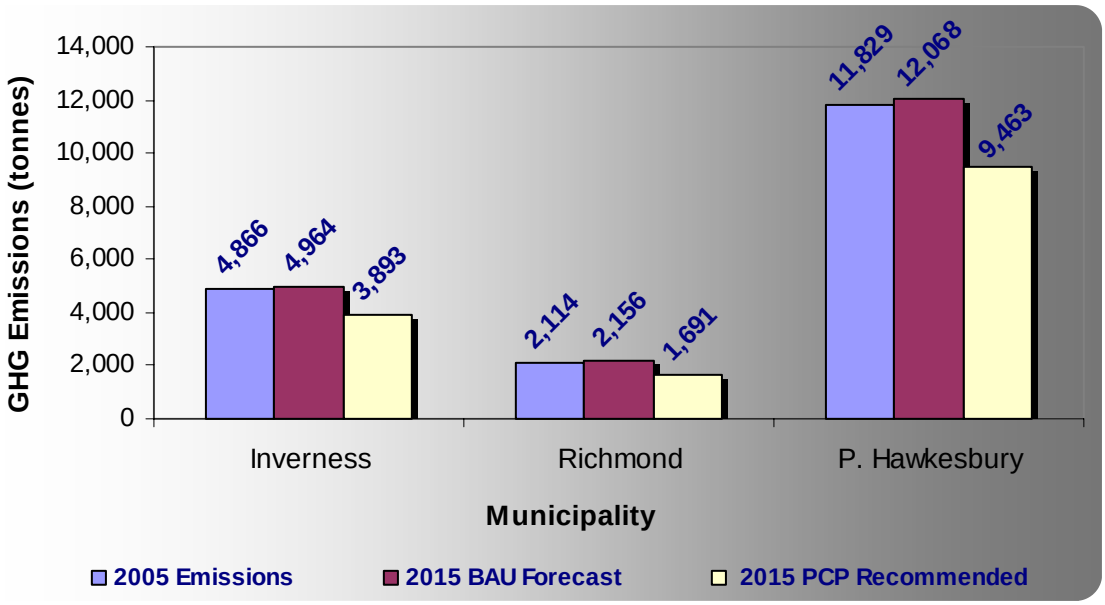



**Figure 15. Strait Highlands Region Corporate Emissions Forecast and Summary**

# 3 CURRENT GHG REDUCTION MEASURES

In this context, current measures refer to GHG reduction initiatives and measures that have been in place since 2005. This allows for the communities and municipalities to take credit for the emissions reducing activities and projects that were completed anytime after the base year until the writing of the Milestone Two report. Table 3 summarises energy efficiency measures that are currently in place in the region. Specific details of each of these measures are discussed in Section 3.1.

**Table 3. Summary of Annual GHG Reduction Measures Currently in Place**

| Description of Measure | Energy Savings (kWh) | GHG Reduction (tonnes) | Comments |
|---|---|---|---|
| Conversion to CFL lights in residential homes | 1,407,328 | 1,236 | 80% of houses have at least 3 CFLs, inclusive of the 5,000 bulbs from Conserve NS in 2007. |
| Lighting retrofit to T-8 in Commercial and Small Industrial | 5,335,845 | 4,685 | 69.5% of C&I audited have converted, Savings are about 7,928 kWh/Bldg |
| Lighting retrofit to T-8 in Institutional buildings | 1,110,143 | 975 | 55% of Institutional bldgs audited have converted, savings are 30,126 kWh/bldg, (including schools) |
| Port Hood Court House partial upgrades (windows and insulation) | 9,216 | 8 | Scale of retrofits not deep enough. Assumed energy savings of about 10% annually. |
| **TOTAL** | **7,853,317** | **6,895** | |

As described in section 2.1.5, note that although the community solid waste transfer from the Strait Highlands Region to Guysborough County landfill has been in place since 2005, this is not considered a greenhouse gas emission reduction credit since landfill gas emissions from decay of all the organic waste originating from the community is included in the respective community GHG emissions.

## 3.1 Current Community Measures

### *3.1.1 Adoption of CFL for Lighting in Residential Homes*

Many home owners have converted their lighting units from incandescent bulbs to the compact fluorescent lamps (CFLs). A single 13-Watt CFL has a lighting effectiveness equivalent to that of a 60-Watt incandescent bulb, reducing the power intensity by over 40 watts while not diminishing the lighting quality. In 2007, Conserve Nova Scotia donated about 5,000 CFLs to S-HRDA for distribution to the wider community of the Strait Highlands. While many residents were already utilising at least two CFLs

in their home, the additional 5,000 lights became a stimulus that helped increase the rate of conversion from incandescent to CFL.

#### *3.1.2 Lighting Retrofits to T-8 in Commercial and Institutional Buildings*

During the energy audits of the commercial and institutional sector throughout the region, it was observed that many commercial buildings and institutions (particularly schools), had converted a lot of their lighting from the standard T-12 tubes with magnetic ballasts to high performance T-8 lights with electronic ballasts. A typical 4-foot T-12 fixture with two bulbs draws about 96 watts, while its equivalent T-8 fixture with electronic ballast requires about 59 watts for savings of about 37 watts. The estimated annual energy savings and the corresponding reductions in greenhouse gas emissions in the commercial and institutional sectors from the lighting improvement are respectively shown in Table 3.

### 3.2 Current Corporate Measures

There are not many quantifiable GHG reduction measures in operation within the three municipalities apart from the ongoing education of municipal staff and the community at large. However, the Port Hood courthouse was partially retrofitted in 2007. The retrofit consisted of window replacement and a moderate increase of the wall insulation on the upper floor where the court proceedings take place. This upgrade is estimated to result in energy savings of about 10%, or roughly 9,216 kWh per year. The GHG emissions reduction from this retrofit is approximately eight (8) tonnes annually.

# 4 PLANNED GHG REDUCTION MEASURES

Planned measures are those for which preliminary plans, designs and major considerations have been undertaken; sometimes even financing and resources are in place. Table 4 gives a summary of a few initiatives in the Strait Highlands Region that suit the description of the planned GHG reduction measures. Each one is discussed in turn:

**Table 4. Summary of Planned GHG Reduction Measures in Place**

| MEASURE DESCRIPTION | GHG REDUCTION (TONNES) | REMARKS |
|---|---|---|
| Strait Area Transit Cooperative | 4,004 | First bus in operation by Fall 2008. |
| Town of Port Hawkesbury Wind Power Generation Project (~1 MW) | 2,681 | Includes both Community and Corporate reduction. |
| SûGen/Grand Etang Harbour Authority Partnership Project | 8 | Research and development underway. |
| **TOTAL** | **6,693** | |

## 4.1 Planned Community Measures

### *4.1.1 The Strait Area Transit Cooperative*

The Strait Area Transit Cooperative is a very effective means of reducing GHG emissions given the fact that transportation requires a significant amount of energy. Furthermore, it is also very difficult to find a suitable alternative to liquid transportation fuels that will lead to GHG emission reductions.

The co-op will provide both a dial-a-ride service (door-to-door pick up) if a call is placed one to two days prior, as well as regularly scheduled weekday routes. Road side pick up will be offered to passengers, but there will also be designated stops such as nursing homes, senior complexes, regional occupation centres and others. Main pick-up points include Port Hastings, Louisdale and Mulgrave, with pit stops or secondary pick-up points in Petit de Grat, L'Ardoise, St. Peter's, Chapel Island and Arichat. It is assumed that due to the limited initial service routes (mainly within Richmond County), that only residents within Richmond County will utilise the Strait Area Transit Co-op.

A significant amount of information on the Strait Area Transit Cooperative may be found in the 'Strait-Area Alternative Transportation Project Feasibility Survey Results – January, 2007' document.

Energy conservation and/or efficiency as well as renewable energy are being taken into consideration in the development of the co-op. For example, energy efficient vehicles will form the fleet, while anti-idling policies will be in effect.

It is also likely that a feasibility study will be conducted for expansion of the Strait Area Transit into Inverness County. A positive outcome from this study would surely be very helpful in order to provide coverage into this area (as there once was) and increase rider-ship in order to further reduce GHG emissions. Although there have been some unanticipated delays, the Strait Area Transit Co-op initiated service in the fall of 2008.

Several common facts were used and assumptions made in order to analyse the action items relating to the Strait Area Transit Co-op to quantify the level of GHG emissions reduction associated with each item. This information was also used for the analysis of Section 4.2.2.

- The population of Arichat is 1,000;
- The population of St. Peter's is 1,500;
- The average return trip taken on the Strait Area Transit will be 90 km[1];
- The average Strait Area Transit user will utilise the system five times per week;
- The buses will have a 50 passenger capacity;
- All private vehicles and Strait Area Transit vehicles use gasoline;
- The average fuel consumption of private vehicles is 12 litres per 100 km;
- The average fuel consumption of the Strait Area Transit vehicles is 20 litres per 100 km; and
- The $CO_2$ emission factor for gasoline is 2.36 kg per litre.

.1 **Action Item:** Support the Strait Area Transit Cooperative initiative through community membership of the co-op and regular usage of the system.

According to the feasibility survey results, 30% of respondents indicated that they would use the Strait Area Transit three or more times per week. This analysis assumes that realistically, 20% of residents in a suitable position (those in Arichat and St. Peter's) would use the transit 5 times per week. Under an optimistic scenario, 30% of the population of Arichat and St. Peter's will utilise the transit system;

Under the realistic scenario, the average annual GHG emissions reduction resulting from the Strait Area Transit Cooperative would be 3,203 tonnes of $eCO_2$, while an optimistic reduction would be 4,804 tonnes of $eCO_2$ annually. Since the Strait Area Transit did not previously exist, a BAU scenario would not see any GHG emissions reductions.

#### *4.1.2 Port Hawkesbury Wind Power Initiative*

While the wind turbine planned for Port Hawkesbury will power municipal operations at the Civic Centre and the waster water treatment plant, a third of total output (33%) is destined to supply power to the nearby Nova Scotia Community College (NSCC). This represents annual wind energy generation of approximately 1,022,000 kWh, resulting in a reduction of community-wide GHG emissions of about 890 tonnes annually.

