

# Annapolis Royal Energy Conservation Pilot Project

Project Report  
Prepared for Clean Annapolis River Project  
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Clean Annapolis River Project



## Acknowledgments

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## Executive Summary

Early in 2006, staff with the Town of Annapolis Royal approached the Clean Annapolis River Project (CARP) seeking their assistance in developing an energy conservation plan. For a regional organization like CARP, this invitation presented an opportunity to develop a pilot project that could become a model that other towns and villages in the Annapolis Watershed might adopt. Hence, the objective of the *Annapolis Energy Conservation Pilot Project* is to use the Town of Annapolis Royal as a test bed to develop community-based energy conservation plans for other communities.

The base year of 2006 was originally selected as the most recent full 12 month period because Nova Scotia Power indicated that they could provide electrical consumption data for a three-year period, 2005, 2006 and 2007 and this could be averaged for the period, minimizing the influence of seasonal variance. Due to changes in the routing for meter reading, this proved to be much more difficult than initially anticipated. For the purposes of this baseline survey, energy consumption has been broken into several components. Energy consumption in its various forms was then used to estimate greenhouse gas (GHG) emissions for each of the following sectors: Corporate Town of Annapolis Royal (CTAR); Industrial, Commercial and Institutional (ICI) and Residential/Small Business (RSB). This research does *not* include emissions arising from private transportation.

When fossil fuels are burned several greenhouse gases are released, depending upon the fuel and other factors. To manage these diverse gases, all emissions are converted into equivalent units of carbon dioxide, shown as eCO<sub>2</sub>. For the purposes of this report, the conversion factors developed by the Union of Nova Scotia Municipalities were used.

Using a variety of research techniques, the total greenhouse gas emissions from energy users within the geographic boundaries of the Town of Annapolis Royal were estimated at just over 12 million kilograms in a 12 month period as expressed in equivalent units of carbon dioxide. The larger commercial and institutional users including schools, large businesses and others accounts for over 62 %, followed by small business/residential and Corporate entity of the Town of Annapolis Royal at 34 % and 4 %, respectively.

The majority of greenhouse gas emissions from all users in the geographic boundaries of the municipality originated from the use of furnace oil for space heating and electrical energy for various uses. Electrical consumption accounts for slightly more than 78 % followed by furnace oil for space heating at just under 22 %. The largest source of GHG emissions from the Corporate Town of Annapolis Royal arose from electrical consumption which represented 77 % of the total emissions. This would seem to be an area in which the Town administration might wish to focus. In the ICI sector, 91 % of the GHG emissions was from the consumption of electricity followed

by space heating at only 8 %. This would imply that there should be areas for very substantial reductions in electrical consumption by this sector. With respect to small business and residential, the split between GHG emissions from electrical and space heating at 46 % and 54 %, respectively. This would imply that homeowners might wish to target both energy sources.

The price of space heating fuel could be as much as 30 to 50 % higher in the coming season as compared to last year. Increases in future years are anticipated. While electrical costs may not, in the immediate term, rise as quickly as oil prices, one should expect them to meet and likely exceed oil prices as electrical energy in Nova Scotia is primarily generated from burning fossil fuels. Economics is a very powerful incentive for conservation. There are federal, provincial and private sector incentive programs that encourage conservation. Utilization of these initiatives provide the bridges necessary to make the transition into the emerging world of high energy costs.

## 1.0 Background

Early in 2006, representatives of the Town of Annapolis Royal approached the Clean Annapolis River Project (CARP) seeking their assistance in developing an energy conservation plan. For a regional organization like CARP, this invitation presented an opportunity to develop a pilot project that could become a model that the other towns and villages in the Annapolis Watershed might adopt. There are some special challenges in the western portion of the Annapolis Valley. Many communities like Annapolis Royal have been able to maintain their unique built-history of very beautiful and stately historic homes. The task is to preserve these important cultural and economic assets while achieving the level of energy conservation required in the present era. Annapolis Royal can become a model of how these difficult challenges can be addressed. The lessons learned here could be applied to a wider program of energy conservation and greenhouse gas reductions.

It is against this background that the *Annapolis Energy Conservation Pilot Project* was proposed. Accordingly, the objective of the project is to use the Town of Annapolis Royal as a test bed to develop community-based energy conservation plans for communities with highly valued culture and heritage resources.

To achieve this objective and to assist project evaluation and management, the *Annapolis Energy Conservation Pilot Project* is divided into four interrelated steps. The first is related to understanding current energy use by all sectors in the community. This does *not* include energy used in private transportation. The second, and likely most critical and challenging step is a series of engagement sessions to develop strategies to enhance energy conservation and reduce greenhouse gas emissions. The third, closely tied to the second, is to understand what worked, what didn't and why or why not. The fourth is to take the lessons learned and turn them into a strategy that could be utilized in other communities that wish to reduce their greenhouse gas emission while maintaining their cultural, historic and economic resources.

