Hudson's Hope

Community Energy Planning: *Municipal Operations Options*

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the PEMBINA institute
Sustainable Energy Solutions

About the Pembina Institute

The Pembina Institute creates sustainable energy solutions through research, education and advocacy. It promotes environmental, social and economic sustainability in the public interest by developing practical solutions for communities, individuals, governments and businesses. The Pembina Institute provides policy research leadership and education on climate change, energy issues, green economics, energy efficiency and conservation, renewable energy, and environmental governance.

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1 Introduction

Hudson's Hope contracted the Pembina Institute and Demand Side Energy to initiate a community energy planning process. Community energy planning can cover a wide scope of activities, so the initial focus in Hudson's Hope was on the energy consumption and greenhouse gas emissions from municipal operations. The objectives of this project are to:

- Communicate how Hudson's Hope's buildings and vehicles contribute to global warming and recommend strategies that will help reduce that contribution.
- Communicate the magnitude of energy costs associated with Hudson's Hope's buildings and vehicles, and recommend strategies that will help reduce those costs.
- Provide a platform for a broader set of energy planning and climate change initiatives targeted at the entire community.

Hudson's Hope uses electricity and natural gas to provide heat and power to the 12 buildings included in this project's scope. These include: the arena, community centre, curling rink, district office, info centre, library, swimming pool, public works facility, Beryl Prairie fire hall, museum, sewer pumping station, and water pumping station. Likewise, Hudson's Hope uses gasoline and diesel fuel to power their vehicle fleet, which includes: one hybrid, four light-duty trucks, three medium-duty trucks, one garbage truck, one backhoe, one tractor, one gravel truck, two topkicks, one grader, and two fire trucks.[1] This analysis quantifies all of the costs and greenhouse gas emissions associated with these uses of electricity, natural gas, gasoline, and diesel.

As Hudson's Hope continues to move forward with this initiative, there are other sources of emissions that could also be included. Within the direct scope of municipal operations, Hudson's Hope could also investigate emissions from air travel or municipal wastes, while additional sources are discussed in Section 5.

The remainder of this report covers the following areas:

- Section 2 provides additional information on the science of climate change and the relevant political context within British Columbia.
- Section 3 looks at the energy consumption and related costs and emissions from Hudson's Hope's buildings and vehicles.
- Section 4 details the opportunities available to Hudson's Hope to reduce those costs and emissions.
- Section 5 recommends a series of next steps to help Hudson's Hope act on the opportunities identified to date and grow that list of opportunities and action into a broader energy and climate change initiative.

[1] Since August 2007, several vehicles have been replaced or removed from the vehicle fleet. However, these were the vehicles that made up the fleet during the time period of August 2005 – 2007; the time period in which data were collected and analyzed for this report.

2 Climate Change

2.1 Climate change: Why should we care?

Activities that burn fossil fuels, such as driving vehicles or generating electricity from natural gas, release greenhouse gas emissions.[2] These emissions are causing the concentration of greenhouse gases in our atmosphere to increase because they have nowhere to go. The thicker layer of gases are trapping more of the sun's heat, warming the surface of the Earth, and leading to an increasingly uncertain climate.

The need to reduce greenhouse gas emissions is clear. According to the Intergovernmental Panel on Climate Change (IPCC) – the United Nations body that governments set up to advise them on Climate Change – the global average surface temperature has risen by about 0.74°C over the past 100 years,[3] and it is more than 90% certain that the past half-century's warming was mostly due to the build-up of greenhouse gas emissions from human activities.[4] The IPCC has concluded that if no explicit action is taken to curb greenhouse gas emissions, the global average surface temperature is likely to increase by a further 1.1 to 6.4°C between 2090 and 2099 compared to 1980 to 1999.[5] For all but the lowest end of this range, many impacts will be devastating and some irreversible.

By reducing greenhouse gas emissions significantly, humans have the ability to begin stabilizing the concentrations of greenhouse gas emissions in the atmosphere, and reduce the risks of significant and dangerous changes in the Earth's climate. Taking concrete action to achieve emissions reductions in B.C. is part of the global effort that will need to take place.

If governments, communities, families, and businesses don't act decisively to reduce greenhouse gas emissions, the most severe impacts of climate change will become inevitable. Worldwide, the next few decades of climate change could see an increase in severe weather events, water shortages in some areas and flooding in others, an increase in vector-borne diseases, and rising sea levels.

2.1.1 Local environmental impacts

For Hudson's Hope and British Columbia, climate change presents the risk of more immediate and local impacts:

- Climate change could change water levels and temperatures in rivers and streams leading to further pressures on already stressed species, such as bull trout and salmon. Even slight changes in river temperature can have major impacts on these ecosystems.

[2] Greenhouse gas (or GHG) emissions is used to refer to the six gases covered by the Kyoto Protocol: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6).

[3] Intergovernmental Panel on Climate Change, "Summary for Policymakers," in Solomon et al., eds, *Climate Change 2007: The Physical Science Basis, Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press, 2007), 2–3. Also available online at http://www.ipcc.ch.

[4] Ibid., 10.

[5] Ibid., 13.

- British Columbia's forests will likely experience more forest fires and insect infestations as a result of climate change. The massive damage caused by the mountain pine beetle illustrates this concern, because its spread across the province is largely a result of warmer winters. Normally killed off by long, intense cold snaps, mountain pine beetles have been able to spread as a result of a number of mild winters.
- Rapid changes in climate, even if only relatively small, could result in loss of native species and biodiversity as environmental pressures increase.

2.1.2 Not just an environmental problem

The concerns discussed above are clearly significant and warrant decisive action on their own, but climate change is much broader than an environmental problem.

From a social perspective, all of the environmental impacts described above will have impacts on communities. Rising sea levels and changing climates will make some areas either much less suitable for communities or entirely uninhabitable; shifting climates will put pressures on traditional natural resource economies such as agriculture and forestry. These examples represent just a short sampling of the many impacts of climate change on communities.

Climate change poses challenges from an economic perspective too. Although many of the opportunities to reduce emissions can save money, many will result in higher overall costs. At the same time, a large number of economists support taking these actions because the costs of inaction will inevitably be higher. In 2006, the former Chief Economist of the World Bank carried out a review of costs associated with climate change for the British government. The report concluded that a five degree Celsius rise in average temperatures could reduce global economic output by as much as 20 per cent. To stabilize emissions and minimize further temperature increases, on the other hand, would cost only 1 per cent of the world's combined gross domestic product.

In the same way that the challenge is broader than environmental, the solutions provide a broader set of benefits. Measures to reduce GHG emissions in cities can involve positive changes to community design such as improved infrastructure for active transportation. These features, in combination with well-designed public spaces can help create vibrant, healthy places to live and do business. Actively pursuing energy efficiency and renewable energy could also be a significant source of new employment opportunities in Hudson's Hope.

2.2 The B.C. Context

In its February 2007 Speech from the Throne, the B.C. government said, in order to combat global warming, it would reduce provincial greenhouse gas emissions by at least 33% below the 2007 level by 2020. Bill 44 legislated this target and added a 2050 target of 80% or more below 2007 levels. If achieved, these targets will represent a significant change from past trends, where emissions in B.C. have increased by 33% between 1990 and 2005.[6]

The provincial government has begun to put in place some of the key pieces that will be needed to reduce emissions. These include the carbon tax announced in the 2008 budget, a cap and trade system for some source of GHG emissions, tailpipe standards for vehicles, and new standards for electricity generation in B.C. While all of these initiatives should be viewed as positive steps,

[6] Environment Canada (2007). Canada's Greenhouse gas emissions inventory. Accessed at www.ec.gc.ca/pdb/ghg/inventory_e.cfm.

they will not be sufficient to achieve the targets legislated in Bill 44. To address this gap, there will there clearly be a need for additional action and leadership, and some of this will need to come from municipal governments.