### *4.1.3 SûGen/Grant Etang Partnership Wind Power Potential*

In Cheticamp, SûGen Research Incorporated has partnered with the Grand Etang Harbour Authority to test vertical axis mini wind turbines. This initiative is focussed on harnessing energy from the high intensity winds that are found only in this region of Cape Breton. The research hypothesis is based on the premise that vertical axis wind turbines may be more likely than horizontal axis turbines to withstand the strong winds that characterise this area, at speeds of up to 154 km/h. The researchers believe they are very close to finding the proper design and set up for full exploitation of the harsh winds in Cheticamp to generate power for the local community. The first wind turbine is expected to be a 5 kW vertical axis type capable of generating approximately 9,100 kWh of electricity annually for local consumption and internal loads. This electricity is expected to displace approximately 8 tonnes of $eCO_2$ annually. The project researchers believe that after time, larger vertical axis wind turbines will be tested and installed. This additional potential reduction has not been factored into the current reduction target setting for the Inverness Community.

## 4.2 Planned Corporate Measures

### *4.2.1 Port Hawkesbury Wind Power Initiative*

The wind power development initiative in Port Hawkesbury is also intended to provide power to the Port Hawkesbury Civic Centre and the new waste water treatment plant. It is expected that these two municipal entities will collectively consume about 67% of the total power generated by the wind turbine. This amounts to about 2,044,000 kWh in electrical energy production, which will displace approximately 1,787 tonnes of $eCO_2$.

### *4.2.2 The Strait Area Transit Cooperative*

.1 **Action Item:** Support the Strait Area Transit Cooperative initiative by providing annual municipal operating subsidies to ensure its continued operation.

This action item aims to decrease GHG emissions by reducing the amount of fuel required for private vehicles by reducing the cost of transit rider ship through subsidies, thereby increasing the number of patrons utilising public transit.

At present, the Provincial Government has provided $120,000 towards the Strait Area Transit Cooperative, while the Ecology Action Centre (EAC) has provided $25,000. The level of funding that will be provided by the municipalities has not yet been determined. However, municipal funding will ideally act as an incentive for others to donate to the co-op and increase the level of success. It is particularly encouraging that the co-op has obtained registered charitable status.

Together with the assumptions stated in Section 4.1.1, it is assumed that support through subsidies will increase rider ship by achieving a lower cost per ride. With subsidies in effect, it is assumed that:

- Realistically, 25% of the population of Arichat and St. Peter's will utilise the transit system; and
- Optimistically, 35% of the population of Arichat and St. Peter's will utilise the transit system.

The additional annual GHG emissions reduction resulting from the provision of municipal subsidies for the Strait Area Transit Cooperative will be 801 tonnes of $eCO_2$. This is in addition to the reduction in emissions from having community support for the Strait Area Transit through membership and regular usage of the co-op.

# 5 STRATEGY DEVELOPMENT

Although the aforementioned current and planned measures to reduce GHG emissions are strongly encouraged, a higher level of action is required to accomplish significant reductions in the Strait Highlands Region's carbon footprint.

A set of objectives was first identified and reviewed with the client in order to finalise the following list of eight goals:

.1 Improve the energy efficiency of buildings;
.2 Increase transportation choice and efficiency;
.3 Increase industrial energy efficiency;
.4 Encourage energy efficient land use planning and neighbourhood site planning;
.5 Increase efficiency of infrastructure;
.6 Ensure energy security and diversify energy supply;
.7 Educate and engage local residents and businesses; and
.8 Demonstrate local government leadership.

These goals were used to steer the project team when developing a Long List of action items particularly relevant to the Strait Highlands Region. These items covered potential project, policy, planning and programme recommendations. The Long List action items were evaluated against a set of weighted criteria to ultimately come up with a Short List of prospective action items. This allowed for the quantification of potential GHG reductions for most items (those that lend themselves well to the analysis) and the setting of a custom tailored GHG emissions reduction target.

## 5.1 Long List Action Items

Energy use is so endemic to everyday life in Canada that there is no simple way to achieve meaningful reductions in energy consumption without exploring many aspects of energy use to determine what actions could be undertaken that can achieve these reductions. As a result, the development of an implementation strategy for a CEP typically involves a lot of individual actions.

Development of the initial list of actions - the 'Long List' - was based upon researching the energy issues in the community, consulting with stakeholders, and assessing the results of previous and ongoing actions. The generation of individual action items inevitably led to a very long list that would be difficult and costly to fully implement. Instead, the Long List action items were evaluated against a set of weighted criteria to grade the quality of each Long List item and come up with a shorter, more manageable list of actions, known as the 'Short List'.

## 5.2 Evaluation Criteria and Matrix

The Long List consists of many action items that would compete for limited resources within the region if all were to be implemented. Therefore, the Long List was evaluated against a set of criteria to grade the effectiveness of each action item and come up with the Short List; a more manageable list of actions. The criteria selected to conduct the evaluation were based upon the values and expectations of the key stakeholders consulted, the client, the planning team, and were to be consistent with the goals for the region. Each criterion was scored on a scale from one (1) and five (5), and different weights were applied to each category of criteria. Due to the fact that the evaluation criteria affected some categories differently than others, numerical comparisons of scores between categories were not made. We were attempting to demonstrate which project or projects within each category showed the greatest strength and thus the greatest chance of implementation and successful operation.

For the Strait-Highlands Region, the preliminary evaluation criteria consisted of six (6) categories as follows:

**Environmental:**

- What is the $eCO_2$ emissions reduction potential and is it verifiable and guaranteed into the future?
- What is the potential for air pollution reduction?
- Is it sustainable or does it encourage sustainability?
- Does it utilise or encourage renewable energy?

**Societal:**

- What is the local job creation potential/utilisation (both direct and indirect)?
- Is there positive visibility (encourages greater uptake)?
- What is the likelihood of public opposition (i.e. NIMBY)?
- Is it safe, or does it ensure the well being of society?
- Are there health benefits to citizens?

**Economic:**

- What is the cost effectiveness – are there reduced costs?
- Is the project feasible (resource potential, enough land area to be easily acquired, public support and acceptable financial risk)?
- Are there health benefits to citizens?
- What are the local benefits?
- Is there a Federal, Provincial or Municipal financial incentive for this action or set of actions?

**Technical:**

- Is the technology proven?
- Is the project technically feasible?

- Is the technology locally manufactured (or can it be)?
- Can ongoing support be provided locally?

**Regulatory:**

- To what degree may problems exist in obtaining the necessary environmental permits?
- Are there any foreseen municipal zoning issues?
- Are there any foreseen utility connection issues?

**Municipal Control:**

- Does the municipality have an appreciable sphere of influence over the activities?

#### *5.2.1 Criteria Descriptions*

**GHG Reduction** – This examines the potential of an action to lead, directly or indirectly, to reductions in greenhouse gas (GHG) emissions. A subjective estimate of the potential reductions attributable to each measure could be used to rank measures using these criteria.

**Sustainability** – A sustainable action item is one that allows today's generation to meet their needs without compromising the ability of future generations to meet their needs. These items generally have a minimal long-term impact on the environment.

**Local Job Creation** – This looks at the potential for an action to create employment in the local area. Direct employment may be created to construct and/or operate some actions, while other actions could create the conditions necessary for new or existing businesses to expand and increase employment. New companies are attracted to cities by things other than money such as a high quality of life and commitment to sustainability.

**Positive Visibility** – Actions that have a high degree of visibility tend to inspire more action among the community. Daily reminders of the positive actions being taken as part of the CEP can help to convince people to make more sustainable chores in their own lives. Solar panels, wind turbines, hybrid vehicles and bicycle paths are visible reminders to people of what the CEP is doing. Just as visible, however, is an effective media campaign highlighting less visible changes that are just as important (e.g. building insulation, high efficiency boilers, etc.).

**Health Benefits** – This examines the potential direct and indirect health benefits associated with the action. Actions leading to reduced electrical consumption would have only a minor health benefit improvement through reduced power plant emissions compared to actions that encourage active transportation, which would likely have a more significant health benefit. Health benefits can also have an associated economic benefit if citizens require less treatment from public health care.

**Cost Effectiveness** – This examines the economic cost of an action compared to its potential for a measurable change in energy consumption or reduction in atmospheric emissions. The evaluation will be subjective based upon knowledge of similar actions.

**Feasibility** – This examines the potential of an action to be implemented based on its cost and technical challenges. Expensive and/or technologically unproven actions are likely more difficult to implement and involve a greater degree of risk because of the extra resources required to 'fine tune' it. Resource potential must also be assessed based on the magnitude and security of the supply (e.g. wood waste, process waste heat, landfill gas) in order to ensure it can be sustained.

**Municipal Control or Influence** – Managing the implementation of an action is easier when you have direct control over the process. The further removed you are from the process, the more difficult it becomes to ensure that implementation happens. In order for the CEP to be judged a success, a large number of the action items in the plan must be implemented successfully. Those that can be managed directly by the respective municipalities will be easier to implement since they will not involve as much negotiation and partnership with other organisations in order for implementation to occur.

## 5.3 Evaluation Procedure

Three members of the consultant team with different background expertise representing many of the categories of actions in the Long List assembled to evaluate each item on the Long List. A scoring matrix was developed where each criterion was awarded a score ranging from one (1) to five (5) – 'one' being the least favourable and 'five' representing a very favourable item – and the scores were added for each action item. Each item was discussed in order to arrive at a consensus regarding the most appropriate score for each criterion.

Given the large number of items, over 70, and six criteria to evaluate each one against, the process was time consuming. This was despite the fact that it was accomplished with a high degree of subjectivity and without much quantification or analysis. The team relied upon its experience and judgement in order to score each item. An action item that was determined to be very favourable across all elements would score a total of thirty (30), while the least favourable item could score a total as low as six (6).

To account for the fact that certain criteria were considered more important than others, different weights were assigned to different criteria. For instance, due to the fact that the PCP Programme focuses on reducing GHG emissions, and it is also crucial that society must accept and benefit from the actions, both the 'Environmental' and 'Societal' criteria received a weighting of two (2), while the others (with the exception of 'municipal control', which received a weighting of 1.5) received a weighting of one (1).

Once the ranking and weighting analysis was completed, an average score could be determined for each of the corporate (municipal) and community action items in order to establish a cut-off threshold score. In this process, the cut-off threshold score was two points above average (equal to a score of 33) for community actions and two points below average (also equal to a score of 33) for corporate actions.

The number of Long List action items that qualified for the Short List was limited not only because of the extensive feasibility assessment that would be required for each action, but also because implementing the entire Long List of action items would be difficult and costly. The evaluation process resulted in a Short List of 16 corporate action items and 14 community action items.

The items under Goal #7 – "Educate and Engage Local Residents and Businesses" and Goal #8 – "Demonstrate Local Government Leadership", were not evaluated under the criteria per se because they did not lend themselves well to the analysis. Instead, they were considered qualitatively to ensure that they could be easily implemented (did not require ongoing support of external consultants) and also met the eight goals as set out at the beginning of the process.