In the context of urban and suburban communities with a robust, urban driven service economy, there is often little economic motivation to appreciate the cultural and natural history of a community. In the rural parts of Nova Scotia and Canada, the community economic base is tied to non-renewable resources such as its cultural and heritage resources. If the utilization of these cultural assets cannot be adjusted to reflect modern energy conservation needs, they will be lost. This is the challenge embodied in the *Annapolis Energy Conservation Pilot Project*.

## 2.0 Community Profile

Annapolis Royal is situated near the mouth of the Annapolis River with a 2006 population of only 444, a decline of almost 20 % from 2001 (Statistics Canada, 2006). It covers an area of 2.4 square kilometers (Statistics Canada, 2006). While the community is small in terms of both population and geographic area, it serves a catchment area of nearly 7,000 people.

Together with Port Royal, the Annapolis Royal region comprises the oldest continuous European settlement north of St. Augustine, Florida and was settled first by Samuel de Champlain and Pierre Dugua, Sieur de Monts in 1605. The area was subject to frequent capture by the British or its New England colonists only to be restored each time to French control by subsequent recapture or treaty stipulations. The area remained in French hands throughout most of the 17th century. Under the Treaty of Utrecht in 1713, present-day peninsula of Nova Scotia was granted to the British. Annapolis Royal served as the first capital of the Colony of Nova Scotia from 1710 until the founding of Halifax in 1749. Incorporation as a town under the provincial municipalities act took place in 1893 (Welcome to Annapolis Royal, 2007, [www.annapolisroyal.com](http://www.annapolisroyal.com)).

Within the Town, there are 303 private dwellings, half of which are single family dwellings with an average of 6.2 rooms (Statistics Canada, 2006). Since 1986, only 10 new dwelling units have been built in the Town. Annapolis Royal has an unusual treasure of heritage buildings, including the oldest wooden frame buildings in Canada. Much of Annapolis Royal has been designated a National Historic District, with 135 registered municipal heritage properties, possibly the highest concentration of heritage buildings in Canada (Welcome to Annapolis Royal, 2007, [www.annapolisroyal.com](http://www.annapolisroyal.com)). There are several wooden homes in the community that date to the early 18<sup>th</sup> century making them the oldest such structures in Canada.

With respect to environmental issues, Annapolis Royal has been playing a leadership role. Their solid waste program is achieving 60 % diversion (LURA Group, 2005). In cooperation with Ducks Unlimited Canada, a large wetland was created to provide tertiary treatment for wastewater generated in the Town and surrounding communities. Town administration has initiated a number of conservation initiatives including anti-idling programs, building insulation and lighting conversions.

### 3.0 Methodology

The first step in developing an energy conservation plan was to estimate energy consumption for the community for a specific base year. The community is the geographic area within the municipal boundaries for the Town of Annapolis Royal. As can be seen in Figure 1, the boundaries are the center line of Allains and Annapolis Rivers on three sides and following close to Highway 201 back to Allains River.

The base year of 2006 was originally selected as the most recent full 12 month period because Nova Scotia Power indicated that they could provide electrical consumption data for a three-year period, 2005, 2006 and 2007 and this could be averaged for the period, minimizing the influence of seasonal variance. Due to changes in the routing for meter reading, this proved to be much more difficult than initially anticipated. As a result, only 2007 data of electrical consumption by each sector was available. Because this problem did not become apparent



Figure 1: Boundaries of the Town of Annapolis Royal

until the data collection from other sources was completed, other data management issues arose.

For the purposes of this baseline survey, energy consumption has been broken into several components. Energy consumption in its various forms was then used to estimate GHG emissions for each of the following sectors:

- Corporate Town of Annapolis Royal (CTAR)
- Industrial, Commercial and Institutional (ICI)
- Residential/Small Business (RSB)

Staff for the Town of Annapolis Royal compiled energy consumption for all town activities for the base year 2006. This included electrical, space heating and transportation for all the activities carried out by the Town. As described later in this report, a mail survey was undertaken to estimate energy consumption for space heating and hot water using the 2006 base year for homeowners and small businesses in the Town. Interviews with energy managers yielded data on non-electrical energy consumption in the Industrial, Commercial and Institutional (ICI) sector. Details on the methodologies used for each of these are described in the respective section.

Other than for vehicles for which the Corporate Town of Annapolis Royal provides fuel, private transportation is *not* included in this research. The CTAR provides fuel for vehicles operated by the Annapolis Royal Volunteer Fire Department as well as the Town's Police and Public Works Departments. All other transportation uses are excluded.