In recognition of the need for municipal action, the provincial government and the UBCM introduced the Climate Action Charter in September 2007. Signatories of the charter agree to develop strategies and take actions to achieve the following goals:

- Being carbon neutral in respect of their operations by 2012, recognizing that solid waste facilities regulated under the Environmental Management Act are not included in operations for the purposes of this Charter.
- Measuring and reporting on their community's GHG emissions profile.
- Creating complete, compact, more energy efficient rural and urban communities (e.g. foster a built environment that supports a reduction in car dependency and energy use, establish policies and encourage land use patterns that increase density and reduce sprawl.)

The Province and the UBCM have committed to support local governments in pursuing these goals, including developing options and actions for local governments to be carbon neutral in respect of their operations by 2012.

At the time of writing, 133 communities have signed the charter – this includes Chetwynd, Dawson Creek, and Fort St. John in the northeast. Hudson's Hope has not signed the charter, but through this project is moving forward on many of the same actions needed to fulfill the commitments in the charter. In addition to the core objectives, this report also provides information in a way that should help Hudson's Hope decide whether or not to sign the Charter.

2.3 Why Hudson's Hope?

In terms of Canadian or global greenhouse gas emissions, some people might say that Hudson's Hope is just a drop in the bucket. What can the community and the City hope to achieve by taking action? Such sentiments unnecessarily discount an array of creative community-based solutions that will be absolutely critical in the overall effort to reduce greenhouse gas emissions.

Strong provincial and federal action is absolutely necessary to ensure bold and innovative climate change solutions become a reality. Without these partners, municipalities will not be able to achieve the deep cuts in emissions needed. But at the same time, municipalities have the ability to create their own unique solutions and tap into opportunities that other levels of government are unable to access.

3 Baseline Results

The baseline results provide a snapshot of energy consumption and the associated costs and greenhouse gas emissions in Hudson's Hope. These high-level results do not point to specific opportunities, but they do help focus on the biggest parts of the problem and they provide a measuring stick to assess progress over time. All of the results included in this section are derived from Hudson's Hope's energy bills covering 2005/2006 and 2006/2007. The results are provided in table form in Appendix A and they have also been made available to Hudson's Hope in electronic format.

Figure 1 shows Hudson's Hope's total energy consumption, energy costs, and greenhouse gas emissions for the two study years. Note that although the energy consumption is presented in megawatt hours, the results include all energy sources, not just electricity. As can be seen, the cost of energy consumption increased from approximately $198,000 in 2005/2006 to $228,000 in 2006/2007, which basically follows a proportional increase in consumption. The biggest changes underlying the overall increase are the energy consumption from the curling rink, which wasn't operational in 2005/2006.

Greenhouse gas emissions also follow a similar pattern, increasing from 358 to 416 tonnes. For context, the average B.C. household produces approximately 8 tonnes of greenhouse gas emissions from their homes and vehicles. B.C.'s total emissions in 2005 were 66,800,000 tonnes. Subsequent sections explore the consumption, costs, and emissions in greater detail.

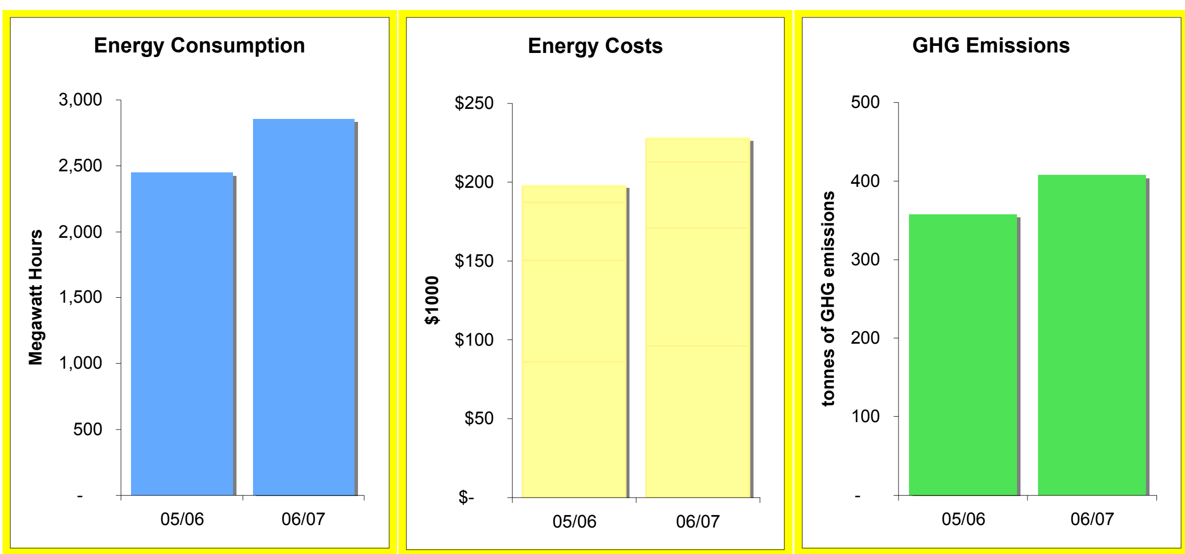

Figure 1: Consumption, Costs, and Emissions in Hudson's Hope

3.1 Consumption, Costs, and Emissions by Energy Source

Greenhouse gas emissions from each sector can originate from a variety of sources, but most of the emissions covered by Hudson's Hope's inventory are produced when fossil fuels are burned to produce energy. Different fuels for heating, electricity, and transportation produce different amounts of GHG emissions per unit of energy they provide (described as greenhouse gas intensity). Figure 2 illustrates the GHG intensities of different fuels. Greenhouse gas emissions are not the only environmental impact associated with energy consumption, so this chart does not provide a complete story. For example, even though electricity in B.C. is relatively clean in terms of GHG emissions, there are other land and water impacts that should be considered when deciding between energy options – in particular when deciding between new supply and energy efficiency options.

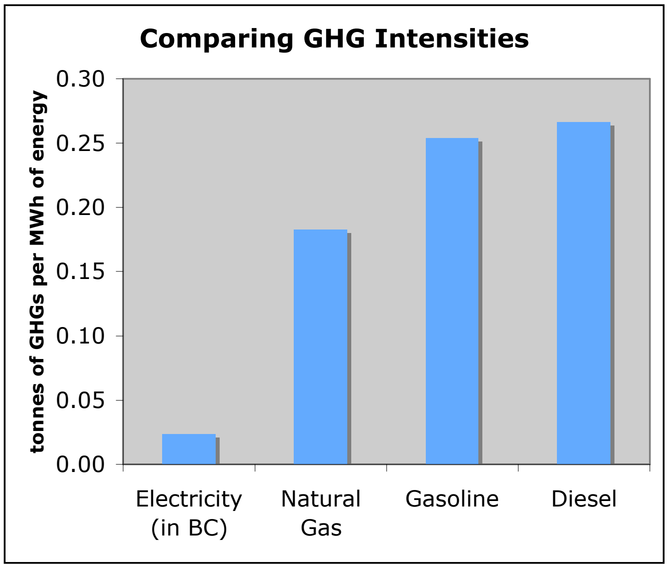

Figure 2: Comparing greenhouse gas intensities for energy options in B.C.