## 5.4 Short List Action Items

The final Short List developed from the evaluation of the original Long List contains the actions upon which the implementation plan will most likely be developed. All of the action items were categorised according to the eight goals discussed in the Introduction, and then further subdivided into 'Legislative Priorities', 'Corporate Actions' or 'Community Actions'. The Short List also includes suggested measures within some actions. These are meant to illustrate possibilities and are not intended to be exhaustive.

During the evaluation of the legislative priorities (policy actions), it was mandatory that each directive was within the jurisdiction of the municipal government. In taking this approach, it is ensured that the municipal governments have the ability to take action for the recommended items. However, where this was not the case (i.e. items were under control of the provincial or federal governments), it was still possible to include these actions under a different category (i.e. programs/promotions) for consideration.

Corporate actions are those that are primarily controlled by and for the benefit of the corporate operations of the municipalities involved. Community actions, whether influenced primarily by the municipalities or not, are intended to benefit the broader community.

**Table 5. The Short List of Action Items for Implementation**

## Goal 1: Improve the Energy Efficiency of Buildings

**Legislative Priorities:**

**1.** Require higher standards of energy efficiency and environmental design in new municipal buildings, or buildings that receive municipal funding:
- Make LEED Silver the minimum standard for new municipally owned buildings by 2015, and LEED Gold by 2020; and
- Make LEED eligibility the minimum standard for municipal funding support for new community owned buildings (i.e. fire halls, arenas, etc.).

**2.** Mandate EnerGuide rating label on homes at time of sale through the use of municipal by-law changes. The Nova Scotia Association of REALTORS and the province may assist with the implementation of this policy.

**Corporate Actions**

**Action 1**:

Retrofit existing municipal buildings for energy efficiency/conservation improvements and the use of renewable energy technologies:
- Utilise demand side management (DSM) programmes (such as NSPI's) as a resource tool to reduce energy consumption;
- Create a capital reserve fund for energy efficiency projects, replenished in part by savings from energy efficiency/conservation initiatives; and
- Encourage municipalities to enrol in Nova Scotia Power's SEIS (Smart Energy Information Service), which will assist them in managing their energy demand, or use a wireless energy monitor that provides real-time energy consumption information.

**Community Actions**

**Action 1**: Reduce infiltration in residential dwellings through weather stripping, caulking, etc.

**Action 2**: Retrofit commercial and institutional buildings for energy efficiency and conservation (i.e. DSM measures).

## Goal 2: Increase Transportation Choice and Efficiency

**Legislative Priorities:**

**1.** Mandate that all municipal employees undergo energy efficient driver training (based on NRCan's FleetSmart Program) and limit municipally owned vehicles to maximum speed of 95 km/hr (possibly through the use of governers).

**Corporate Actions**

**Action 1:** Provide incentives for municipal workers to take public transit (such as a 20% rebate on passes). *Richmond only.*

**Action 2:** Provide (or support the acquisition of) carpooling parking lots in order to encourage ride sharing and transit rider-ship. *Excludes Port Hawkesbury.*

**Action 3:** Determine the current usage patterns and best practices for municipal vehicles, and then incorporate these practices into operation of fleet. Incentives and/or bonuses may be offered for staying within fuel usage limits.

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| **Action 4:** Purchase and showcase more fuel-efficient and/or alternative fuel municipal vehicles (i.e. hybrid, CNG, propane). |
| **Action 5:** Support the Strait Area Transit Cooperative initiative by providing annual municipal operating subsidies to ensure its continued operation. |
| **Community Actions** (***In the PCP framework, Transportation emissions fall under Community***) |
| **Action 1:** Promote local food production on the most productive lands that are currently not being utilised for food production or that would require minimal energy investment (i.e. even community gardens). Work on expanding Farmer's Markets and promoting efforts to share costs or establish cooperatives for food preparation and/or storage. |
| **Action 2:** Support the Strait Area Transit Cooperative initiative through community membership of the co-op and regular usage of the system. |
| **Goal 3: Increase Industrial Energy Efficiency** |
| **Community Actions** |
| **Action 1:** Install heat recovery equipment at coal-fired power plant and/or pulp and paper mill; use for heating newly constructed greenhouses (local source of food) and/or local buildings.<br>**Action 2:** Encourage support and assistance for installation of 60 MW biomass combustion system (BCS) with steam turbine at NewPage. |
| **Goal 4: Encourage Energy Efficient Land Use Planning and Neighbourhood Site Planning** |
| **Corporate Actions** |
| **Action 1:** Incorporate solar access into community planning (layout of both roads and lots). |
| **Action 2:** Allow planning departments to provide preferential or accelerated review for the development permit process for projects meeting energy efficient criteria (i.e. through the use of a checklist) for developments and/or other green criteria. |
| **Goal 5: Increase Efficiency of Infrastructure** |
| **Corporate Actions** |
| **Action 1:** Monitor energy use at water/wastewater treatment plants and pumping stations and perform regularly scheduled maintenance, end of motor life upgrades to high efficiency units and variable frequency drives on pumps with high flow variability. |
| **Goal 6: Increase Energy Security and Diversify Energy Supply** |
| **Legislative Priorities:**<br>**1.** Review and if necessary revise any existing policies that may restrict uses of renewable energy or energy efficiency/conservation measures.<br>**2.** Enact a policy at the municipal level that provides for incentives to encourage the development of local sustainable energy sources (i.e. provide financial support for feasibility studies, defer taxes and/or reduce cost of acquiring land). |
| **Corporate Actions** |
| **Action 1:** Explore the option of seawater cooling in municipal buildings near water. *Richmond only.* |

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| **Action 2:** Utilise solar thermal air heating for suitable municipal buildings where feasible (i.e. solar wall for large buildings, modular units such as Cansolair for smaller buildings). |
| **Action 3:** Utilise solar thermal heating for suitable municipal domestic hot water (DHW) and pools where feasible. |
| **Action 4:** Utilise solar thermal energy for hydronic space heating in municipal buildings where feasible. |
| **Action 5:** Expand the geothermal system at the Port Hawkesbury Civic Centre to include nearby Strait Area Education and Recreation Centre (SAERC) and Port Hawkesbury Provincial Building; *only applicable to Port Hawkesbury*. |
| **Action 6:** Explore the potential of utilising wind energy to power municipal infrastructure. *Excludes Port Hawkesbury.* |
| **Community Actions** |
| **Action 1:** Install district heating system between the Inverary Manor (which is looking to double the size of the facility) and the Inverness Consolidated Memorial Hospital that is in close proximity (both use oil for heat). The system can incorporate one or more types of renewable energy resources (i.e. biomass plus solar supplement). |
| **Action 2:** Assess the feasibility of developing natural gas infrastructure in the town of Port Hawkesbury. |
| **Action 3:** Install a cogeneration BCS using substantial underutilised low-grade wood resource and clean wood (~100 tonnes/yr) from Inverness waste collection facility that can supply energy to local homes and/or greenhouses. *Mutually exclusive with Goal #6, Community Action #4.* |
| **Action 4:** Explore alternative uses of the local biomass resource (i.e. wood pellets, wood chips, gasification, etc.). *Mutually exclusive with Goal #6, Community Action #3.* |
| **Action 5:** Develop utility size wind turbines independently or in cluster approach. |
| **Action 6:** Assess feasibility for installation of solar thermal DHW (i.e. for residential, commercial & small industrial, institutional users, etc.). A high number of installations can obtain bulk pricing. |
| **Action 7:** Explore the potential for small scale (run-of-river) hydropower development on rivers with known flow data:<br>• April Brook at Gillisdale;<br>• Cheticamp River above Robert Brook;<br>• Cheticamp River below Artemise Brook;<br>• Cheticamp River below Cheticamp Lake;<br>• Lake O'Law Brook at Egypt Road;<br>• Little River near Port Richmond;<br>• Northeast Margaree River at Margaree Valley;<br>• North Little River below Beaver Dam Lake;<br>• River inhabitants at Glenora;<br>• Southwest Margaree River at Scotsville; and<br>• Southwest Margaree River near Upper Margaree. |

| Goal 7: Educate and Engage the Community |
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| **Legislative Priorities:**<br>**1.** Hire a sustainability coordinator that will promote existing incentives/programs, build relationships, provide support in application processes, identify local renewable energy and energy efficiency/conservation service providers as well as provide leadership toward the implementation of this community energy plan (CEP).<br>**2.** Build partnerships with energy efficiency/conservation program delivery agents and education organisations such as ACAP Cape Breton (focuses on action and education and delivers EnerGuide for Houses program), Clean Nova Scotia and/or Conserve Nova Scotia. |
| **Corporate Actions** |
| **Action 1:** Day long coalition building session (via invite) organised by mayors and CAOs from the three regions involving CEOs and top managers of large energy users to build momentum to get projects off the ground. |
| **Community Actions** |
| **Action 1:** Implement a public education and awareness campaign on energy efficiency, conservation and renewable energy as well as available incentives/programs. Several forms of media should be used to ensure outreach to all citizens. This campaign can include tours of local RE systems and/or passive solar design, etc. Addressing concerns such as lower quality of life and unemployment would be beneficial. |
| **Action 2:** Explore funding options to conduct feasibility studies on the use of heat pumps for buildings (e.g. water source on the coast and ground or air source inland). |
| **Action 3:** Seek funding for prizes, speakers and educational aids etc. on energy efficiency/conservation and renewable energy at schools. |
| **Action 4:** Using a broad-based approach that involves multi-community partners and organisations in order to increase community participations, conduct a well-planned and timed CEP launch campaign and promotion blitz that utilises local festivals, exhibitions, workshops and other carefully selected social events. |
| **Action 5:** Determine the interest in bulk purchase (to achieve a lower cost) of rain barrels to be available at a nominal fee and provide information on operation and maintenance in order to decrease energy and resources used for water pumping and treatment. |
| **Action 6:** Partner with local and/or provincial NGOs to provide input and deliver education and outreach activities as well as organise school events such as energy challenges. |
| **Action 7:** Work with the NS Community College to develop training programs to enhance the skills of existing trades persons to implement energy efficiency/conservation and renewable energy measures. |
| **Action 8:** Develop and deliver an information and education campaign for developers and the Builders Owners and Managers Association (BOMA) that emphasises the benefits of energy efficient neighbourhood and building design. |
| **Action 9:** Create a carpool culture with a large ad campaign, or through a newsletter and/or call-in show and offer to provide a centralised car pooling registration system to allow interested participants to contact one another. |