When fossil fuels are burned several greenhouse gases are released. Depending upon the fuel and other factors, these could include carbon dioxide, carbon monoxide, nitrous oxides and others. To manage these diverse gases, all emissions are converted into equivalent units of carbon dioxide, shown as eCO<sub>2</sub>.

**Table 3A:** 2007 eCO<sub>2</sub> Greenhouse Gas Conversion Factors - UNSM Corporate Energy and Emissions Inventory

Furnace Oil	2.68 kg eCO <sub>2</sub> per liter
Gasoline	2.34 kg eCO <sub>2</sub> per liter
Diesel	2.63 kg eCO <sub>2</sub> per liter
Propane	1.52 kg eCO <sub>2</sub> per liter
Electricity (2006 for Nova Scotia)	0.868 kg eCO <sub>2</sub> per kWh

These raw data on energy consumption were converted into equivalent units of carbon dioxide using the conversion factors derived for the Union of Nova Scotia Municipalities for energy management software they are developing (UNSM Corporate Energy and Emissions Inventory).

Unfortunately, this software was unavailable in the time frame for this research but will hopefully be used by Town managers when it becomes available next year. For the purposes of this report, the following conversion factors were used. As electrical energy in Nova Scotia is primarily produced using coal-fired thermoelectric plants, it is critical to have an up-to-date conversion factor for Nova Scotia electricity. The conversion factors are summarized in Table 3A.

In reporting the results, Section 4 will give the overall summary of greenhouse gas emission, expressed in equivalent units of carbon dioxide from all three sources. The subsequent sections, record in detail the energy consumption by source for each of the three groups from all sources.

#### 4.0 Summary of Community GHG Emissions

As stated in the methodology, the GHG emission production from energy consumption by the community of Annapolis Royal for the three sectors (Town of Annapolis Royal, ICI, and Residential/Small Business) was estimated for the base years 2006 and 2007. Table 4.1 shows GHG emissions by sector, and as a total for the community. By sector, ICI accounts for 62 % of the total followed by 34 % for the small business/residential sector. The Town accounts for about four % of the total greenhouse gas emissions.

**Table 4.1:** Total GHG Production for the Community of Annapolis Royal in 2006 and 2007 (Kilograms of eCO<sub>2</sub>)

Total	Corporate Town of Annapolis Royal	Industrial, Commercial, Institutional	Small Business Residential
12,217,100 kg	443,700 kg	7,622,200 kg	4,151,200 kg
100 %	3.6 %	62.4 %	34.0 %

When viewed by the energy source, see Table 4.2, a slightly different picture emerges with respect to the production of greenhouse gas emissions. Great care must be taken when interpreting these data. The gasoline and diesel sources are primarily composed of the energy used in vehicles for which the Town provides the fuel. These include public works, police and fire-fighting vehicles which would represent a very tiny fraction of the total greenhouse gas emissions arising from the transportation sector in the community. The data on propane includes only one or two ICI users of that fuel source. Accordingly, greenhouse gas emissions from these three energy sources are significantly underestimated.

These data do show that electricity and furnace oil are the larger sources of greenhouse gases in the Annapolis area. If conservation gains can be made, citizens could reduce greenhouse gas emissions. Both federal and provincial agencies offer incentives for the conservation of electrical energy and home heating fuels. Furthermore, Nova Scotia Power now realizes that the most economical source of electricity is that which can be derived from conservation. There are many

emerging opportunities to very significantly reduce the consumption of these two energy sources. Reduction in consumption of home heating fuel and electricity will have a direct and immediate impact on the production of greenhouse gases in the community. Reductions will also result in considerable cost savings for users.

**4.2: Total GHG Production by Non-Transportation Sources in the Community of Annapolis Royal, 2006 and 2007**

GHG Source	eCO <sub>2</sub>	Percentage Breakdown
Electricity	9,544,900 kg	78.4 %
Furnace Oil	2,622,300 kg	21.5 %
Propane	5,900 kg	0.01%
<b>Total</b>	<b>12,173,100 kg<sup>1</sup></b>	<b>100 %</b>

## 5.0 Corporate Town of Annapolis Royal GHG Emissions

The total production of greenhouse gases by the Town of Annapolis Royal is summarized in Table 5.0. Using the respective conversion factors developed by the Union of Nova Scotia Municipalities, energy consumption has been converted into equivalent units of carbon dioxide measured in kilograms.

