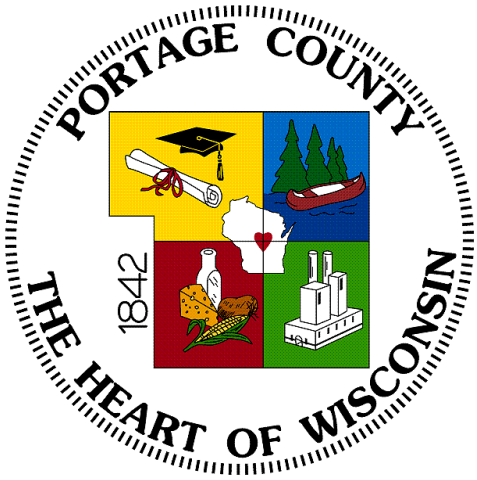
Portage County



Strategic Energy Management Plan

Phase II:
Transportation fuels
March 2012

Portage County
Strategic Energy Management Plan
Phase II – Transportation Fuels

Recommended by Space and Properties Committee:
March 5, 2012

Adopted by County Board of Supervisors:
March 20, 2012

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Donald Jankowski, Vice-Chair
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Acknowledgements
This report was developed by the Portage County Smart Energy Team and written by Joe Kottwitz and Dan Mechenich, Central Wisconsin Resiliency Project, Energy Specialists. The plan was developed over a 10 month period beginning May, 2011.

Also thank you to:
Sarah Wallace, Associate Planner, Portage County Planning and Zoning
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EXECUTIVE SUMMARY

The Portage County Strategic Energy Management Plan Phase II – Transportation Fuels was developed to understand how the County uses transportation fuels, and to identify areas where economic solutions exist to reduce transportation fuel use. The Strategic Energy Management Plan acknowledges that transportation fuel use is key to successful County operations and that any efforts to reduce fuel use must not interfere with those operations.

During the past ten to fifteen years, Portage County has implemented efforts to save fuel. These and future efforts to reduce transportation fuel use are important as estimates predict that fuel prices will continue to rise. The majority of the gasoline and diesel fuel purchased and used by Portage County is used in vehicles. These fuel purchases represented nearly three quarters of a million dollars in 2010. While the County does not have control over fuel prices, the County has considerable control over the policies and procedures that affect fuel and transportation use by County Departments. The Strategic Energy Management Plan details goals and objectives pertaining to the use of transportation fuels in Portage County and recommends that an overall quantifiable fuel reduction goal be set by 2013. The plan recommends annual monitoring of the fleet, including annually reviewing a transportation fuel use report, an alternative transportation fuel report, Department right-sizing assessments, fuel billing and purchasing practices, and the overall Strategic Energy Management Plan goals.

Several options are available for reducing the use of gasoline and diesel fuels in County vehicles. This plan considers options relating to policies and procedures for fuel purchasing, alternative fuel use (specifically biodiesel and Bio-CNG), fleet analysis and vehicle purchasing, driver behavior, and other options for Motor Pool and personal vehicles. The gasoline and diesel fuel purchased by the County may be obtained at lower prices through the expansion of bulk fuel purchases. The use of biodiesel or Bio-CNG fuels, and their associated decline in air pollution emissions, may prove a cost effective method for Portage County to meet its environmental stewardship aspirations. To produce Bio-CNG, the County would need to make a significant investment in the infrastructure, which could be off-set by extensive cost savings. The overall fleet requires additional assessment to determine the right size of the fleet and the appropriate vehicles for different uses, such as hybrid electric vehicles. Moreover, additional education may reduce transportation fuel use and prompt economic savings through enhanced driver behavior. Lastly, the County can create policies that create incentives for employees to use Motor Pool vehicles or rentals when it is cost-effective.

These things will be discussed in the Portage County Strategic Energy Management Plan Phase II – Transportation Fuels. Continued use of monitoring will enable the documentation of the success of efforts to further reduce the use of transportation fuels in Portage County.

The overall goals set forth in the plan are transportation management and efficiency, leadership, and environmental protection. In order to reach those goals, the Strategic Energy Management Plan lays out an extensive implementation plan.

This report bases its recommendations on extensive research about currently available technologies and opportunities. However, the County needs to remain vigilant of newly emerging technologies and opportunities that might address transportation needs.