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| **Action 10:** Conduct a focussed neighbourhood canvassing program to promote the EnerGuide for Houses Programme. |
| **Action 11:** Use demonstration projects of renewable energy technologies and energy efficiency/conservation measures. Once installed, organise tours to promote them via the public education and awareness programme. |
| **Goal 8: Demonstrate Local Government Leadership** |
| **Legislative Priorities:**<br>**1.** Enact a policy that requires a sustainability filter to be applied for all municipal goods and services procurement (i.e. purchasing renewable fuels/energy from sustainable sources, using local materials wherever available and within reason, etc.).<br>**2.** Enact a policy that requires a sustainability filter to be applied for all municipal operating procedures (i.e. using local labour and engaging in energy efficient practices such as temperature setbacks, energy efficiency sensitivity training for employees, etc.).<br>**3.** Develop a policy for the siting and permitting of wind power developments.<br>**4.** Encourage the UNSM to work with the province to provide legislation and related regulations to open up market to IPPs. Standard offer contracts (SOCs) should be the norm for power purchase agreements (PPA), while owners have rights over any carbon credits generated. Municipality may also offer renewable energy generation incentives through 'Behind the Meter Application' and implement a Green Power program that allows the purchasing of power from a sustainable source. |
| **Corporate Actions** |
| **Action 1:** Use demonstration projects (i.e. heat pumps, solar thermal, green roofs, wind, biofuels, etc.) to prove technology and reduce (perceived) risk. Once installed, organise tours to promote them through the public education and awareness programme. |
| **Action 2:** Develop a long-term sustainable municipal energy vision that focuses on local, renewable, low or no carbon resources for the next 50 years. |
| **Action 3:** Officially endorse the GHG emission reduction target and the resulting implementation plan. |
| **Action 4:** Incorporate energy efficiency principles into municipal planning documents through regular review cycles (i.e. roundabouts and yield signs). |
| **Action 5:** Maintain the Green Action brand presence in all incentive programs and promotions developed through Green Action and the CEP. |
| **Action 6:** Develop a programme to exchange information related to sustainable development projects (i.e. share lessons learned, or cooperate on the launch of a capacity building programme). |

This Short List of action items is the most essential output of the CEP process and should be reviewed thoughtfully. It must be understood that the CEP is a dynamic document. It represents our best suggested plan in the setting of current circumstances, resources and needs, with a particular focus on the actions that will drive transformation. As an active, living process therefore, the plan can and should evolve in light of changing conditions. It will therefore be reviewed and assessed periodically. The entire current Long List of prospective actions, as well as new ideas will be viewed as essential resources for future planning and adjustment and revisited regularly. Some of these items may come back into higher priority and will require action on behalf of the municipalities, while other actions will be implemented by the community due to resource availability or other changing conditions in the future.

If the Strait Highlands Region is going to fulfill its aspirations and potential around a sustainable energy future within its broader sustainability and municipal objectives, this is the game plan – these are the key actions around which all sectors of the region should be mobilised toward for aligned action.

# 6 FUTURE GHG REDUCTION MEASURES

## 6.1 Future Community Measures

This section outlines various action items that have the potential to result in community-wide GHG emission reductions as set out in the Short List of Table 5. These action items include different community measures across various sectors. Several common facts were used and assumptions made throughout these analyses in order to quantify the level of GHG emissions reduction associated with each action item:

- The current Nova Scotia Power Inc. carbon emission intensity factor of 0.878 kg/kWh will not change until at least the end of the forecast period (2015);
- The $eCO_2$ emission factor for diesel is 2.73 kilograms per litre;
- The $eCO_2$ emission factor for gasoline is 2.36 kilograms per litre;
- The $eCO_2$ emission factor for home heating oil is 2.73 kilograms per litre;
- The average fuel consumption of private gasoline vehicles is 12 litres per 100 km;
- The average fuel consumption of the Strait Area Transit Co-op vehicles is 20 litres of gasoline per 100 km;
- Municipal vehicles are driven an average of 18,000 km per year; and
- All wood used as an energy source is carbon neutral (produces no GHGs).

### *6.1.1 Residential*

.1 **Action Item:** Reduce infiltration in residential dwellings through weather stripping, caulking, etc.

In the Strait Highlands Region, roughly 47% of residential dwellings were built prior to 1970 based on our energy audits and profiling estimates. It was determined during the residential energy audits that a significant number of homes would benefit from energy efficiency and/or conservation upgrades.

One of the most cost effective measures that may be undertaken to improve the energy efficiency of a home is to ensure that the building envelope is properly sealed through the installation of weather stripping, caulking and foam gasket insulating pads. It is worthy to note that the condition of any existing weather stripping and caulking should also be taken into consideration when evaluating its effectiveness due to the fact that dried out or compressed seals are significantly less effective at reducing infiltration and should be replaced.

In order to quantify the GHG emissions reduction that may be achieved by reducing infiltration in residential dwellings, additional assumptions were made:

- The total number of dwellings that could benefit from tightening the envelope was calculated by extrapolation of the number of dwellings found during the residential audits that could benefit from this action within the Strait Highlands Region;

- This analysis considers that 15% of homes in the area are seasonally used and are therefore excluded from the analysis;
- 20% of homeowners who could benefit from reducing infiltration would do so under a realistic scenario; and
- 25% of homeowners who could benefit from reducing infiltration would do so under an optimistic scenario.

Under a realistic scenario, the annual GHG emissions reduction that could be achieved by reducing infiltration in residential dwellings is 3,715 tonnes of $eCO_2$. Optimistically, the annual GHG emissions reduction that could be achieved by this measure is 4,644 tonnes of $eCO_2$.

It is likely that an increasing number of homeowners will participate in the EnerGuide for Houses Programme, which encourages energy efficiency/conservation retrofits by currently offering financial incentives to greatly reduce the financial barriers inherently present with this type of work. However, encouraging participation through the promotion of this programme is covered under a different item. As such, the reductions estimated here will be subtracted from the overall estimated reductions under the EnerGuide action item so as to avoid double counting.

.2 **Action Item:** Conduct a focussed neighbourhood canvassing program to promote the EnerGuide for Houses Programme.

Demand side management (DSM) – or reducing energy use - is typically more (cost) effective than increasing energy supply. Furthermore, enacting DSM measures to reduce or meet energy demand results in a very high level of job creation (per dollar invested) than other methods; roughly 50 jobs are created for every million dollars invested in DSM.

The residential audits yielded important information about how energy is being used within each home. Our residential auditing team focussed mainly on the building envelope, heating systems, major appliances, lighting and attic (roof) insulation. It was indicated that the Strait Highlands Region has a high number of older (pre-1970) houses with relatively inefficient building envelopes. As a result, the area could benefit greatly in terms of both GHG emissions and cost reductions through energy efficiency upgrades such as sealing air leaks and upgrading insulation levels.

Financial assistance (from both the provincial and federal governments) to a maximum of $6,500 per residential household through the EnerGuide for Houses Programme is currently available and greatly reduces the financial barriers associated with energy efficiency retrofits. To be eligible for the rebates, homeowners must have an initial audit performed in order to evaluate the energy efficiency of their home (and obtain a ‘rating’). At this point, they are encouraged to perform retrofits to increase the overall energy efficiency before a ‘follow-up’ audit is conducted (within 18 months of the initial audit) to evaluate the level of improvement and total eligible rebate for the actions taken.

Since the focus of the EnerGuide Programme is 'Keeping the Heat In', significant rebates are offered for actions such as insulating, reducing infiltration, etc. These rebates, combined with the energy and resultant cost savings from the actions taken, make this programme particularly attractive and effective towards reducing GHG emissions.

For the purposes of this analysis, all reductions achieved through the EnerGuide for Houses Programme are entirely accounted for under this action item as a 'Future GHG Reduction Measure' even though some of the retrofits have already occurred. This ensures that the emission reduction is more easily quantified and that the results are more easily interpreted.

Several additional facts were used and assumptions made during this analysis. Bullet points two to five contain data obtained from provincial results[2]:

- It is valid to extrapolate provincial results from the EnerGuide Programme to the Strait Highlands Region;
- The number of follow-up audits are the most significant because they indicate how many homes have actually performed retrofits and contributed to the overall average provincial GHG emission reduction level of 5.2 tonnes of $eCO_2$ per house per year;
- Confirmed average GHG reduction of 5.2 tonnes/house/yr for those who performed retrofits and had follow-up audit will be same for any home which underwent retrofits;
- 673 follow-up audits were performed from April 2007 to March 2008. However, this was realistically from October 2006 to March 2008 inclusive (18 months) because homeowners were told to wait until federal funding and additional rebates were available;
- 730 follow-up audits were performed from April 2008 to August 2008 inclusive (five months);
- Total number of Nova Scotia households was 376,845[3];
- Total number of households in the Strait Highlands Region was 11,100[4];
- Optimistic scenario assumes growth in retrofits in the S-H Region is same as current provincial rate (from April-August 2008) and continues until March 2010 when it plateaus. This translates into 46% of homes in the S-H Region being retrofitted by 2015;
- Realistic scenario assumes that 25% of homes in S-H Region will have performed retrofits by 2015;
- These results exclude reductions from the action item that involved reducing infiltration in residential dwellings due to the fact that reducing infiltration is a targeted measure in the EnerGuide for Houses Programme and hence to avoid double counting emissions.
- These results include reductions from an assumption that optimistically 60% of homeowners will convert lights to CFLs, while realistically 45% of homeowners are expected to undertake this conversion. This is due to the fact that the EnerGuide Programme promotes the use of CFLs (and even provides free bulbs) but does not quantify the reductions achieved from these actions.

Realistically, the estimated annual reduction that would be achieved by promoting the EnerGuide for Houses Programme is 16,638 tonnes $eCO_2$. Under an optimistic scenario, the estimated annual

reduction that would be achieved by promoting the EnerGuide for Houses Programme is roughly 29,978 tonnes of $eCO_2$.

Promoting the EnerGuide for Houses Programme will also likely lead to additional, indirect reductions of GHG emissions in addition to those quantified here due to increased awareness and education about energy usage and ways to manage it effectively.

#### *6.1.2 Commercial and Small Industrial*

.1 **Action Item:** Assess the feasibility of developing natural gas infrastructure in the town of Port Hawkesbury.

While natural gas is not a renewable source and not carbon neutral, it is the least carbon intensive of all the fossil fuels. As a result, displacing oil and coal with natural gas offers significant GHG reductions.

Strait Area Gas Corporation holds a tentative franchise licence to distribute gas in the Strait area. There are roughly nine or ten conditions that must be met in order for Strait Area Gas to proceed with the development of natural gas infrastructure; none of these conditions are very formidable. As a result, it is reasonable to assume that with sufficient demand and determination, the development of natural gas infrastructure in the Port Hawkesbury area could be a reality by 2015.