**Table 5.0:** Corporate Town of Annapolis Royal GHG Emissions by Source

Source	eCO <sub>2</sub> (kg)	Percentage
Space Heating	58,900 kg	13.2 %
Transportation: Gasoline	24,700 kg	5.6 %
Transportation: Diesel	17,500 kg	3.9 %
Metered Electrical	264,900 kg	59.8 %
Unmetered Electrical	77,700 kg	17.5 %
<b>Total</b>	<b>443,700 kg</b>	<b>100 %</b>

Estimating the production of greenhouse gases for the Corporate Town of Annapolis Royal was relatively complex. The first step is estimating consumption of energy for the various activities undertaken by the legal entity for its citizens. Town staff, using the agreed upon base year of 2006, produced data on diesel, gasoline and furnace oil for space heating and transportation.

<sup>1</sup> Excludes 43,977 kg of GHG emissions from Corporate Town of Annapolis Royal transportation sources.

As well, they collected consumption of electrical energy for building lighting and water and wastewater services. While they have information on street lighting, the bills do not record kilowatt hours of electricity consumed. Nova Scotia Power provided 2007 data on electrical consumption by both metered and unmetered uses. Generally streets lights are unmetered because consumption is a function wattage of the lighting device. The result was complete electrical data for 2007 from Nova Scotia Power and 2006 electrical consumption data for everything but street lights broken down according to building lighting and water and wastewater services.

To reflect this reality and to provide as accurate a picture as possible, these data will be presented to reflect energy consumption and greenhouse gas generation for space heating, transportation and electrical consumption. As described below, the electrical consumption data will be configured to reflect the two information sources.

### 5.1 Corporate Town of Annapolis Royal Space Heating GHG Emissions

The Corporate Town of Annapolis Royal pays the space heating costs for three facilities. The Town Hall includes the Police Department, Council Chambers and Town offices. The Public Works compound contains one heated garage space with related offices and washrooms. The Town also provides the space heat for the Kings Theater which is operated by a non-for-profit society but is owned by the Town. Furnace oil was the only energy source involved. Using their billing records, Town staff provide data on fuel consumption in both liters and actual dollar cost. While not a very useful as a yearly comparison due to price fluctuations, costs are included because they will yield a very quick rough estimate of the financial implications of improved fuel efficiency.

As shown in Table 5.1, in 2006 a total of 21,963 liters of furnace oil was consumed for space heating and it generated 58,861 Kilograms of equivalent units of carbon dioxide.

**Table 5.1** Corporate Town of Annapolis Royal GHG Emissions form Space Heating

Facility	Cost	Litres	eCO <sub>2</sub> (kg)	Percentage
Town Hall	\$ 4,200	7,305 l	19,600 kg	33.2 %
Public Works Bldg.	3,500	5,882 l	15,800 kg	26.8 %
King Theater	5,300	8,776 l	23,500 kg	40.0 %
<b>Total</b>		<b>21,963 l</b>	<b>58,900 kg</b>	<b>100 %</b>

## 5.2 Corporate Town of Annapolis Royal Transportation GHG Emissions

With the exception of some fire calls, most fuel consumed by vehicles for which the Corporate Town of Annapolis Royal provides gasoline or diesel fuel, was for travel within the Town. The Public Works Department and the Annapolis Royal Volunteer Fire Department operate both gasoline and diesel vehicles while the Police Department uses only gasoline vehicles. The data were generated by Town staff from their financial records. As noted above actual dollar costs were included because they will yield a very quick rough estimate of the financial implications of improved fuel efficiency.

As recorded in Table 5.2, in 2006 transportation services generated 42,220 kg of greenhouse gases expressed in carbon dioxide equivalences. As is noted in Table 5.2, 24,738 kg came from gasoline and 17,482 kg was generated by diesel fuel.

**Table 5.2:** Corporate Town of Annapolis Royal GHG Emissions from Transportation

User	Gasoline			Diesel		
	Cost	Litres	eCO <sub>2</sub>	Cost	Litres	eCO <sub>2</sub>
Public Works	\$ 2,100	3,074 l	7,200 kg	\$ 2,700	3,502 l	9,200 kg
Police Dept.	3,000	4,343 l	10,200 kg	NA	NA	NA
Fire Dept.	2,000	3,155 l	7,400 kg	2,100	3,145 l	8,300 kg
<b>Total</b>		<b>10,572 l</b>	<b>24,800kg</b>		<b>6,647 l</b>	<b>17,400kg</b>

## 5.3 Corporate Town of Annapolis Royal GHG Emissions from Electrical Consumption

In the Corporate Town of Annapolis Royal, electricity is principally used for interior and exterior lighting, the Farmers Market and operating equipment associated with providing drinking water and treating wastewater. These sources are metered. Electrical consumption for street lighting and traffic control is not metered as consumption is a product of the wattage of the lighting fixture.