SECTION 1: INTRODUCTION

On April 27, 2010 the Portage County Board adopted Resolution 5-2010-2012, which established the Portage County Smart Energy Team (Energy Team) and called for the development of a Strategic Energy Management Plan. The plan will be used to reduce the County's energy use, better utilize alternative energy sources, and monitor energy consumption and costs over time.

In July 2010, a Sustainability Specialist was retained to assist the Energy Team in developing an energy baseline for the County (an analysis of existing use), and aid in plan development for Phase I of the Strategic Energy Management Plan, devoted specifically to Electricity and Natural Gas use. This position was paid for by the Portage County Facilities Department and a UW-Extension Innovative Grant.

After adoption of the Phase I plan in April 2011, an Energy Specialist from the Central Wisconsin Resiliency Project was retained to assist the Energy Team with developing Phase II, this current review of Transportation Fuels use. This position was paid for by an AmeriCorps grant and matching funds from Portage County.

PURPOSE OF THE PLAN

The purpose of this Phase II plan is to: 1) Understand how transportation fuels are currently used for County operations; 2) Establish goals, objectives, and actions related to their use; and 3) Provide fiscally responsible recommendations for meeting these goals. To do this, the plan provides an inventory of fuel use, mileage reimbursements, and Enterprise car rentals as a baseline of overall transportation fuel consumption and costs. It also includes goals and objectives that establish areas of emphasis, and fuel management technology, policy, and alternative energy options for County operations to meet the goals.

This planning effort focused on developing recommendations and policies that not only focus on fuel efficiency, but take other criteria, such as the utility and life cycle cost of the vehicle, into consideration as well. The plan calls for recommendations that reduce Portage County's fuel use and costs, and increase the use of renewable or alternative fuels. Principles, practices, and procedures are also included in the plan.

This Phase II plan attempts to find practical solutions that can be applied to County operations that will control rising transportation-related costs, including fuel costs, while not jeopardizing the mission of each Department. Our hope is that other transportation-related efficiencies and decision making will also be achieved as a result of this plan.

PREVIOUS EFFORTS

Over the past 10 – 15 years Portage County government has undertaken various measures to increase fuel conservation and efficiency in its fleet of vehicles. Previous efforts include:

Emergency Management

- Limit non-essential trips with ambulance and fire apparatus'.
- Consolidate non-essential trips.
- Take care of non-essential duties when returning from a call/hospital.
- Keep idle time to "scene standby".

Parks Department

- Cut back on areas to mow by encouraging tree plantings and natural re-vegetation in areas previously mowed.
- Reduced mowing along shorelines to follow State and County setback requirements and to encourage bank stabilization. Mowing reductions began at least 15 years ago and there are few new areas where this can be applied.
- Substituted smaller trucks for several pickup trucks over the past five years. Gators (ATV's) were purchased for use at the campgrounds instead of trucks.
- Replaced two remaining ski tow rope gasoline engines with electric tow rope engines at Standing Rocks Park in winter 2011.

Sheriff's Department

- Motors are turned off when stopped for long periods of time.
- Patrol officers occasionally ride double at night, which reduces consumption of fuel, and some foot patrol in the villages eliminates the operation of that squad for a period of time during a shift.
- Detectives and supervisors try to purchase the highest fuel economy used vehicles that meet Department needs.
- A new fuel provider supplies fuel to Portage County at a lower price, which saves the County money. The use of this new fuel provider does not, however, affect fuel consumption.

Human Resources Department

- Increased use of car pooling. When out of town training is offered, all interested employees contact the HR Assistant, who then reserves a car or two. Employees are notified that car pooling is available and if they do not take advantage of it, they are not eligible for mileage reimbursement. The current policy states mileage will be reimbursed if a County employee "is required to use their personal vehicle". If transportation is available via the car pool, employees are not required to use their personal vehicle, and therefore are not eligible for mileage reimbursement.
- Increased use of remote meeting technology.
  - Use *GoToMeeting* for meetings instead of always traveling.
  - Provide training using webinars.

Child Support

- Renting vehicles from Enterprise has saved the cost of reimbursement. Some employee vehicles do not get the same gas mileage as a mid-size car (standard rental).
- Prepaying for fuel at Enterprise has historically been allowed, and the cost is significantly less than going to the pump after returning and filling up the tank.