In order to justify the expenditure associated with installing gas distribution infrastructure, anchor loads would be required. The Strait Area Campus of the Nova Scotia Community College is located on the main commercial street in Port Hawkesbury. A commitment from the NSCC to use natural gas for cogeneration could accelerate development of the gas distribution infrastructure in the area. Additionally, residential dwellings exist along the proposed natural gas pipeline corridor; a certain number of these would likely subscribe to natural gas if given the opportunity.

Several additional facts were used and assumptions made in order to quantify the GHG emissions reduction potential from this measure:

- Natural gas will be utilised at the NSCC in a cogeneration system;
- Natural gas cogeneration carbon emission intensity factor is 0.491 kg/kWh (power);
- NSCC boiler carbon emission intensity factor is 0.234 kg/kWh (thermal);
- Cogeneration unit produces full power of 225 kW for 8,100 hours per year = 1822.5 MWh;
- Cogeneration unit supplies 350 kW of thermal energy to heating main, displacing No. 2 oil fired boiler with 80% efficiency;
- Realistically, twenty (20) households will subscribe to natural gas, while 30 households would subscribe under an optimistic scenario and there would be no additional users of natural gas in the S-H Region under a BAU scenario;
- Of the houses subscribing, 75% currently use oil and 25% using 50/50 oil/wood;
- Natural gas will displace oil completely in all cases, but will not displace wood;

- Energy content of natural gas is 39.5 MJ/$m^3$; carbon intensity is 1.903 kg $eCO_2/m^3$. Therefore, carbon emission factor for natural gas is 0.048177 kg $eCO_2$ per MJ;
- Figures based on 100-year global warming potential (GWP)[5];
- Residential oil efficiency = 83%; and
- Residential natural gas efficiency = 92%.

The annual GHG emissions reduction at the NSCC from this action item would be 961 tonnes of $eCO_2$. There was no assumed difference between optimistic and realistic scenarios for the NSCC uptake of natural gas due to the fact that the only two scenarios proposed are the presence or absence of gas. Therefore, the only other scenario considered for the NSCC is under a BAU scenario, where no reductions would result.

The optimistic annual residential GHG emissions reduction from this measure is estimated to be 53 tonnes of $eCO_2$, while the realistic annual residential GHG emissions reduction from this measure is estimated to be 35 tonnes of $eCO_2$.

Therefore, optimistically, the introduction of natural gas into Port Hawkesbury would result in an annual reduction of 1,014 tonnes of $eCO_2$. Realistically, this action item would result in an annual reduction of 996 tonnes of $eCO_2$.

.2 **Action Item:** Install a cogeneration biomass combustion system (BCS) using substantial underutilised, low-grade wood resource and clean wood (~100 tonnes per year) from Inverness waste collection facility that can supply energy to local homes and/or greenhouses.

**Note:** This action item is mutually exclusive with the next action item '*Explore alternative uses of the local biomass resource (i.e. wood pellets)*'. Therefore, only one of these action items may be acted upon.

Forestry resources can be secure, local and renewable sources of energy that help to create local employment. Furthermore, it is also possible to engage in sustainable harvest practices which ensure a long-term, stable supply of carbon neutral energy. When harvested trees are replanted, the $CO_2$ created during combustion is no more than that which was absorbed during their growth. As there is no net contribution of $CO_2$ into the atmosphere, this approach can therefore offer a secure source of energy that does not contribute to climate change.

The installation of a cogeneration BCS may take either a centralised approach in an area such as Orangedale (in order to minimise energy used for transportation) and/or take a smaller systems approach spread throughout the region. However, there are requirements that must be met to ensure feasibility (such as sufficient demand for the generated heat) that would render this action item to be site specific.

Several additional facts were used and assumptions made during this analysis:

- Emissions from transportation of fuel remain unchanged;

- Energy content per tonne of clean waste wood is 15 GJ;
- 49% of the input energy into a cogeneration biomass system is converted into thermal energy;
- 11% of the input energy into a cogeneration biomass system is converted into electricity;
- The average efficiency of residential oil furnaces is 83%;
- 75% of the thermal energy generated will displace oil-fired heating, while 25% of thermal energy generated will displace 50/50 oil/wood;
- Optimistically, 5% of the underutilised forestry resource is used, while realistically, 2.5% of the underutilised forestry resource is used, with none being used under the BAU scenario; and
- All clean waste wood is used under both the realistic and optimistic scenarios.

The Strait Highlands Region is endowed with a substantial wood resource; a significant amount of which is currently low-grade and underutilised. Through resource quantification in a previous exercise titled 'Energy Asset Mapping' that was performed for the region, it was estimated that there is 1,515,962 cubic metres ($m^3$) of available biomass in the Strait Highlands Region that could be annually harvested in a sustainable manner. Using the assumptions made, this equates to about 5,704,748 GJ.

It was also discovered in the same Energy Asset Mapping exercise that approximately 100 tonnes of clean waste wood would be available annually from the Inverness waste collection facility. This equates to approximately 1,500 GJ.

The Department of Natural Resources (DNR) will be releasing a report in 2008 that will contain detailed forestry yield calculations that should be very helpful in ensuring a sustainable harvest. Consultation with the DNR once this information is made available is highly recommended in order to ensure that this resource is in fact renewable, secure and carbon neutral.

Realistically, utilising the forestry resource in the Strait Highlands Region for a cogeneration BCS would result in an annual reduction of 18,278 tonnes of $eCO_2$. Optimistically, this action item would result in an annual reduction of 36,460 tonnes of $eCO_2$. Under a BAU scenario, no GHG emission reductions would be realised. It should be noted that this analysis has assumed that even under an optimistic scenario, only 5% of the potential resource will be utilised. Therefore, ample opportunity exists to further expand the use of this resource and make deeper, more substantial GHG emissions reductions.

.3 **Action Item:** Explore alternative uses of the local biomass resource (i.e. wood pellets, wood chips, gasification, etc.).

Using the forestry resource to make wood products may be more attractive than using the resource in a cogeneration system due to the lower operational costs. Additionally, the location of a wood pellet process is very flexible given that the pellets are easily transported.

Several additional facts were used and assumptions made during this analysis:

- Emissions from transportation of fuel remain unchanged;

- Biomass resource will be used to produce wood pellets and used locally;
- Average mass of one cubic metre of green wood is 500 kg;
- 400 kg of wood pellets can be produced from one tonne of green wood;
- One tonne of wood pellets will displace 500 litres (L) of home heating oil;
- 185 kWh of electricity is used to produce each tonne of wood pellets;
- 5% of the underutilised forestry resource is used under the optimistic scenario;
- 2.5% of the underutilised forestry resource is used under the realistic scenario; and
- None of the underutilised forestry resource is used under the BAU scenario.

Realistically, utilising the forestry resource to make wood pellets would result in an annual reduction of 18,231 tonnes of $eCO_2$. Optimistically, this action item would result in an annual reduction of 36,461 tonnes of $eCO_2$. Under a BAU scenario, no GHG emission reductions would be realised. In the same manner as in the previous measure, this analysis has assumed that even under an optimistic scenario, only 5% of the potential resource will be utilised.

#### *6.1.3 Transportation*

.1 **Action Item:** Promote local food production on the most productive lands that are currently not being utilised for food production or that would require minimal energy investment (i.e. even community gardens). Work on expanding Farmer's Markets and promoting efforts to share costs or establish cooperatives for food preparation and/or storage

The Nova Scotia Federation of Agriculture (2008)[6] estimates that there are approximately 1,400 hectares of underutilised or abandoned farmland within the Strait Highlands Region. Bringing this farmland into food production for local consumption can reduce transportation related GHG emissions because of the shorter distance the food is required to travel.

It is reasonable to state that any food grown in the Strait Highlands Region would only displace food imported from an area with a similar climate and growing conditions (i.e. within several hundred kilometres as opposed to several thousand). In other words, it would not be realistic to presume that food grown on these underutilised lands could displace bananas or mangoes from the Tropics.

Two common crops in the Maritimes are potatoes and blueberries. Potatoes are typically grown in a three-year crop rotation with hay and grain. Blueberries are only harvested every two years from any given parcel of land. Therefore, an average yield per year is taken. AgraPoint (2008)[7] has stated that there is an appreciable area of land suitable for blueberry production in the Strait Highlands Region, particularly between Whycocomagh and Mabou.

Many more assumptions were made during this analysis in order to quantify the GHG emissions reduction:

- Emissions from local growth (tilling, planting, harvesting, etc.) are identical to those from growing the food further away and cancel each other out;

- GHG reductions resulting from this measure would be solely from the avoided transportation of the food;
- Optimistically, 50% of this land would be utilised for three-year crop rotation between potatoes, hay and grain, while realistically 25% of this land would be utilised for this purpose;
- Only the potatoes from the three-year rotation would be counted as displacing imported food since hay and grain are not normally imported;
- Optimistically, 25% of this land would be utilised for growing blueberries on a two-year cycle (harvested every two years), while realistically 12.5% of this land would be utilised for this purpose;
- Under a business as usual (BAU) scenario, none of this land would be developed for farming;
- The average annual potato yield (taking into consideration two out of three years of non-production) is 8800 kilograms per hectare;
- The average annual berry yield (taking into consideration one out of two years of non-production) is 430 kilograms per hectare[8];
- 5% of all crops are lost to various factors such as weather, etc.;
- Each trailer load transports 40,000 kilograms;
- The average distance per round trip for imported food is 800 km; and
- The average fuel consumption of diesel transport trucks is 30 litres per 100 km.

There are many other variables that influence the level of production that would be achieved in reality. These include, but are not limited to: how suitable the land is for food (particularly blueberry) production; if enough of a local market exists to be able to sell available production; and if land owners are willing to either farm by themselves, or sell the right to others to farm on their land.

This action item suggests that work should be done on expanding Farmer's Markets and promoting efforts to share costs or establish cooperatives for food preparation and/or storage. This will not only help to increase the level of demand for local food, but it will also provide a means of preserving/storing this food for later by those who are willing to consume it, thereby increasing absolute demand. Taking these factors into consideration make the realistic and optimistic assumptions seem reasonable.

Optimistically, the average annual GHG emissions reduction from promoting local food production on the most productive lands that are not currently used for food production would be 103 tonnes of $eCO_2$, while a realistic reduction would be 52 tonnes of $eCO_2$ annually. It is assumed that no GHG reductions would be achieved through this measure without active promotion.