Using billing records, Town staff were able to estimate the consumption of electricity that was metered by Nova Scotia Power to the Town in 2006 by its use for building lighting and operating the utilities.

They did not have consumption data for street lighting and traffic control is not metered but is a function of the wattage of the lighting fixture.. As is noted above, NS Power indicated that they would be able to provide consumption figures for 2005, 2006 and 2007. Unfortunately, due to routing changes for the NS Power meter readers, only 2007 electrical consumption data were

available. Data respecting both metered and unmetered consumption was available for that year.

**Table 5.3:** Corporate Town of Annapolis Royal GHG Emissions from Electrical Consumption

Use	%	2006	2007	
		kWh	kwh	eCO <sub>2</sub> (kg)
Town Hall	20 %	38,095 kWh	N/A	N/A
Public Works Compound	7 %	13,020 kWh	N/A	N/A
Farmers' Market	1 %	1,462 kWh	N/A	N/A
Sewage Lines/Life Stations	19 %	36,070 kWh	N/A	N/A
Sewage Treatment Plant	43 %	80,550 kWh	N/A	N/A
Water Utility	9 %	16,080 kWh	N/A	N/A
Total Metered Use	100 %	185,277 kWh	305,169 kWh	<b>264,800 kg</b>
Total Unmetered Use		N/A	89,028 kWh	<b>77,700 kg</b>

This rather complicated mix of data are summarized in Table 5.3. In calculating the generation of greenhouse gases, only the 2007 data from NS Power is used so as to maintain comparability with the industrial, commercial and institutional (ICI) users and with the residential and small business sector. It also allows a comparison between 2006 and 2007 which might be especially interesting since the Town converted to ultraviolet disinfection of its waste water. Town staff may wish to review their records of 2007 electrical consumption data when it becomes available to investigate possible sources for this difference. One would expect the consumption from the Town's billing records to be very close to the data provided by NS Power. In making these comparisons, one should be careful about attributing any difference entirely to the switch from chlorine to ultraviolet treatment.

Based on the 2007 electrical consumption data provided by NS Power for the Corporate Town of Annapolis Royal, total metered and unmetered electrical use generated 342,500 kg of equivalent carbon dioxide units. Of this total, 23 % or 77,700 kg was from unmetered consumption for traffic control and street lighting with the remainder divided among the various metered uses.

## 6.0 Institution, Commercial, Industrial (ICI) GHG Emissions

Institution, commercial and industrial (ICI) energy consumption data was somewhat simplified due to the size and structure of that sector in the geographic area of the Town of Annapolis

Royal. As Nova Scotia Power has agreed to provide data on ICI electrical energy consumption, only energy consumption for space heating, cooking and emergency generator use was required. With one exception, all ICI consumers were forthcoming with the required energy consumption data for the base year 2006. In Annapolis Royal, there are no large industrial enterprises so the ICI sector includes schools, non-Town owned government buildings and other institutional structures.

Because the Municipality of the County of Annapolis, which owns a Municipal Office Building in Annapolis Royal, elected not to make this information available, the consumption estimate is based on the fuel consumption per square meter of the building footprint for the Annapolis Royal Town Hall. While the buildings are not the same age, the use is similar. The Municipal Building was built in the 1960s when little attention was paid to energy conservation. The Town Hall was built in the 1920s when conservation concerns might have been greater but technology more limiting. As the Annapolis Royal Town Hall consumes 21.87 liters per square meter of footprint, this was used to derive an estimate for the Annapolis County Municipal Building. There is likely a very small amount of diesel fuel consumed by the standby generator used in emergencies.

As noted above, Nova Scotia Power could only provide electrical consumption data for 2007 while the information provided for non-electrical energy is for 2006. While this is not an ideal situation, no other option existed.

In collecting the data from individual consumers, it was offered that individual consumption would not be reported but that the data would be combined to protect privacy. Based on the energy consumption figures provided for the respective ICI buildings in the community, generation of greenhouse gases in carbon equivalents was generated using the conversion factors kindly provided by the Union of Nova Scotia Municipalities.

As shown in Table 6.1 and based on 2006 non-electrical energy consumption and 2007 electrical energy consumption, the ICI sector in the geographic area of Annapolis Royal produced 7,622,206 kg of greenhouse gases measured in equivalent carbon dioxide units. This is almost two thirds of the total greenhouse gases produced in the community. As well, it should be noted that over 91 percent of the greenhouse gas emissions from the ICI sector arise from electrical consumption.

## **7.0 Residential and Small Business GHG Emissions**

Two methods were utilized in estimating energy consumption among the residential and small business sectors.