Highway

- Educate employees and ask them to turn off equipment when not in use, including lunch hour and breaks.

Solid Waste

- Contacted Midwest Renewable Energy Association (MREA) and Central Rivers Farmshed to determine interest in use of landfill gas (LFG). Neither expressed interest.
- Calculated feasibility of using landfill gas to generate electricity. Payback exceeded 12 years not including interest payments. Option was not pursued.
- Determined feasibility of burning methane gas to dry agricultural products. This practice was not acceptable to town government. Option was not pursued.

PLANNING METHOD

After Phase I – Electricity and Natural Gas was adopted by the Portage County Board in April 2011, the Energy Team continued to meet regularly to stage the planning for Phase II. Overall, the Energy Team followed a five step process to develop this strategic Phase II – Transportation Fuels energy plan.

Step 1 *Developed a 2010 baseline figure for transportation fuel usage and costs incurred by the County.*

The Energy Specialist worked cooperatively with individual Department Heads, fuel purchasing managers, and Finance Department staff to develop an inventory of all bulk fuel purchases, gas card purchases, personal mileage reimbursements, and Enterprise car rentals.

Step 2 *Formed a Technical Work Group to discuss and consider action steps to be presented to the Energy Team.*

The Technical Work Group included Heads from the Purchasing, Highway, Parks, and Sheriff's Departments. Topics included purchasing policies, training options, renewable energy options, technology upgrades, and other action steps. The group discussed historic and current fuel use practices and identified potential future solutions or shifts in practices. Results were forwarded to the Energy Team to prioritize.

Step 3 *Drafted a strategic fuel management plan with goals, objectives and actions, and final recommendations.*

The plan includes an energy baseline report, recommendations from the Energy Team, and research studies conducted.

Step 4 *Reviewed strategic fuel management plan with all affected stakeholders including relevant Committees, Department Heads, and building managers.*

This was done to familiarize the affected stakeholders with the plan and garner support for plan implementation. Feedback was used to revise the plan where seen fit before it was taken to the County Board.

Step 5 *County Board adoption.*

SECTION 2: INVENTORY OF CURRENT TRANSPORTATION FUEL USE

Table 1: A Snapshot – 2010 by the Numbers

Number of:	
County-owned vehicles (licensed/registered only):	155
Miles traveled by County-owned vehicles (licensed/registered only):	1,947,904
Miles reimbursed for personal vehicle miles in 2010:	331,814
Total Gasoline and Diesel Fuel Consumption (gallons):	235,966
MMBtu's consumed in ALL County-owned vehicles and equipment:	28,950.11
Dollars spent on:	
Transportation fuel for County-owned vehicles: (licensed/registered only)	$489,230
Transportation fuel for ALL County-owned vehicles and equipment: (Includes mowers, heavy machinery, etc.)	$566,177
Mileage reimbursements in 2010:	$165,907
Enterprise rentals (fuel charges included) in 2010:	$4,528
Total spent on transportation fuels (excluding maintenance) in 2010:	**$736,612**

MMBTU = represents one million BTU

CURRENT TRANSPORTATION FUEL SOURCES AND TRACKING SYSTEMS

Portage County government spends the majority of its transportation fuel dollars on vehicles it owns. The Highway, Parks, and Sheriff's Departments all have vehicles owned by Portage County. The Highway Department has 59 vehicles, the Parks Department has 20 vehicles, and the Sheriff's Department has 46 vehicles. Portage County also owns 28 "Fleet" vehicles. Fleet vehicles are emergency response ambulances, Lincoln Center buses, Facilities Department trucks, the Land Conservation truck, Portage County Public Library vans, and general Motor Pool vehicles located at the Portage County Annex and Ruth Gilfry buildings. Portage County also incurs cost from reimbursing employees and elected officials for mileage related to use of their personal vehicles to conduct County business, and from renting vehicles and purchasing fuel for rentals.

The fuel that Portage County uses is exclusively petroleum based and non-renewable. As petroleum supplies dwindle, the cost can be expected to continue to rise because the laws of supply and demand apply to the market price. There are two systems for fuel dispersal: from County-owned bulk tanks and from commercial gas stations using fuel procurement cards. The fuel cards were historically for The Store gas stations. Portage County's fuel contract was re-bid in 2011, with the bid being awarded to the Kwik Trip Corporation.