Figure 3 repeats the consumption, costs, and emissions provided in Figure 1, but the results have now been split by energy source. The impact of varying greenhouse gas intensities is well illustrated by this figure. For example, electricity accounts for one third of total energy consumption, but because electricity generated in B.C. does not generate many greenhouse gas emissions, it only accounts for about 5% of total emissions. Likewise, transportation fuels account for less than 20% of energy consumption, but because gasoline and diesel are relatively greenhouse gas intensive fuels, they account for one third of total greenhouse gas emissions.

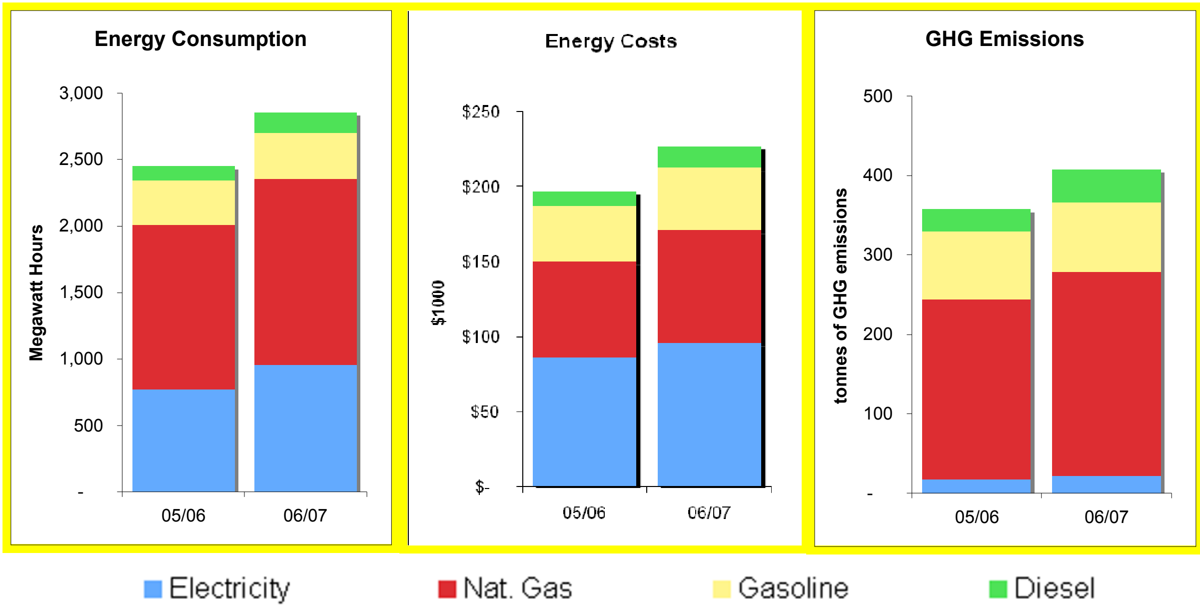

Figure 3: Hudson's Hope energy consumption, costs, and emissions by energy type.

3.2 Comparing Individual Buildings and the Vehicle Fleet

This section expands the overview results presented in Figure 1 to show how the consumption, costs, and emissions vary between individual buildings and the vehicle fleet in Hudson's Hope. In all figures in this section the blue bars represent results from 2005/2006 and the red bars are the results from 2006/2007.

3.2.1 Energy consumption

Figure 4 shows the energy consumption for each of Hudson's Hope's buildings and the vehicle fleet. The greatest single consumer is the arena with consumption accounting for one quarter of the total in both 2005/2006 and 2006/2007. Other significant consumers are the pool, the municipal hall, the public works building, the pumping stations, and the vehicle fleet.

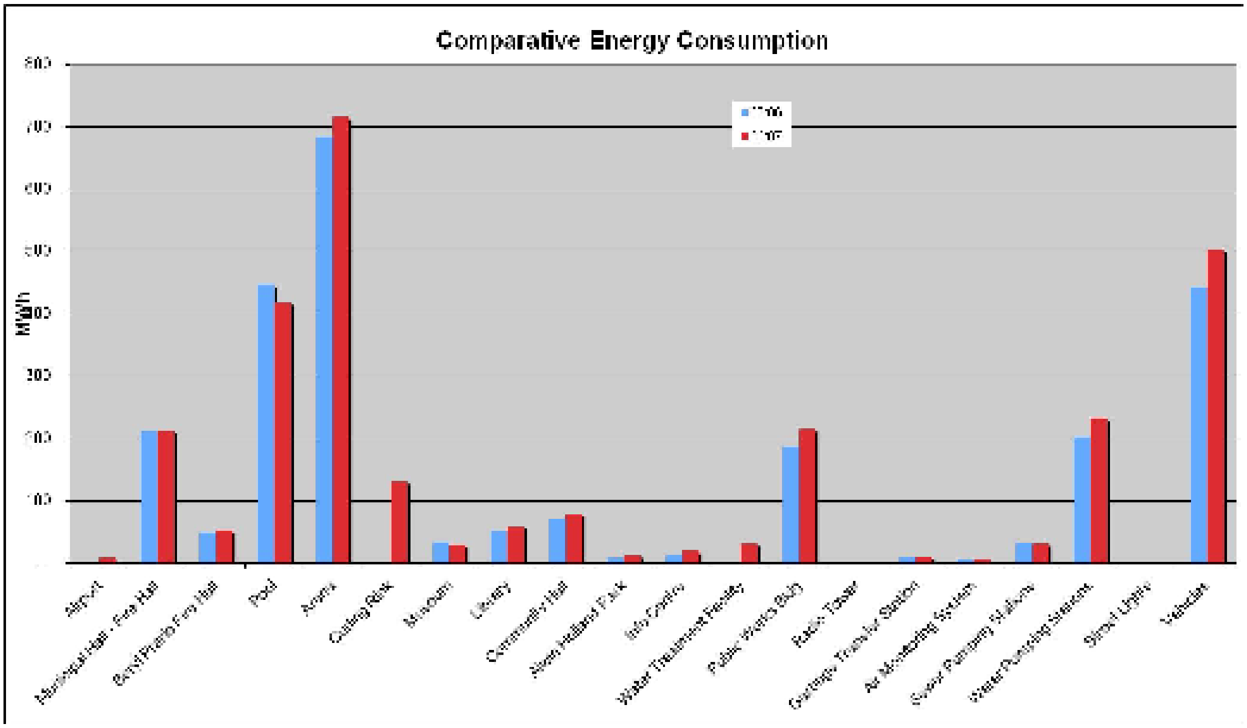

Figure 4: Disaggregated Energy Consumption

Overall, the two-year consumption trends indicate that consumption is increasing on the order of 10-12% per year. Electricity consumption increased by about 10% between 2005/2006 and 2006/2007, and natural gas consumption increase about 12% in the same time period. Vehicle fuel consumption increased by approximately 12% in the same time period. This fuel consumption increase is made up of a 2% increase in gasoline consumption and a 34% increase in diesel consumption.

3.2.2 Costs

Figure 5 shows the energy costs for each of Hudson's Hope's buildings and the vehicle fleet. The results follow a similar patter to the energy consumption figure, with the most notable exception being the relative ranking of the vehicle fleet. The vehicle fleet was the second largest energy consumer (accounting for 19% of total consumption), but it is the largest source of energy costs because diesel and gasoline are more expensive per unit of energy. In total, the vehicle fleet accounts for one quarter of total costs.