For residential and small business consumption of energy for space and domestic hot water heating, confidential questionnaires were sent out to 183 property owners in the community by

Town Hall staff in early November and posted on the Town website. A follow-up reminder was sent out in the latter part of the month. The questionnaire was developed in cooperation with the project partners and is enclosed in Appendix A. To encourage returns, all participants who filled out the reply form attached to the questionnaire were entered into a draw for one of 10 water and energy conservation kits provided by Conserve Nova Scotia and the Clean Annapolis River Project (CARP).

**Table 6.1:** ICI GHG Emissions 2006 & 2007

2006 Furnace Oil		2006 Propane		2006 Diesel		2007 Electricity	
Liters	eCO <sub>2</sub>	Liters	eCO <sub>2</sub>	Liters	eCO <sub>2</sub>	KwH	eCO <sub>2</sub>
251,612 l	674,500kg	3878 l	5,900 kg	668 l	1,800 kg	7,995,515kwh	6,940,100 kg
9 %		.07 %		.03 %		91 %	
<b>Total Greenhouse Gas Emissions</b>						<b>7,622200 kg of eCO<sub>2</sub></b>	

It is important to be able to apply statistical tests to verify the validity of the sample. Such tests work on the assumption that the returned questionnaires are a representative sample of the population of the entire Town. In this survey, 43 replies were received which indicates a statistical confidence level of +/-13.11%, 19 times out of 20.

[www.surveysystem.com/sscalc.htm](http://www.surveysystem.com/sscalc.htm).

Working on the early assurances that NS Power could provide electrical consumption data for 2005, 2006 and 2007, data on energy consumption for space and domestic hot water heating for 2006 was sought in the questionnaire. As has been previously noted, changes in the routing of meter reading resulted in electrical consumption data from 2007 only being available. While not an ideal situation, the estimates of energy consumption for space and domestic water heating are based on 2006 data and electrical consumption on 2007 data. Since the questionnaire indicated that Nova Scotia Power Inc. was preparing data on electrical consumption, this may have inadvertently signaled to electrical users that their use was already being recorded and may or may not have resulted in over-representation of oil users in the survey returns.

Of the responses received from the landowner questionnaire sent out through the Town Hall, 74% (32 respondents) indicated that furnace oil was their primary energy source for space heating. As well, 9% used electricity, 5% used solid fuel such as wood and 12 % used more than one fuel for primary space heating. Of these, three used oil in combination with electricity and two used propane in combination with either electricity or wood but the respondents did not differentiate between primary and secondary heating sources.

It is interesting to note that provincially, 60% of homes use furnace oil as their primary energy for space heating; 25 % use electricity, 15% use other sources such as wood or propane ( The Way We Heat Our Homes, [www.statcan.ca](http://www.statcan.ca) (2006). This difference the provincial averages and those recorded in Annapolis Royal could be real or may have been influenced by a note on the questionnaire that indicated that Nova Scotia Power Inc. was preparing data on electrical consumption. This may have inadvertently signaled to electrical users that their use was already being recorded and may have resulted in over-representation of oil users in the survey returns. It could, as well, be a combination of both of these factors.

Of the total respondents, 18 or 42% reported a supplementary source of space heating. Of these, they were almost evenly split with 8 respondents using solid fuel and 9 using electricity, propane, oil or a combination as the energy source for supplementary space heating. It is interesting to note that two respondents reported wood as their energy source for primary space heating and oil as the energy source for supplementary space heating and domestic hot water. This might imply a switch from oil to wood as the energy source for primary heating.

Of the total respondents, 36 % (15 respondents) heat their domestic hot water with electricity, 44% (18 respondents) use oil only and 20% (8 respondents) use combination of oil and electric. None of the respondents reported using propane as an energy source for domestic hot water. As noted above, the questionnaire indicated that Nova Scotia Power Inc. was preparing data on electrical consumption. This may have inadvertently signaled to electrical users that their use was already being recorded and may have resulted in over-representation of oil users in the survey returns.

All respondents using a combination of electricity and oil as the energy source for domestic hot water also use oil as the energy source for primary space heating. This could imply that oil fired hot water furnaces are also providing domestic hot water during the heating season while electric hot water heaters are used in the summer. Several respondents confirmed this. While most manufacturers of boilers do not recommend this practice, some users opt for this option due to the real or perceived cost savings.

In order to estimate furnace oil consumption for residential and small commercial properties in Annapolis Royal, the survey results formed the basis for this calculation. As noted above the survey results were accurate within +/- 13.11%, 19 times out of 20, **assuming** that the questionnaires returned are representative of the population of the entire Town. By upscaling to the entire community, any statistical error could be amplified. To minimize the risks inherent in this calculation, mid, low and high estimates were generated.