Highway Department

The Highway Department orders fuel in bulk through a competitive bidding process involving five different companies. The Highway Department has two 12,000 gallon

diesel tanks, one 6,000 gallon unleaded gasoline tank, and one 6,000 gallon regular gasoline tank that is used for older equipment requiring no ethanol (which infrequently gets refilled). When employees dispense fuel from the tanks they must insert a vehicle key that records the vehicle number, and manually enter their operator number and mileage. This information, plus the quantity of fuel pumped, is digitally recorded. Normally, all heavy equipment is filled by a large transport truck, filled from the tanks and transported to the work site.

Parks Department
The Parks Department orders fuel in bulk through a competitive bidding process. The Parks Department has one 1,000 gallon unleaded gasoline tank and one 500 gallon diesel fuel tank. When employees dispense fuel from the tanks they are required to fill out a log sheet that includes operator name, equipment #, quantity, and mileage/hours. The log sheet is taken monthly from the pump and stored in the Parks Department Office for records. The log sheet is a paper record and not available in digital format at this time.

Sheriff's Department
The Sheriff's Department has individual fuel cards for each of their 46 vehicles for use at Kwik Trip commercial gas stations. Deputies are required to enter odometer readings at the pump; there has typically been a high level of compliance with this requirement.

Fleet Vehicles (see 'Fleet Vehicles' definition in Glossary)
All 28 Fleet vehicles have individual fuel cards for use at Kwik Trip commercial gas stations. Employees were required to enter the odometer reading at the pump, but there was poor compliance with this requirement. A new mileage tracking system was implemented in 2011 to more accurately track the mileage of these vehicles and improve accountability; a log sheet in each vehicle will be provided for the operator to complete every trip.

Personal Mileage Reimbursement
Current practice for mileage payment for use of an employee's personal vehicle for conducting County business has been reimbursement at a Federal Internal Revenue Service standard rate. This rate was $0.51/mile in 2010, and since July 2011, $0.555/mile. The cost of fuel that is purchased by employees for their personal vehicles comes from many different gas stations, and is included in the overall reimbursement rate. Over 280 staff and Board and Committee members drive personal vehicles for County business.

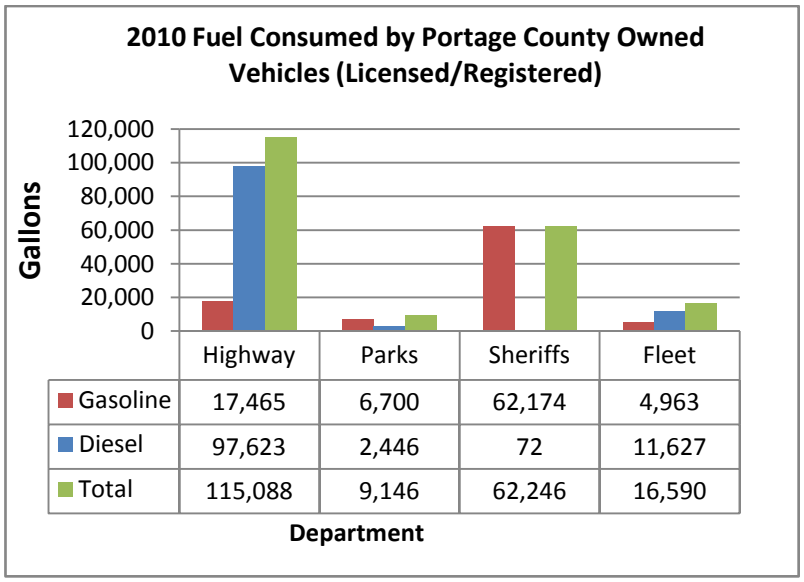
Enterprise Car Rentals
In the past, the fuel to refill the rental car's tank was purchased at many different gas stations. The employee either uses a County procurement card (P-Card) to fill the tank or pay for it with personal funds and claim it for reimbursement. If the car is returned to Enterprise without a full tank the fuel is charged to the bill for that rental. Some Departments have pre-paid for fuel with Enterprise and have realized savings. To pre-pay for fuel, an employee needs to specify this option to the sales associate at the time of rental.