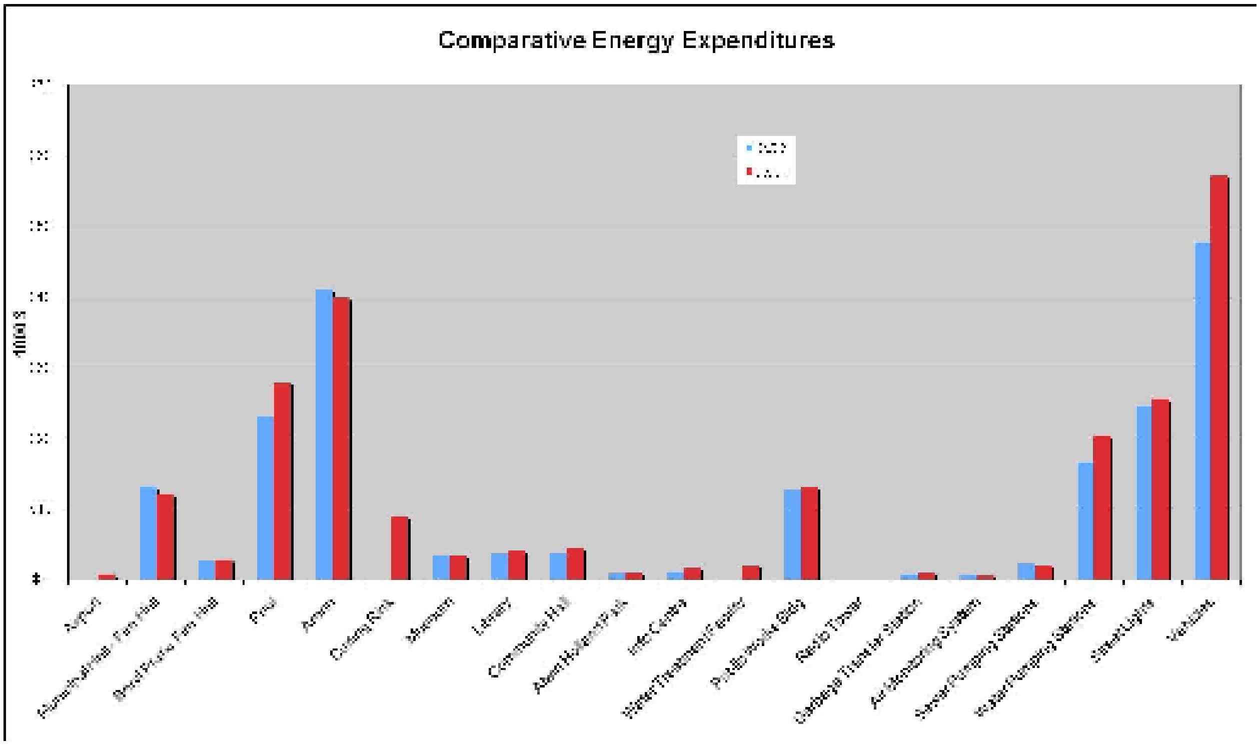

Figure 5: Disaggregated Energy Costs

3.2.3 Greenhouse gas emissions

Figure 6 shows the greenhouse gas emissions for each of Hudson's Hope's buildings and the vehicle fleet. As with costs, vehicles are the highest single source of emissions for Hudson's Hope operations for both 2005 and 2006 (one third of total emissions). As discussed in Section 3.1, this is largely the result of gasoline and diesel's high emissions intensity relative to electricity. Other major emitters include consumers of large amounts of natural gas – most notably the pool and arena. Taken as a group, recreational facilities account for approximately 40% of Hudson's Hope's operating emissions. Combined, the top two emitting sectors – vehicles and recreational facilities – produce about 73% of the District's total operating emissions.

The relatively low greenhouse gas intensity for electricity in B.C. results in the low levels of emissions from the pumping stations, which rely primarily on electricity, illustrate the significance of emissions intensity. While both of these are fairly significant energy consumers, that consumption is dominated by electricity, so the resulting greenhouse gas emissions are quite low. The fact that the greenhouse gas emissions associated with electricity consumption are relatively low should not diminish the value in finding ways to use that electricity as efficiently as possible. There are several justifications for this. First, reducing electricity consumption reduces electricity costs and those savings will often be greater than the cost involved in being more efficient. Second, there are other impacts associated with electricity generation that are not captured by greenhouse gas emissions.

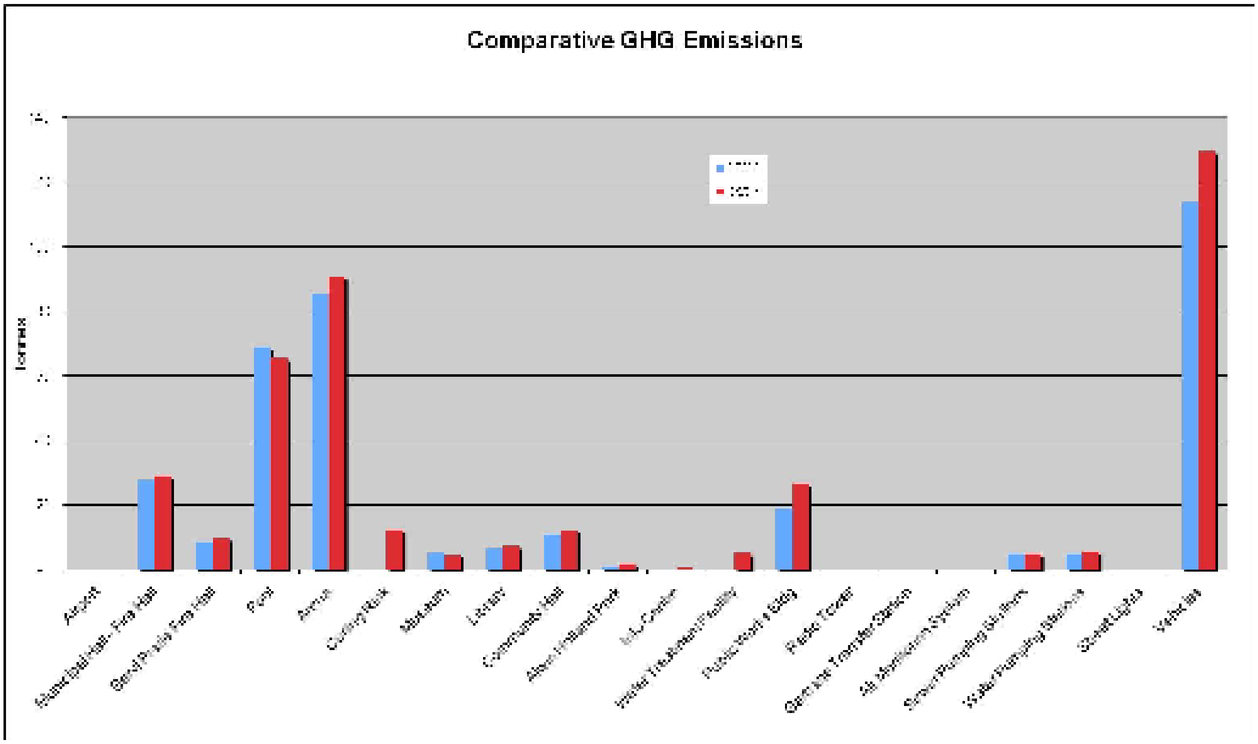

Figure 6: Disaggregated Greenhouse Gas Emissions

4 Opportunities

4.1 Reducing Costs and Emissions from Buildings

The baseline provides the high-level picture of energy consumption, costs, and emissions for Hudson's Hope's buildings. To complement this picture, Demand Side Energy completed a series of detailed energy audits to understand the specific opportunities in those buildings. More in-depth energy audits (Type II audits) were carried out for the arena and district office, while less comprehensive audits (Type I audits) were undertaken for the community centre, curling rink, info centre, library, swimming pool, public works facility, fire hall, museum, and pumping stations.