In the survey, 30 property owners responding reported that the energy source for primary space heating in 2006 was furnace oil. They consumed a total of 81,989 liters with average consumption at 2732 liters. As there are 354 property owners on the Town's assessment roles,

the survey results indicate that 74% or 258 property owners in the Town used furnace oil for space heating. ICI property owners are excluded from this calculation.

Table 7.1 presents energy consumed for space heating based on the arithmetic mean, including the error range. In reporting greenhouse gas emissions from space heating for this sector in Section 4, the result was based on the arithmetic mean.

**Table 7.1:** Residential and Small Business GHG Emissions in 2006 and 2007

	Space/Water Heating 2006			Elec. 2007	
	Per RSB User	All RSB Users	eCO <sub>2</sub>	KwH	eCO <sub>2</sub>
Arithmetic Mean	2,732 l	704,856 L	1,889,000kg		
- 13.11 % error	2,374 l	612,492 L	1,641,500 kg		
+ 13.11 % error	3,090 l	797,220 L	2,136,600 kg		
Electrical Energy				2,606,243kwh	<b>2,262,200kg</b>

### 8.0 Summary and Conclusions

Using a variety of research techniques, the total greenhouse gas emissions from energy users within the geographic boundaries of the Town of Annapolis Royal were estimated at just over 12 million kilograms expressed in equivalent units of carbon dioxide for the 12 month period but includes data from 2006 and 2007. The larger commercial and institutional users including schools, large businesses and others accounted for over 62 %, followed by small business/residential and corporate entity of the Town of Annapolis Royal at 34 % and 4 %, respectively. These results are summarized in Table 4.1 in Section 4.

For all users in the geographic area of the Town electrical consumption accounts for slightly more than 78 % of the greenhouse gas emissions followed by furnace oil for space heating at just under 22 %. These results are summarized in Table 4.2 in Section 4.

From a strategic point of view, it would make the most sense to target those uses where the emissions are the highest. The largest source of GHG emissions from the Corporate Town of Annapolis Royal is from electrical consumption which represents 77 % of the total emissions. This would seem to be an area in which the Town administration might wish to focus.

In the ICI sector, 91 % of the GHG emissions arise from the consumption of electricity followed by space heating at only 8 %. This would imply that there should be areas for very substantial reductions in electrical consumption by this sector. With respect to small business and residential, the split between GHG emissions from electrical and space heating is 46 % and 54 % respectively. This would imply that homeowners might wish to target both energy sources.

There is a need for some form of bench marking so the corporate town can compare its energy consumption with other towns in the province. Development of such a system could be very challenging so that it accurately reflects community variables such as population, road maintenance, police service and other variables.

The price of space heating fuel could be as much as 30 to 50 % higher in the coming season as compared to last year. While electrical costs may not, in the immediate term, rise as quickly as oil prices, one should expect them to meet and likely exceed oil prices as electrical energy is primarily generated from burning fossil fuels. This is a very powerful incentive for conservation.

It is highly likely that many trade associations may have developed bench marks for their members. For example, there are likely data on energy consumption per square meter of grocery store or expressed as a function of sales. Individual business owners might wish to explore this option.

There are federal, provincial and private sector incentive programs that encourage conservation. Following is a preliminary list of possible sources of technical and financial assistance with respect to energy conservation

The Clean Annapolis River Project, in partnership with the Clean Nova Scotia Foundation, is delivering the EnerGuide Program for Homes. This program involves an assessment of the home and the preparation of a report that identifies home energy improvement that the homeowner can undertake. There are significant subsidies from both the federal and provincial governments to implement these recommendations. They may, as well, be additional assistance for low income homeowners.

Nova Scotia Power is developing and piloting programs to assist small and medium sized electrical energy users with the implementation of conservation measures. NS Power has come to realize that energy saved through conservation is a significant and inexpensive source of "new" energy. This assistance may, as well, be available to other large users like the schools.

The EcoEfficiency Centre, associated with Dalhousie University, offers services to the business community to foster conservation and, therefore, enhanced business productivity and profitability. Over the past few weeks, they have met with several business owners and managers in this region.

It is quite likely industry trade organizations and similar groups for the non-for-profit groups also have technical advise and/or financial assistance available to support conservation initiatives. For business operations that are associated with national organizations, it is highly likely that the parent organization would have access to this type of expertise.

### References,

Harder, Steve; The Town of New Glasgow's Energy Sustainability and Local Action Plan 2007 to 2013. Town of New Glasgow, March 2007.

Hawboldt, Stephen, Editor. Community Conservation in Action. Clean Annapolis River Project, 1994.

LURA Group, Solid Waste Management in Annapolis Royal. LURA Group, 2005.

Statistics Canada, 2006 Community Profiles, Statistics Canada.