CURRENT TRANSPORTATION FUEL USE BY FUEL TYPE

When collecting and analyzing fuel data, the fuel consumed by licensed/registered vehicles was considered first. This includes vehicles from the Highway, Parks, and Sheriff's Departments, as well as Fleet Vehicles. Figure 1 shows gallons of gasoline and diesel fuel consumed by each of those categories. This does not account for all of the fuel consumed by the Highway and Parks Departments; they each have portions of their daily operations (including mowing, trimming equipment, heavy machinery, construction equipment, etc.) that use fuel as well. Personal vehicle reimbursement and Enterprise rentals are also not included in Figure 1.

While a completely accurate calculation cannot be done with the current fuel tracking system in place, Figure 1 gives a strong general indication of use. A total of 202,828 gallons of fuel were used by Portage County-owned licensed and registered vehicles in 2010. The 'Fleet' column consists of many vehicles used by various Departments for various uses. The only vehicles that are not assigned to a specific Department or employee are the 'Motor Pool' vehicles (see 'Motor Pool' in the Glossary). These are general use vehicles but for fuel tracking purposes are included within the 'Fleet' column. There are six Motor Pool vehicles included in the 28 total vehicles that make up the 'Fleet' column. They used 1,054 gallons out of the 4,963 gallons (21%) of gasoline fuel used by the Fleet or 1,054 gallons out of the 16,590 total gallons (6%) of fuel used by the Fleet.

Figure 1



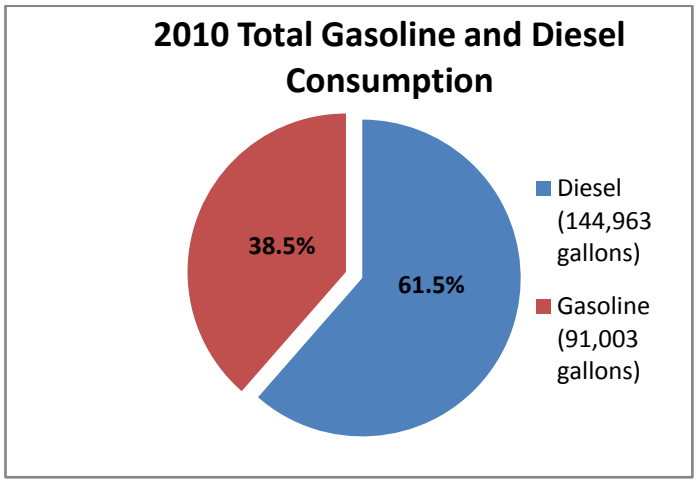
	Highway	Parks	Sheriffs	Fleet
Gasoline	17,465	6,700	62,174	4,963
Diesel	97,623	2,446	72	11,627
Total	115,088	9,146	62,246	16,590

Source: Data gathered from County Departments, Fuel Purchasing Managers, and Finance Department.
Excludes: Mowers, trimmers, tractors, heavy machinery, etc.

Figure 2 shows the total fuel consumption of Highway, Parks, and Sheriff's Department vehicles, as well as Fleet vehicles, by gallons and percentage use for gasoline vs diesel. The 235,966 gallon total also includes the fuel consumed by all heavy machinery, mowers, tractors and other equipment that is not considered to be licensed or registered. Consumption from personal vehicle miles and Enterprise car rentals are not

included in this figure because it is difficult to accurately calculate the consumption of fuel in personal vehicles and Enterprise car rentals.