These audits helped to identify several cost-effective energy conservation opportunities that could be acted upon immediately. The results of those audits are summarized here and contained in their entirety in Appendix B. Some of the opportunities include:

- On-demand water heaters for offices and buildings with intermittent hot water use
- Unplugging equipment when not is use
- Improved weather stripping around doors and main entrance areas
- Radiant panels instead of unit heaters, to warm occupants rather than the surrounding air
- Programmable thermostats to setback temperatures at night

Additionally, energy conservation measures that can be implemented incrementally include:

- High efficiency furnaces and boilers when new heating equipment is to be purchased, and
- Additional envelope and roof insulation when building envelope or roofs are renewed

The opportunity for cost savings and GHG emissions reductions in buildings is significant. Improvements costing $144,000 could save about $34,000 per year, resulting in a payback period of only 4.25 years. These efficiency improvements and conservation measures would also reduce GHG emissions by as much as 114 tonnes of GHG emissions per year, representing a nearly 28% reduction in overall operating emissions, and a nearly 50% reduction from emissions from stationary sources. To put this reduction in perspective, 114 tonnes annually is very close to the total emissions from District vehicles. The largest opportunities for reductions occur in the swimming pool (49 tonnes), arena (23 tonnes), and curling rink (21 tonnes). The results from the energy audits are summarized on the following page.

The most cost effective savings (on a per building basis) could be achieved in the water pumping station, museum, and community centre with simple paybacks of about two and a half years. The longest paybacks are for the curling rink, swimming pool, and district office, with a range of just under five to almost seven years. None of these payback estimates account for the incentives available to the municipality, the increases in energy costs that have occurred over the past year, potential future increases, and new costs associated with the carbon tax and carbon offsets. All of these factors will likely make the opportunities more attractive economically.

		Annual Savings		
Building	**Gross investment ($)**	**ekWh/yr**	**$/yr**	**Tonnes CO2e/yr**
Arena*	26,300	192,212	7,659	23
Community Centre	1,541	7,004	584	1
Curling Rink	26,198	119,102	5,568	21
District Office*	8,370	27,615	1,304	4
Info Centre	403	1,831	150	0
Library	1,584	7,200	539	1
Swimming Pool	60,000	271,975	12,897	49
Public Works Facility	15,579	70,826	3,665	12
Beryl Prairie Fire hall	977	4,442	224	1
Museum	2,734	12,428	1,086	2
Sewer Pumping Station	574	2,609	150	0
Water Pumping Station	492	2,235	196	0
Total	**144,749**	**719,479**	**34,023**	**114**

* These buildings had more detailed audits completed, so there is greater certainty in the numbers.

4.2 Reducing Costs and Emissions from Vehicles

The baseline report for vehicles provides consumption, cost and emissions details about Hudson's Hope's vehicle fleet. An additional analysis was completed to identify potential reduction opportunities for the vehicle fleet. The data collected did not include vehicle-specific mileage or fuel consumption information, so the results focus on fleet-wide opportunities for reductions. The reduction opportunities presented below include switching to less greenhouse gas intensive fuels (such as bio-diesel), as well as replacing older, inefficient vehicles with newer and more efficient models.

To calculate the emissions reductions from switching from diesel to biodiesel or from gasoline to ethanol, it was assumed that the quantity of fuel consumed would equal the fuel consumption totals from August 2006 to August 2007. Both biodiesel and ethanol must be mixed with standard diesel and gasoline to be usable in standard engines. Various concentrations of each fuel are commercially available. For this analysis, we used a 10% biodiesel blend (B10)[7], and 10 and 85% ethanol blends (E10 and E85). Figure 7 illustrates the potential reduction in emissions from switching to biodiesel and ethanol blends. Switching all the fuel used by the Hudson's Hope fleet to 10% biodiesel and 10% ethanol could reduce emissions from vehicle fuels by 5.1 tonnes (or 1.2% of Hudson's Hope's total corporate emissions).[8]

[7] Higher concentrations of biodiesel are available; however given the northern climate, the B10 fuel is likely most appropriate. Higher concentrations of biodiesel could be used, which would result in greater emissions reductions than estimated in this report.

[8] Using 85% ethanol would result in greater emissions reductions, but the higher percentage blends of ethanol do no work in most standard vehicles.

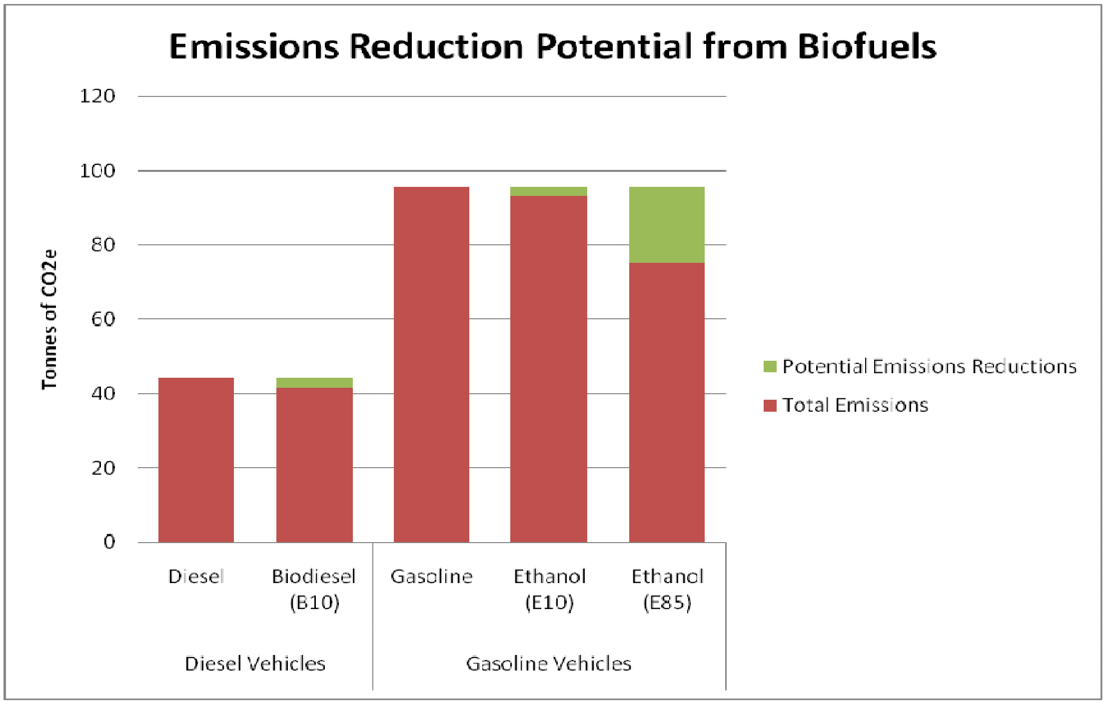

Figure 7 - Emissions reduction potential from biofuels

Another opportunity to reduce emissions is to replace the older, less efficient vehicles. The following analysis compares the emissions that could be reduced by replacing each light-duty vehicle (LDV) in the Hudson's Hope fleet with two alternatives: 1) a 2008 model of the same vehicle, and 2) the most efficient option in each vehicle class.[9] Figure 8 illustrates the results. If all vehicles were replaced with a comparable 2008 model, there would be an improvement in the fuel efficiency of the vehicles of approximately 10 to 12%. This would result in an emissions reduction of approximately 4.8 to 5.7 tonnes (equivalent to a 1.2 to 1.4% reduction from total corporate emissions).