## 6.2 Future Corporate Measures

This section outlines various action items that have the potential to result in corporate (municipal) GHG emission reductions. These analyses are broken down by municipality, as each municipality is in a

different situation with regards to current and future GHG emissions. Some measures will exclude certain municipalities where they are not applicable, while other measures may be applicable to all three. Many established facts were used and assumptions made throughout these analyses in order to quantify the level of GHG emissions reduction potential associated with each action item. These facts and assumptions are listed as follows:

- All municipal employees who undergo energy efficient driver training reduce fuel consumption in both municipal vehicles they drive as well as their own private vehicles through behavioural changes;
- Municipal vehicles are driven an average of 18,000 km per year;
- 80% of municipal employees own and operate an automobile an average of 20,000 km per year;
- Realistically, a 10% reduction in fuel consumption may be realised by mandating energy efficient driver training for all municipal employees;
- Optimistically, a 20% reduction in fuel consumption may be realised by mandating energy efficient driver training for all municipal employees;
- The average fuel consumption of vehicles prior to energy efficient driver training is 15.0 litres per 100 km;
- The average carbon emission factor used for fuel consumption of vehicles is 2.5 kg per litre (average between diesel and gasoline);
- 55% of the population of Inverness and Richmond municipalities is employed (this is not related to unemployment rate);
- Citizens who are not carpooling are riding alone;
- Three people are in each carpooling car;
- Emissions reduction calculated includes those achieved from increased transit rider ship as a result of additional carpooling parking lots;
- Under a business as usual (BAU) scenario, 5% of commuters carpool;
- Realistically, 20% of commuters will carpool if carpooling parking lots are provided;
- Optimistically, 30% of commuters will carpool if carpooling parking lots are provided;
- The average daily return trip for commuters is 80 km[9];
- Commuters will carpool five times per week if carpooling parking lots are provided;
- Vehicular fuel consumption is not affected by number of passengers;
- Best practices for vehicles include actions such as proper maintenance and scheduling;
- All power used in wastewater treatment plants, pumping stations, storage tanks/water towers, sewer lift stations, etc. can be displaced with wind power;
- The current Nova Scotia Power Inc. carbon emission intensity factor of 0.878 kg/kWh remains unchanged until at least the end of the forecast period (2015);

#### *6.2.1 Common Future Municipal Measures*

.1 **Legislative Action Item:** Mandate that all municipal employees undergo energy efficient driver training (based on NRCan's FleetSmart Program) and limit municipally owned vehicles to a maximum speed of 95 km/hr (possibly through the use of governers).

EcoENERGY for Fleets is a program offered by Natural Resources Canada introducing fleets to energy-efficient practices that can reduce fuel consumption and emissions. FleetSmart is a

component of this program offering free practical advice on how energy-efficient vehicles and business practices can reduce fleet operating costs, improve productivity and increase your competitiveness.

It is proposed that all municipal employees undergo energy efficient driver training which will not only reduce municipal vehicle fuel consumption and emissions, but also reduce fuel consumption in the private vehicles of municipal employees. This is due to the fact that as people are educated, they are likely to apply these principles to their own vehicles, thus changing their behaviour and reducing fuel consumption. Table 6 highlights expected GHG reductions resulting from the implementation of this legislation by all three municipalities.

**Table 6. GHG Reduction Estimates from Energy Efficient Driver Training Program**

| MUNICIPALITY | GHG EMISSIONS REDUCTION | REMARKS |
|---|---|---|
| Inverness | Realistic: 24 tonnes<br>Optimistic: 46 tonnes | Assumed 24 employees and 13 municipal vehicles |
| Richmond | Realistic: 14 tonnes<br>Optimistic: 28 tonnes | Assumed 18 employees and 5 municipal vehicles |
| P. Hawkesbury | Realistic: 27 tonnes<br>Optimistic: 55 tonnes | Assumed 40 employees and 5 municipal vehicles |

.2 **Action Item:** Provide (or support the acquisition of) carpooling parking lots in order to encourage ride sharing and transit ridership.

Providing carpooling parking lots in strategic areas will offer the opportunity for residents to reduce their GHG emissions through an absolute decrease in the number of vehicle kilometres travelled (VKT). The best approach to this development is to identify areas where the use of carpooling lots would be maximised. Suitable areas are typically at main cross-roads and/or near ramps for thoroughfares. Once an area is identified, signs at the lot and on the road adjacent to the lot are installed to inform motorists of this designated carpool lot.

The residents of Port Hawkesbury are not included in this analysis due to the fact that most people would have a very short commute to work since most employment in the region is within the town of Port Hawkesbury and Point Tupper. Expected emission reduction results are summarised in Table 7.

**Table 7. GHG Reductions from Provision of Carpooling Lots**

| MUNICIPALITY | GHG EMISSIONS REDUCTION | REMARKS |
|---|---|---|
| Inverness (15,979 citizens) | Realistic: 3,365 tonnes<br>Optimistic: 5,610 tonnes | Assumed 65% of workers commute to work. Maximum potential estimated at 22,435 tonnes. |
| Richmond (9,982 citizens) | Realistic: 2,750 tonnes<br>Optimistic: 4,580 tonnes | Assumed 85% of workers commute to work. Maximum potential estimated at 18,326 tonnes. |

.3 **Action Item:** Determine the current usage patterns and best practices for municipal vehicles, and then incorporate these practices into operation of fleet. Incentives and/or bonuses may be offered for staying within fuel usage limits.

Likely opportunities exist within the operation of all municipal vehicles that can offer reductions in GHG emissions. For example, regular vehicle maintenance enables a more efficient operation of the vehicle and reduced fuel consumption. Both these outcomes lead to savings of time and money.

It would be useful to compile a fleet inventory with a usage database (to whatever level of practical detail) in order to identify opportunities that exist. This would allow the municipalities to consider municipal vehicle and equipment management as well as coordination with a focus on energy efficiency.

It would also be useful to re-visit the municipal vehicle operations policy to determine if there are any areas of deficiency or opportunity and also to include training for Best Practices in the operations policy for drivers.

Another consideration is whether or not the type of vehicles being used suit their purpose. For example, using a vehicle that is only as large as is needed may offer reductions in fuel use. Exploration of the procurement policy to ensure that vehicles will be replaced with more energy efficient vehicles according to regular replacement schedules may also be necessary. Table 8 summarises expected emission reductions resulting from this programme.

**Table 8. GHG Reductions from Revision of Vehicle Usage and Implementation of Best Practices**

| MUNICIPALITY | GHG EMISSIONS REDUCTION | REMARKS |
|---|---|---|
| Inverness | Realistic: 9 tonnes<br>Optimistic: 18 tonnes | Assumed 13 municipal vehicles currently owned and operated |
| Richmond | Realistic: 3 tonnes<br>Optimistic: 7 tonnes | Assumed 5 municipal vehicles currently owned and operated |
| Port Hawkesbury | Realistic: 3 tonnes<br>Optimistic: 7 tonnes | Assumed 5 municipal vehicles currently owned and operated |

.4 **Action Item:** Explore the potential of utilising wind energy to power municipal infrastructure.

Municipal infrastructure uses an appreciable amount of electricity to power operations. It is proposed that some of this load is met through the generation of electricity through wind turbines.

In Nova Scotia, it is possible to install renewable energy of up to 100 kW installed capacity for use on-site through the net metering programme. Net metering allows any excess power that is fed into the grid to be credited to the power generator's account. Any credits generated may be used at times when the user demands more power than is currently being generated by their system. However, if credits are not used within twelve (12) months, they expire and their value is lost (unconfirmed sources have hinted that this is likely to change to thirty-six (36) months in the near future). See Table 9 for estimated GHG emission cuts if this action is carried through. This measure excludes Port Hawkesbury given that a wind turbine is already in the planning stages (see Section 4, Planned GHG Reduction Measures).

**Table 9. GHG Reduction from Wind Energy for Municipal Infrastructure**

| MUNICIPALITY | GHG EMISSIONS REDUCTION | REMARKS |
|---|---|---|
| Inverness | Realistic: 650 tonnes<br>Optimistic: 866 tonnes | Assumed wind meets 45% of current load under Realistic scenario, and 60% under Optimistic scenario. |
| Richmond | Realistic: 105 tonnes<br>Optimistic: 140 tonnes | Assumed wind meets 45% of current load under Realistic scenario, and 60% under Optimistic scenario. |

### *6.2.2 Unique Measures for Richmond Municipality*

.1 **Action Item:** Provide incentives for municipal workers to take public transit (such as a 20% rebate on passes).

Providing incentives such as a rebate on transit passes/tickets to municipal workers should encourage the use of the service and ultimately help to reduce GHG emissions. However, this

measure is only applicable to the municipal employees of Richmond County due to the fact that at present, the Strait Area Transit has limited service throughout the region, mainly within Richmond County. The only other areas to be served outside of Richmond County are Port Hawkesbury and Port Hastings. It has not become clear yet if municipal employees residing in Port Hawkesbury or Port Hastings will use the service.

Facts used and assumptions made in order to quantify the GHG emissions reductions possible by providing a 20% rebate on transit passes to municipal employees include:

- Only municipal employees that reside within Richmond County will utilise the service;
- Only fuel saved in municipal employees' vehicles by using Strait Area Transit are included;
- There are 18 municipal employees in Richmond County;
- 40% of municipal employees will realistically utilise the 20% rebate on transit fees;
- Optimistically, 60% of municipal employees will utilise the 20% rebate on transit fees;
- Of those who use the Strait Area Transit, they will ride the service 90 km per day, five times per week;
- The capacity of the buses is 50 passengers; and
- The fuel used by the transit is pro-rated (i.e. each person is only responsible for 2% of the fuel consumption of the bus.

Using these assumptions, this measure will result in a realistic GHG emissions reduction of about 46 tonnes of $eCO_2$ per year. Optimistically, this action will result in an annual GHG emissions reduction of 69 tonnes of $eCO_2$ per year.

.2 **Action Item:** Explore the option of seawater cooling in municipal buildings near water.

A significant portion of the energy used in the buildings is for heating and cooling. Municipal buildings are currently cooled by power energised conventional air conditioners. An alternative approach is to use cold water from a nearby water body in order to meet the cooling load. It was determined that only Richmond has a municipal building where the use of seawater for cooling may be feasible (i.e. close enough to water with an appreciable cooling load).

Since the generation of electricity is carbon intensive in Nova Scotia, this action item offers GHG emission reductions by displacing carbon intensive electric air conditioning with the utilisation of sea water which is significantly less carbon intensive.

Assumptions made to quantify the level of reductions that may be realised through this measure include the following:

- The Richmond Municipal Administration Building is close enough to utilise seawater for cooling;
- 15% of the total annual electricity usage in the Richmond Municipal Administration Building is used for air conditioning;
- All of the cooling load can be met with seawater cooling;

- Seawater cooling is carbon neutral save for electric energy in the water circulators;
- The realistic and optimistic scenarios lead to identical reductions due to the fact that the design and installation of a seawater cooling system would meet the entire load.