Union of Nova Scotia Municipalities, UNSM Corporate Energy and Emissions Inventory, Union of Nova Scotia Municipalities, 2008.

[Www.annapolisroyal.com](http://www.annapolisroyal.com), Welcome to Annapolis Royal, 2007.

## Appendix A

October 19, 2007

To the residents, attractions, and businesses of Annapolis Royal,

### Town of Annapolis Royal Energy Conservation Plan

The Town of Annapolis Royal is working with the Clean Annapolis River Project (CARP) and several other partners to develop an energy conservation plan for the entire community. The process will be comprised of three stages. First, there is a need to determine the consumption of energy from all sources for the base year 2006. Second, there will be a series of town meetings to collectively set energy conservation targets and third a plan to achieve the conservation goals will be developed.

The Town is preparing information on energy consumption for all of its activities. Nova Scotia Power is calculating total electrical consumption by all of its customers in Annapolis Royal. This will be total electrical consumption for all consumers.

Space heating in homes and other buildings using fuel sources other than electricity is much more difficult to estimate. The following confidential questionnaire will help estimate total energy consumption for space heating in Annapolis Royal. Can you please could take a few minutes to answer the following questions. Individual responses will be confidential as the data will be combined to determine the total energy consumed by all residents for space hearing.

If you have questions or wish further information, please contact the Jackie Longmire at Town Hall, 532-2043 or Steve Hawboldt at CARP, 532-7533.

Copies of the completed survey may be dropped off at Town Hall, the Clean Annapolis River Project office at the Annapolis Royal Train Station at 151 Victoria Street, faxed to 532-3038, or e-mailed to [carp@annapolisriver.ca](mailto:carp@annapolisriver.ca). You can also complete this survey on line at [www.annapolisroyal.com](http://www.annapolisroyal.com). Completed questionnaires should be returned by November 19, 2007.

***All returned questionnaires will be entered in a draw to win one of 10 water conservation kits. If you wish to enter this draw, please provide your name and phone number below.***

**Name:** \_\_\_\_\_ **Phone** \_\_\_\_\_

1. In the property where you currently live, do you:

\_\_\_\_\_ Own

\_\_\_\_\_ Rent

2. Do you pay your heating costs ? \_\_\_\_\_ No \_\_\_\_\_ Yes  
 If No, proceed to Question 4. If Yes, proceed to Question 3

3. Do you pay your hot water heating costs ? \_\_\_\_\_ No \_\_\_\_\_ Yes  
 If No, proceed to Question 4. If Yes, proceed to Question 5

4. Please provide contact information for your landlord

Name: \_\_\_\_\_

Address: \_\_\_\_\_

Phone: \_\_\_\_\_

5. What is your main energy source to heat your home?  
 \_\_\_\_\_ Oil  
 \_\_\_\_\_ Electricity  
 \_\_\_\_\_ Propane  
 \_\_\_\_\_ Wood  
 \_\_\_\_\_ Other (Please Specify) \_\_\_\_\_

6. Do you have a supplementary heating source? \_\_\_\_\_ Yes \_\_\_\_\_ No

7. If yes, what is the energy source for your supplementary heating?  
 \_\_\_\_\_ Oil  
 \_\_\_\_\_ Electricity  
 \_\_\_\_\_ Propane  
 \_\_\_\_\_ Wood  
 \_\_\_\_\_ Other (Please Specify) \_\_\_\_\_

8. How do you heat your water?  
 \_\_\_\_\_ Oil

- \_\_\_\_\_ Electricity
- \_\_\_\_\_ Propane
- \_\_\_\_\_ Other (Please Specify) \_\_\_\_\_

9. For the calendar year, 2006, how much fuel did you consume to heat your home and/or domestic hot water? (This information can be found on the bill of purchase from your energy supplier. Please remember to tally all of the energy supplies for the 2006 calendar year.)

Oil (in litres) \_\_\_\_\_

Propane (in litres) \_\_\_\_\_

Wood ( in cords) \_\_\_\_\_

The consumption of electricity for all uses in the Town is being calculated by Nova Scotia Power.

10 If you do not know your oil or propane consumption, will you give Clean Annapolis River Project (CARP) permission to contact your oil company for fuel consumption figures for the calendar year 2006 for your property(ies)? The individual results will be kept confidential as the data will be combined to determine the total energy consumed by all residents for space heating.

\_\_\_\_\_ Yes \_\_\_\_\_ No

11. If Yes, please provide

\_\_\_\_\_ Your Signature \_\_\_\_\_ Date

Account Number from your bill of purchase  
\_\_\_\_\_

What is the civic address of your property(ies)?  
\_\_\_\_\_

Name(s) of property owner(s)

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Who supplies your fuel?

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*All replies will be kept confidential*