Similarly, if all vehicles were replaced with the 2008 Best-in-Class option, the vehicle fuel efficiency would improve by approximately 27 to 30%.[10,11] This would result in an emissions reduction of approximately 12.9 to 14.4 tonnes (equivalent to a 3.1 to 3.5% reduction from total corporate emissions). Figure 8 illustrates the maximum potential emissions savings (i.e., 12% for upgrading to an equivalent 2008 model, and 30% for upgrading to a 2008 best-in-class model).

[9] Vehicle manufacturers are only required to report light-duty vehicle fuel efficiency information. Medium and heavy-duty vehicle efficiency information is only available directly from the manufacturer, and was not pursed as part of this study.

[10] The best-in class vehicles for the 2008 pickup truck ratings are the Mazda B2300 and the Ford Ranger. Both the Mazda B2300 and the Ford Ranger have a fuel efficiency of 9.9 L/100km (city) and 7.5 L/100km (highway).

[11] Specific vehicles may experience higher (or lower) efficiency improvements. For example, replacing the 1994 GMC Sierra half tonne 4x4 with the smaller Mazda B2300 or Ford Ranger, results in a 44% improvement in efficiency for city driving, and 41% improvement for highway driving. Replacing the 1994 GMC Sierra with a 2008 Chevrolet Colorado (a vehicle of similar curbside weight, but higher efficiency) would improve fuel efficiency by 14% for city driving and 17% for highway driving.

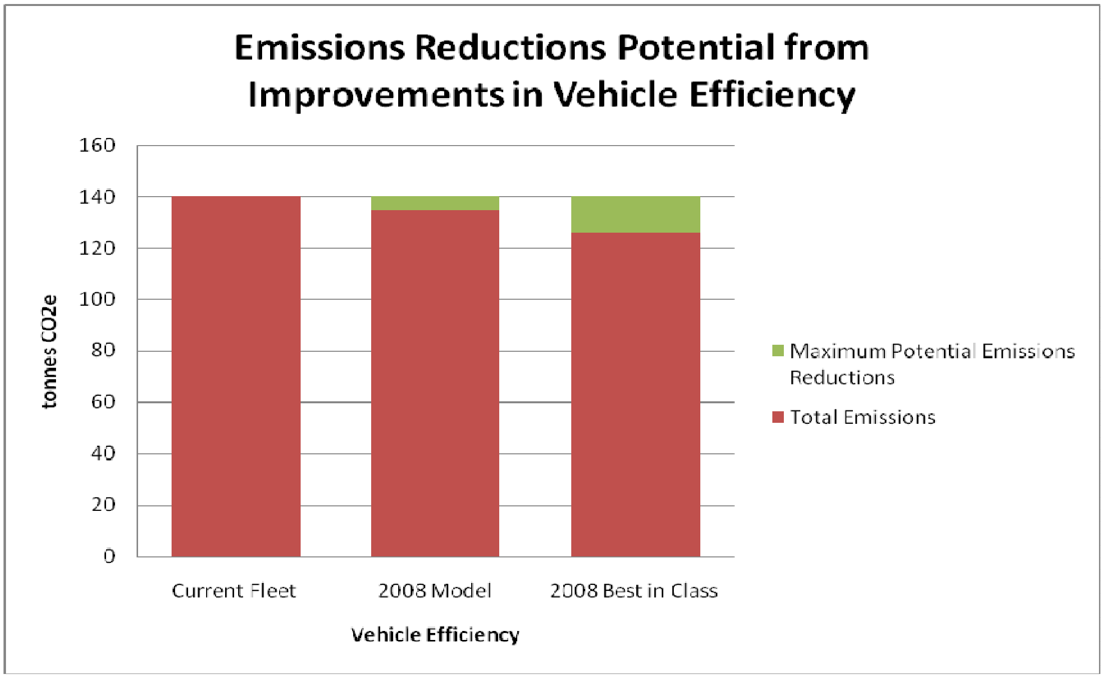

Figure 8 - Emissions reduction potential from more efficient vehicles

There are several caveats to keep in mind when considering the results from improved vehicle efficiency:

- The fuel consumption numbers in this report are from August 2005 to August 2007. Since that time, some of the older vehicles in the fleet have already been replaced, and the newest additions are more efficient than their predecessors. As a result, a portion of the opportunities illustrated above have already been realized.
- Fuel consumption was not available on a vehicle-by-vehicle basis for this analysis. To calculate the fuel savings (and emissions reductions) from the light duty vehicles, an assumption was made that the light duty vehicles used 50% of the gasoline consumed by Hudson's Hope.
- The specific energy efficiency of each vehicle will depend on driver habits, type of driving, and driving conditions. None of these specific factors are accounted for in this analysis, and the actual opportunities to reduce emissions could be larger or smaller as a result.
- The analysis assumes that the vehicles are well maintained. The specific maintenance practices in Hudson's Hope were not assessed, so there may be further opportunities to improve efficiency and reduce emissions through better maintenance.
- The analysis assumes that each vehicle in the Hudson's Hope fleet is appropriately sized for its demands. If there are opportunities to use smaller vehicles, further reductions in emissions could be achieved.

If Hudson's Hope upgraded all the light duty vehicles to the 2008 Best-in-Class model and switched the entire fleet to biofuels (10% biodiesel and 10% ethanol), emissions could be reduced by 16.4 tonnes (a 4% reduction in total corporate emissions). The emissions reductions from improving the efficiency of the fleet and fuel switching are not completely additive because more efficient vehicles use less fuel, so there is a less fuel to replace with biofuel.

4.3 Getting to Carbon Neutral

Although Hudson's Hope has not signed the community climate charter, it has expressed an interest in understanding the implications of doing so. Based on implementing all the opportunities discussed in Section 4.1 and 4.2, it would be possible to reduce total emissions by 31% (27% from buildings and 4% from vehicles). After these improvements, Hudson's Hope would still be responsible for 286 tonnes of greenhouse gas emissions (see Figure 9).[12]

> **Carbon Offsets:**
> Municipalities, businesses, and individuals are not always able to reduce their emissions to the desired level, so they often pursue "carbon offsets" to count against their emissions. Good examples of this are the B.C. government, which has committed to become 'carbon neutral' by 2010, and Vancity, which became carbon neutral in 2008.
>
> A greenhouse gas offset can be used to cancel out, or 'offset', a portion of emissions. By paying for the offset, the purchaser is investing in a project that will reduce emissions elsewhere. For example, travel emissions can be offset by investing in a renewable energy project that allows remote First Nation communities to reduce their need for diesel powered electricity.
>
> Not all offsets are created equally – offset quality is usually a function of the rules and procedures around what is considered an emissions reduction. Some offset standards are much more stringent than others and provide the purchaser with a higher level of confidence that reductions are actually resulting from their investment. The key criterion for quality offsets is that they are verified to be additional. Additionality means that the offset project would not have happened without the offset investment.