Using these assumptions, it can be estimated that meeting the cooling load of the Richmond Municipal Administration Building with seawater instead of conventional air conditioning will lead to an annual GHG emission reduction of 20 tonnes of $eCO_2$.

# 7 INVESTMENT AND SAVINGS

Investment requirements and the potential cost effectiveness of each of the recommended GHG reduction measures will be assessed in Milestone Three (Local Action Plan) of this PCP framework. Short and long term Local Action Plan items will be prioritised on the basis of their feasibility with regard to financing options, technology availability and the level of impact they will have on the emissions reduction target by 2015.

# 8 EMISSIONS REDUCTION TARGET RECOMMENDATION

## 8.1 Community Target

The greenhouse gas (GHG) emissions reduction target for the community takes into consideration all identified measures in each of the three jurisdictions and is therefore recommended for the entire Strait Highlands Region. As a minimum, the PCP programme recommends a GHG reduction target for communities of 6% reduction below the base year emissions. The Strait Highlands Region Community has many resources and opportunities to easily achieve this minimum. Based on the estimates made and the potential for the combined Strait Highlands community, the **recommended community GHG emissions reduction target is 18% below 2005 emissions level by 2015.** This is believed to be a reduction target which is both challenging, and yet achievable.

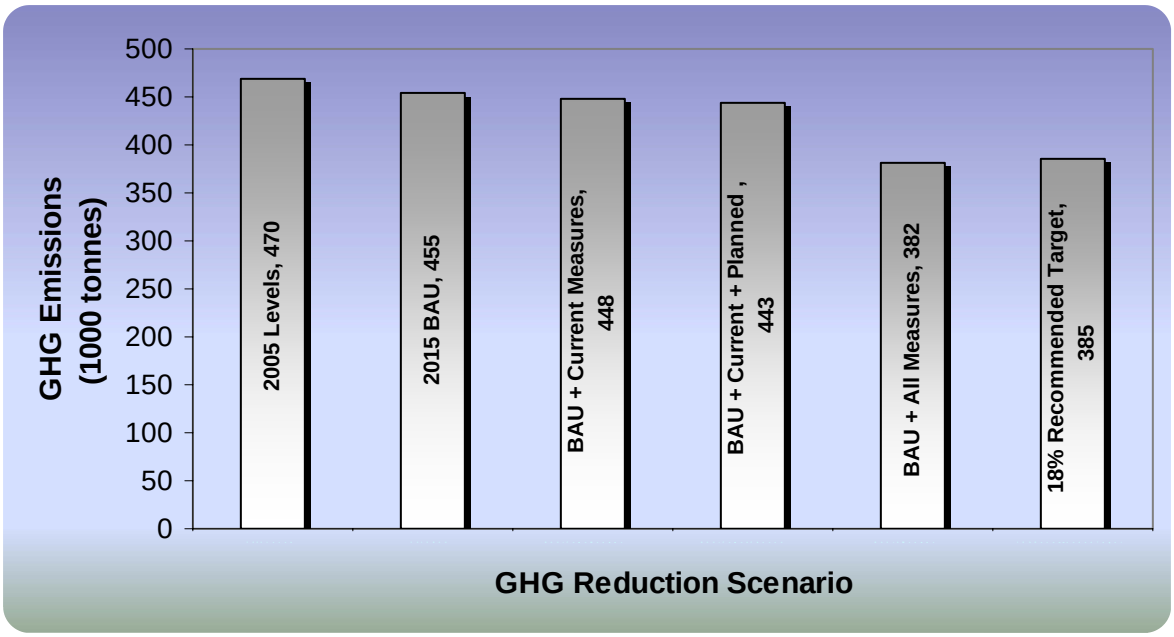


**Figure 16. Comparison of GHG Emission Reduction Outcomes**

With the recommended community target as stated above, the three GHG emission scenarios are summarised in Figure 17.

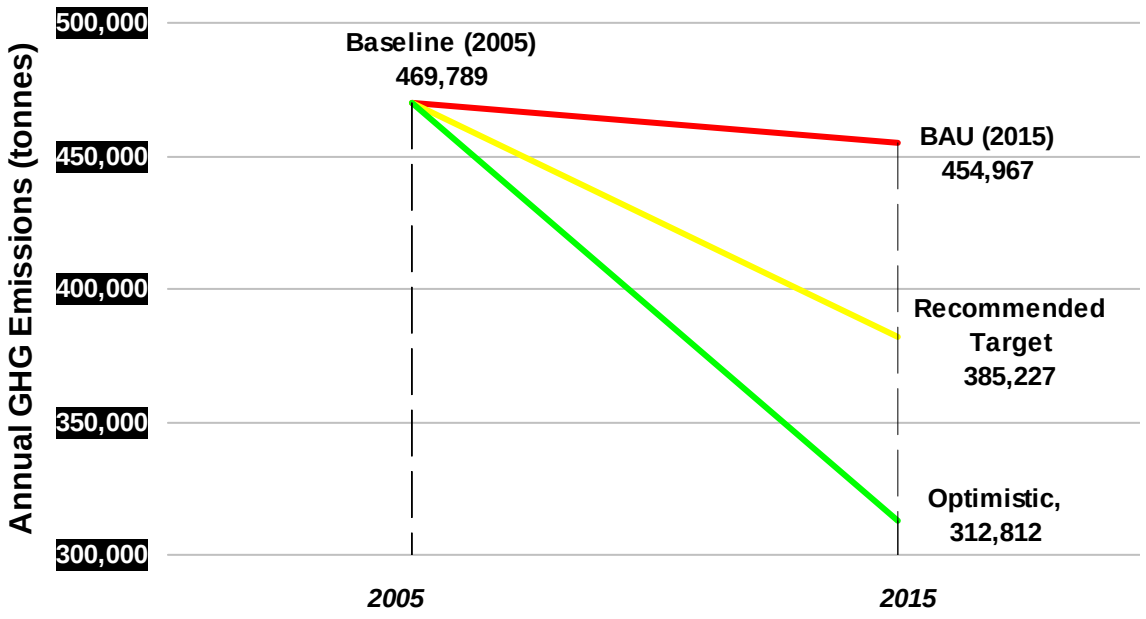


**Figure 17. Community GHG Emission Scenarios**

## 8.2 Corporate Target

At the municipal level, target assessment was carried out for each of the municipalities independently. The PCP programme recommends a corporate emissions reduction target of 20% below the base year GHG emissions. GHG emissions reduction potential for each of the three municipalities was assessed on the basis of the size of its operations, vehicle fleet, infrastructure and number of buildings. It cannot be expected with so many variables that the municipalities will have the same reduction targets. However the Team has concluded that to be consistent with the PCP framework, 20% reduction below the 2005 emissions will be a minimum target for any municipality whose realistic reduction analysis is not greater than 20%. The analyses and assessments have resulted in the 2015 recommended GHG reduction targets for each municipality as derived and summarised in the following sections:

### *8.2.1 Inverness Corporate GHG Emissions Summary and Reduction Target*

**Table 10. Inverness Municipality Emissions and Recommended Reduction Target**

| GHG Reduction Scenario | GHG Emissions (tonnes) | Percent Reduction |
|---|---|---|
| 2005 Baseline Emissions | 4,866 | 0% |
| PCP Target | 3,893 | 20% |
| 2015 With All Measures Implemented | 3,845 | 21% |
| **Recommended Target** | **3,845** | **21%** |

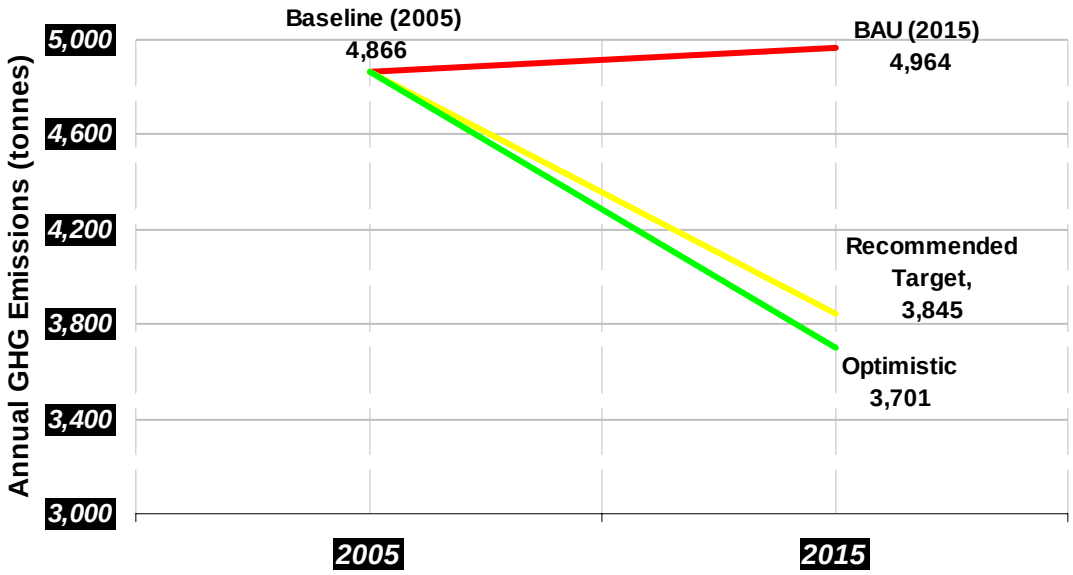


**Figure 18. Summary of Corporate GHG Emissions Scenarios for Inverness Municipality**

### *8.2.2 Richmond Corporate GHG Emissions Summary and Reduction Target*

**Table 11. Richmond Municipality Emissions and Recommended Reduction Target**

| GHG Reduction Scenario | GHG Emissions (tonnes) | Percent Reduction |
|---|---|---|
| 2005 Baseline Emissions | 2,114 | 0% |
| PCP Target | 1,691 | 20% |
| 2015 With All Measures Implemented | 1,872 | 11% |
| **Recommended Target** | **1,691** | **20%** |

As can be deduced from Table 11 above, the recommended GHG reduction target of 20% is above the assessed potential for the municipality. However, the 20% target has been recommended in order to be consistent with the PCP framework which recommends a minimum reduction target of 20% below the baseline emission rate. Nonetheless, the optimistic scenario as captured in Figure 19 below shows that the recommended 20% reduction target can be achieved within the optimistic means, but that still implies a launch of an aggressive implementation plan to make up for the shortfall to target.