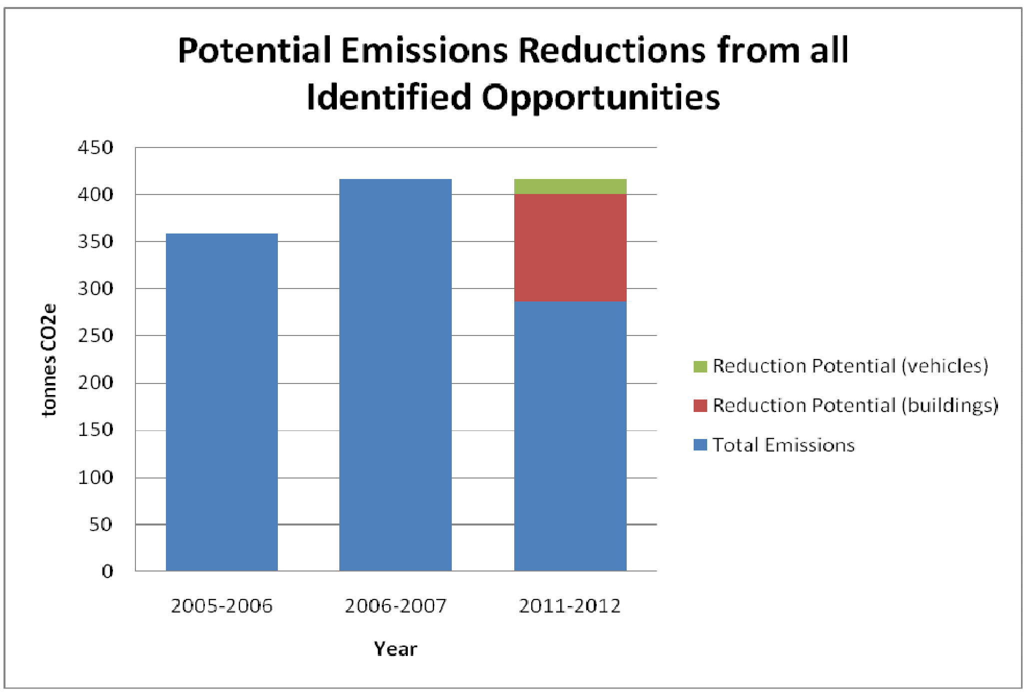

Figure 9 - Potential Emissions Reductions from all Identified Opportunities

The opportunities to reduce emissions from vehicles and buildings considered in this report are not exhaustive. New opportunities to further reduce emissions will continue to emerge if

[12] This estimate assumes that the emissions in 2012 would be equal to the emissions from August 2006 – 2007. This is likely a conservative estimate, since even without considering new construction, emissions increased by 10% between 2005/2006 and 2006/2007.

Hudson's Hope continues to explore opportunities. Regardless of how many opportunities are pursued however, Hudson's Hope is unlikely to be able to eliminate their emissions by 2012. As a result, some carbon offsets would need to be purchased to become carbon neutral.

If Hudson's Hope chooses to become carbon neutral (or to purchase any offsets), the cost of purchasing offsets will depend on:

- How many offsets need to be purchased (or conversely, how much success Hudson's Hope has had reducing emissions)?
- How much each offset costs (in dollars per tonne of greenhouse gas emissions reduced)? This will depend in part on the demand for those offsets and also on the requirements that the province set to determine eligible offsets (plus any additional requirements that Hudson's Hope may impose).

Figure 10 illustrates how the overall cost of purchasing offsets could vary. The four scenarios represent different levels of success in reducing emissions, and what the corresponding offset liability would be. In Scenario A, Hudson's Hope acts on all of the identified emission reduction opportunities. In Scenarios B, C, and D, emissions reductions would range from acting on none of the identified reduction opportunities (Scenario B) to doing 20% more than currently identified (Scenario D). Assuming offsets cost $50 per tonne in 2012, the overall annual cost of purchasing offsets could range between $13,000 and $20,800.[13]

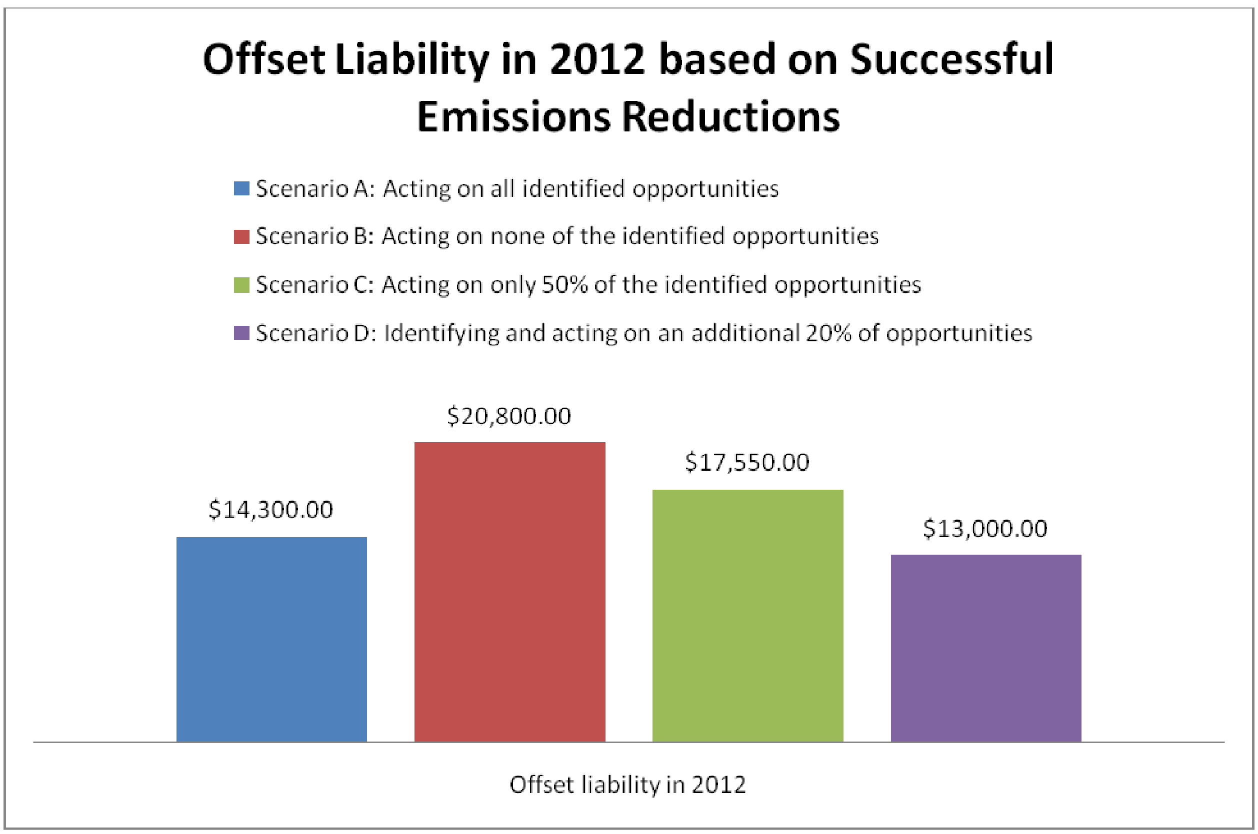

Figure 10 - Offset Liability in 2012 based on Successful Emissions Reductions

[13] The cost of an offset will fluctuate depending on the market value of an offset. This dollar figure has not yet been determined.

The potential cost increases associated with offsets are mitigated by the September 2008 announcement from Premier Campbell at the UBCM convention. He adjusted B.C.'s carbon tax policy so that municipalities are eligible for a grant equal to the amount they pay in carbon tax if they signed the Climate Action Charter and committed to becoming carbon neutral by 2012. To obtain the grant, municipalities are also responsible to publicly report their plan to reduce emissions and their progress towards their carbon neutral objectives.

Whether Hudson's Hope is assessing the costs of offsets or the carbon tax offset costs, both amounts will be smaller if Hudson's Hope's does more to reduce emissions. If no or minimal action is taken to reduce emissions, the costs of carbon will be significant. In the highest cost scenario from Figure 10, the cost of offsets to become carbon neutral would represent a 9% increase on Hudson's Hope energy costs. Thankfully, there is no reason why this scenario needs to become reality because there are many opportunities to reduce emissions between now and 2012, and many more that have yet to be explored.

5 Next Steps

This report has outlined the source and quantity of emissions from Hudson's Hopes municipal operations, and also provided an assessment of opportunities to reduce those emissions. Based on this work, the following next steps are recommended for Hudson's Hope.

1. **Implement the cost-effective opportunities to improve building energy efficiency**

   The energy efficiency audits conducted by Demand Side Energy identified a number of cost effective opportunities to reduce energy consumption and greenhouse gas emissions from buildings. All of these opportunities appear to merit implementation because, as a package, they will pay themselves back in reduced energy consumption in slightly over four years. If Hudson's Hope is not able to schedule the full list of improvements in the short-term, they should be prioritized considering factors such as:

   a. Potential GHG reduction
   b. Payback period
   c. Natural building stock turnover
   d. Co-benefits such as improved office comfort

   The largest opportunities for reductions occur in the swimming pool (49 tonnes), arena (23 tonnes), and curling rink (21 tonnes).

2. **Perform more detailed energy audits municipal buildings as needed**

   Hudson's Hope has information about the opportunities to improve energy efficiency in every building, but the quality of that information varies. Demand Side Energy completed more in-depth energy audits (Type II audits) for the arena and district office, and completed less comprehensive audits (Type I audits) for the community centre, curling rink, info centre, library, swimming pool, public works facility, fire hall, museum, and pumping stations. If the quality of data from the Type I audits is deemed a barrier to moving forward on energy efficiency opportunities, Hudson's Hope should ensure that a Type II audit be conducted in a timely manner to answer any outstanding questions. Type II audits can also be used as an opportunity to dig deeper for additional opportunities that may not have been explored in the Type I audit.

   For any new construction (replacing the public works building for example), the District should develop an energy model for the new facility in advance of construction. The model should be used to analyze opportunities to reduce energy consumption and utilize renewable energy, and then help revise the design accordingly to implement the best opportunities.

3. **Commit to purchasing new vehicles that are efficient and 'right-sized'**

   Although the potential energy savings and greenhouse gas emissions reductions from vehicles was relatively small, there are still easily implemented opportunities that Hudson's Hope would benefit from. The most important include:

a. Committing to purchasing vehicles that are the 'right-size' for the tasks they will be needed for. If smaller vehicles can meet the District's needs for capacity and power, they will typically be more efficient than a larger option.
b. Committing to purchasing the most efficient vehicle available once the District has determined the class of vehicle needed.
c. Look for local suppliers capable of providing biodiesel and ethanol blends for use in Hudson's Hope's vehicles. This effort will be aided by new provincial regulations that will require B10 and E10 blends throughout the province.

There may also be opportunities for the District to benefit from improved maintenance and operating practices for vehicles (these were not reviewed as part of this project). To keep on top of these and other emerging opportunities, Hudson's Hope should engage with Dawson Creek's Fleet manager (to be designated in 2009).

4. Develop consistent and reliable emissions data collection and monitoring

The analysis for this report is based on data collected from August 2005 to August 2006, and August 2006 to August 2007. Collecting the information was a relatively labour intensive process and is probably not worth repeating on an annual basis. Working with their energy providers, Hudson's Hope should develop a system that provides annual energy consumption and greenhouse gas emissions figures for municipal operations. These would not be disaggregated to individual buildings or vehicles, but would provide useful high-level information. Developing accurate and timely data systems will allow the City to assess the efficacy of any emissions reductions strategies or policies. This will also help communicate successes to staff and council, and the broader community.

5. Commit to becoming carbon neutral by 2012

Although Hudson's Hope has not signed the B.C. Climate Action Charter, the municipality has taken a number of concrete steps to understand what is involved in becoming carbon neutral. As a result, Hudson's Hope is well positioned to make immediate and tangible strides towards becoming carbon neutral and should sign the charter. As part of the effort to become carbon neutral, Hudson's Hope could also take responsibility for the emissions produced by staff air travel, staff and council commuting, and office paper use. These are not included in the scope of this analysis or the climate action charter, but they are being included in the efforts of some municipalities and businesses.

6. Expand energy planning work to entire community

The scope of this report is focused on Hudson's Hope's municipal operations, and these represent opportunities that the District has direct control to implement. They can also serve as a local catalyst by demonstrating leadership on climate change to the broader community. However, emissions from municipal operations are a small fraction of the total emissions generated in Hudon's Hope when all residential, commercial, transportation, and industrial emissions are accounted for. Accordingly, Hudson's Hope should expand its energy planning to the entire community to take advantage of the opportunities to achieve more significant reductions in emissions. Several starting points for this endeavor include:

a. Developing a baseline of energy consumption, costs, and emissions for the entire community. This should be a relatively cost-effective effort because the B.C. Ministry of Environment has been developing a central database of community baselines. The project, called the Community Energy and Emissions Inventory, is expected to be released in 2009.

b. Setting short, medium, and long-term targets for reductions in greenhouse gas emissions. Doing so can ensure that the District's efforts are in line with the conclusions of current climate science. Clear targets also provide a frame of reference that can help focus the District's efforts to reduce emissions.

c. Launching a dialogue between council, staff, and the community to talk about the reasons for taking action on climate change, learn where the community's emissions are coming from, and generate ideas to reduce those emissions.

Appendix A – Baseline Results

Facility	Energy (MWh)		GHGs (tones CO2e)		Cost ($1,000)	
	05/06	06/07	05/06	06/07	05/06	06/07
Airport	0	8	0	0	0	1
Municipal Hall - Fire Hall	212	212	28	29	13	12
Beryl Prarie Fire Hall	49	53	9	10	3	3
Pool	447	418	69	65	23	28
Arena	684	715	86	91	41	40
Curling Rink	-	131	-	12	-	9
Museum	34	30	5	4	3	3
Library	51	58	7	7	4	4
Community Hall	71	78	11	12	4	4
Alwin Holland Park	9	12	1	2	1	1
Info Centre	13	19	0	0	1	2
Water Treatment Facility	-	31	-	5	-	2
Public Works Bldg	187	215	19	27	13	13
Radio Tower	0	0	0	0	0	0
Garbage Transfer Station	9	10	0	0	1	1
Air Monitoring System	6	5	0	0	1	1
Sewer Pumping Stations	32	31	5	5	2	2
Water Pumping Stations	202	233	5	5	17	20
Street Lights	-	-	-	-	25	26
Vehicles	443	543	114	140	48	57
Total	**2450**	**2803**	**358**	**416**	**198**	**228**

Appendix B – Building Energy Audits

(Provided electronically)