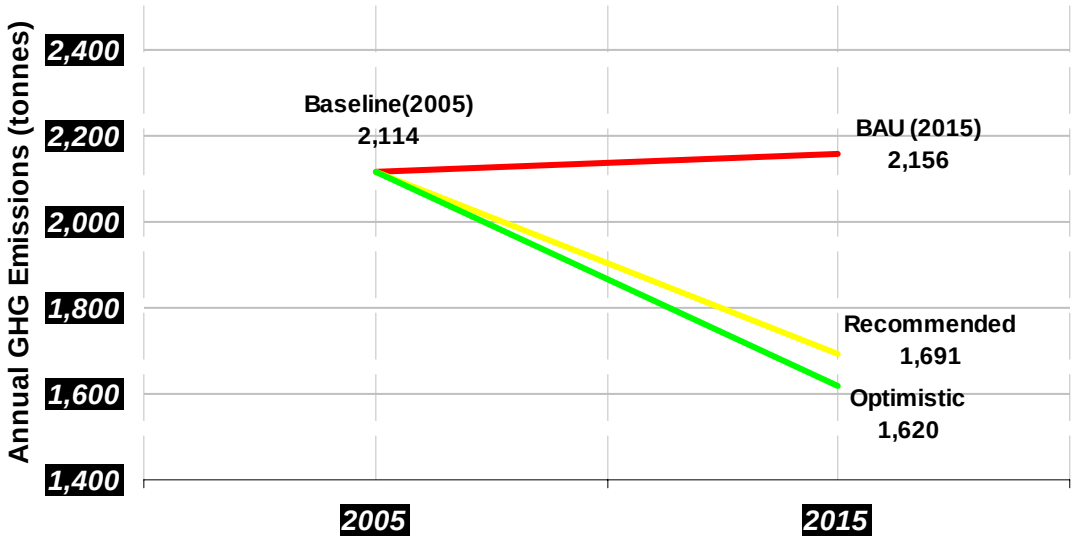


**Figure 19. Summary of GHG Emissions Scenarios for Richmond Municipality**

### *8.2.3 Port Hawkesbury Corporate GHG Emissions Summary and Reduction Target*

**Table 12. Port Hawkesbury Emissions and Recommended Reduction Target**

| GHG Reduction Scenario | GHG Emissions (tonnes) | Percent Reduction |
|---|---|---|
| 2005 Baseline Emissions | 11,829 | 0% |
| PCP Target | 9,463 | 20% |
| 2015 With All Measures Implemented | 9,730 | 18% |
| **Recommended Target** | **9,463** | **20%** |

Municipal GHG reduction measures enumerated and analysed for the Town of Port Hawkesbury appear to achieve a potential reduction just two percentage points short of the recommended target. Nonetheless, a 20% GHG reduction target below the 2005 baseline emission rate is recommended to be in tune with the PCP programme guidelines. Much opportunity is available for the Town of Port Hawkesbury to rise above the assessed 18% realistic reduction potential. The Municipality has been working hard at formulating plans to exploit what potential exists in the areas of renewable energy and waste heat recovery. Therefore a 20% reduction target is a further stimulus to allow for further imagination in the next six years to bring GHG emissions under control. Figure 20 summarises three of many potential municipal GHG emission outcomes by the end of 2015.

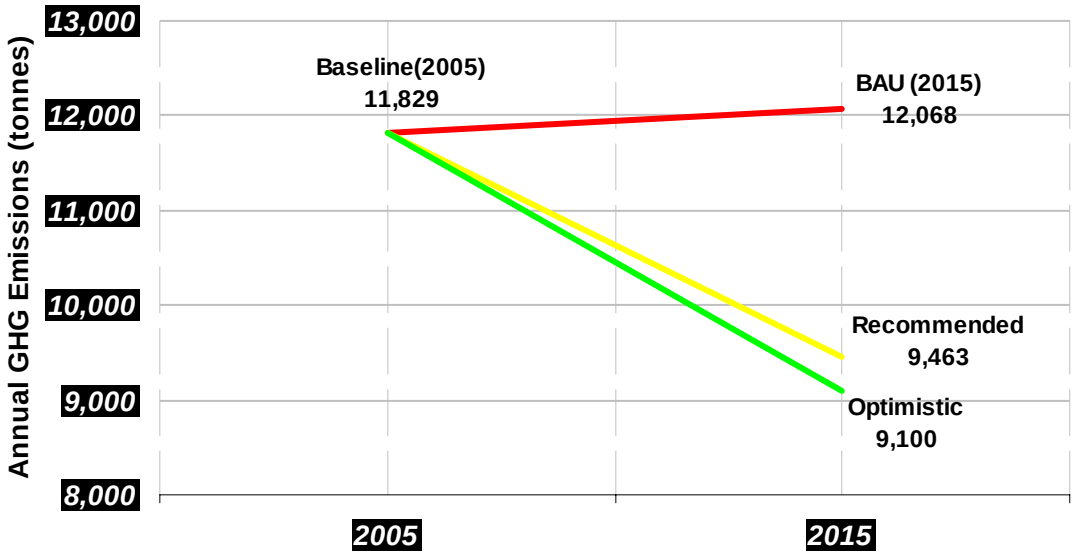


**Figure 20. Corporate GHG Emissions Scenarios for Port Hawkesbury Municipality**

# 9 OTHER AREAS OF OPPORTUNITY FOR THE REGION

.1 **Action Item:** Install district heating system between the Inverary Manor and the Inverness Consolidated Memorial Hospital that is in close proximity (both use oil for heat). The system can incorporate one or more types of renewable energy resources (i.e. biomass plus solar supplement).

This action item was proposed upon the realisation that the Inverness Consolidated Memorial Hospital and the Inverary Manor were undergoing an expansion and that there could be physical plant shared services.

It is possible to utilise renewable energy for the operation of the facilities, as opposed to conventional oil-fired heating. A biomass combustion system (BCS) could supply the majority of the heating load in the winter, with a solar supplement component that would supply the domestic hot water (DHW) load in the summer. A configuration such as this could allow the biomass system (which operates most efficiently at higher outputs) to be shut off for the summer.

It was discovered upon investigation in September 2008 that oil-fired boilers were already ordered and soon to be delivered to and installed at the hospital. However, this does not completely rule out the possibility of utilising renewable energy. This action is still worth considering, not only from a GHG emission reduction standpoint, but also from a financial perspective. It may well be more cost effective over the long-run to exploit renewable energy as opposed to heating oil even after the purchase of the oil-fired boilers. A feasibility analysis would surely help to determine whether or not this is the case.

## 9.1 Non-Quantifiable Action Items

There are many measures where GHG emission reductions were not quantified. This is due to the fact that the emissions reduction resulting from these items is very uncertain (involves too many assumptions), or because the actions will lead to reductions that fall under the realm of other action items.

There are measures that would simply require so many assumptions such that the resulting reduction quantification would have to be stated at an unacceptable level of uncertainty. An example of this is: *Work with the NSCC to develop training programmes to enhance the skills of existing trades persons to implement energy efficiency/conservation and renewable energy measures*. Not only is there an uncertainty in how many trades people will partake in this kind of training, but there is also a high level of uncertainty in determining how many of these trades people will be in a position to (and feel inclined to) recommend a particular kind of technology that reduces dependency on fossil fuels.

Many of the action items that are recommendations with the goal of educating and engaging the community (Goal #7) or demonstrating local government leadership (Goal #8) essentially promote other action items with the aim of increasing uptake. For example, this may be done through increasing

awareness, and/or stimulating sustainable development by opening up the market. As a result of the promotion of other action items, certain measures will lead to indirect reductions of GHG emissions. Therefore, to avoid double counting reductions, it was decided that the more easily quantifiable measures would be used for inclusion into the GHG emission reduction target calculation.

Many of these action items that have not been quantified may be even more important than those that have been quantified because of the fact that much of the uptake of the analysed measures will depend on how well educated and engaged the community is. For example, the recommended Legislative Priority that involves hiring a **Sustainability Coordinator** may well be the most essential action that may be taken. Consider that this regional 'champion' can provide the necessary leadership and coordination required to fully implement this community energy plan.

Furthermore, it is crucial to have widespread acceptance of the CEP for effective action to be taken. Making the benefits of taking action known is one of the most important and effective ways of accomplishing recognition and uptake of the Community Energy Plan and the Strait Highlands Green Action.

# 10 CONCLUSION

It is important that the community energy plan (CEP) reflects in every way possible, the expectations of the stakeholders and citizens who generously offered their time, ideas and opinions during the consultation process.

In order to have the support of the entire Strait Highlands community for the specific actions recommended in this plan, the community needs to understand that this is their plan and its success ultimately depends upon their willingness to accept and embrace the positive changes this plan will bring. Meanwhile, municipalities have a very critical role to play in helping turn this plan into reality. It is therefore very important that each of the three municipalities considers implementing those measures with the greatest impact and visibility so as to provide an educational platform for the community. When the citizens realise how seriously their municipal leaders are engaging to transform this energy plan into policies, programmes and demonstrable projects, they will be stimulated to be part of this exceptional transformation.

It is true that some of the recommended actions may require transformational lifestyle changes in order to achieve the level of greenhouse gas emission reductions necessary to meet the recommended emissions reduction target. However, transformational does not need to have a negative connotation since the overall objective of sustainability includes the benefits of a cleaner environment and better health for all of the Strait Highlands Region's citizens.

With the increasing costs of conventional energy sources, an added benefit of enhanced sustainability practices is the reduced energy consumption and a resultant reduction in costs. Many of the corporate actions recommended will result in significant energy consumption reductions and cost savings for the municipal governments. This makes many of these actions a win-win for municipalities; good for the environment and good for the corporate bottom line.

## END NOTES

[1] Strait-Area Alternative Transportation Project Feasibility Study Results, January 2007.
[2] Personal communication with Conserve Nova Scotia, 02 September, 2008.
[3] http://www.gov.ns.ca/finance/communitycounts/default.asp
[4] From Milestone One report for Strait Highlands Region
[5] http://yosemite.epa.gov/OAR/globalwarming.nsf/UniqueKeyLookup/SHSU5BUM9T/$File/ghg_gwp.pdf
[6] Personal communication with Nova Scotia Federation of Agriculture, 08 May, 2008.
[7] Personal communication with AgraPoint, 08 September, 2008.
[8] Personal communication with AgraPoint, 08 September, 2008.
[9] Strait-Area Alternative Transportation Project Feasibility Study Results, January 2007.

# Strait-Highlands Green Action

## Milestone Two Report
## October 2008

***Building Enterprising Communities!***

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