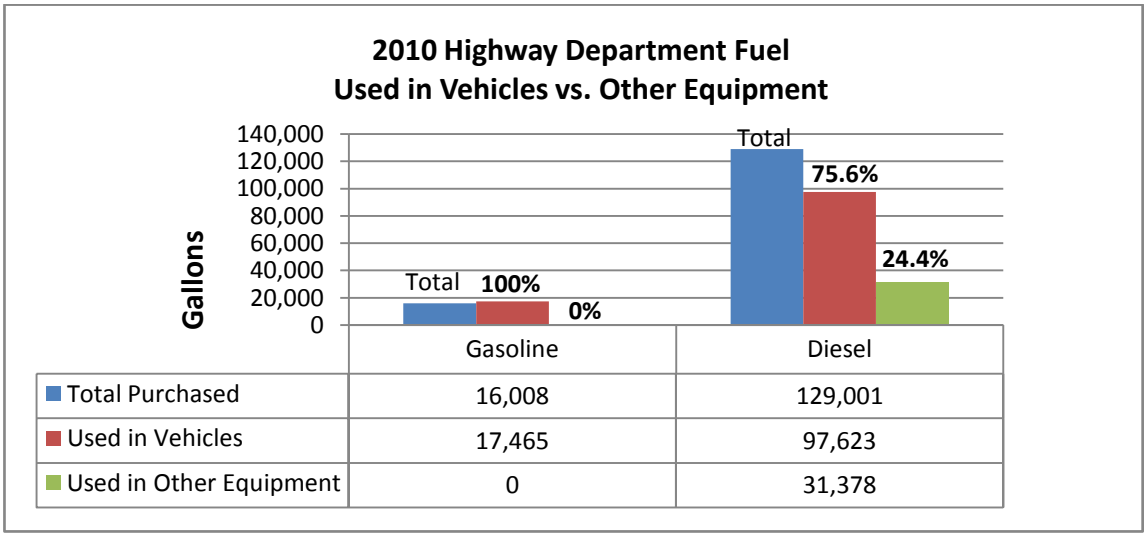
Figure 2



Source: Data gathered from County Departments, Fuel Purchasing Managers, and Finance Department.
Includes: Mowers, trimmers, tractors, heavy machinery, etc.

Shown in Figure 3 is the total amount of gasoline and diesel fuel in gallons that was purchased by the Highway Department vs. the quantity of fuel that was used in licensed and registered vehicles. The difference equals the amount of fuel that was consumed by non-licensed/registered vehicles such as mowers, tractors, trimmers, heavy machinery, etc. The data shows there was more gasoline used than purchased because the tank at the Highway Department is very large, and the fuel that was in the tank in 2009 overlapped into 2010. Figure 4 details the same information for the Parks Department.

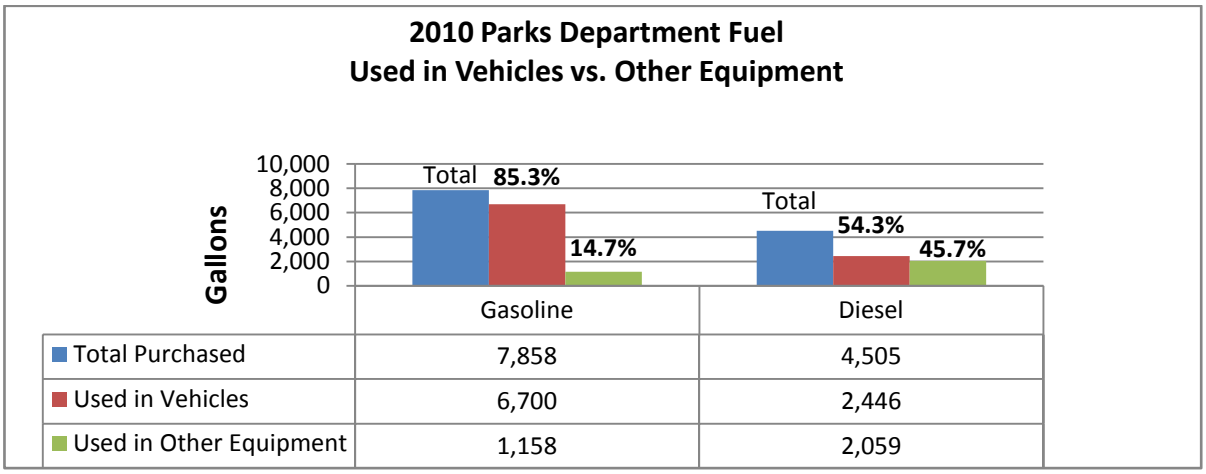
Figure 3



	Gasoline	Diesel
Total Purchased	16,008	129,001
Used in Vehicles	17,465	97,623
Used in Other Equipment	0	31,378

Source: Data gathered from County Departments, Fuel Purchasing Managers, and Finance Department.

Figure 4

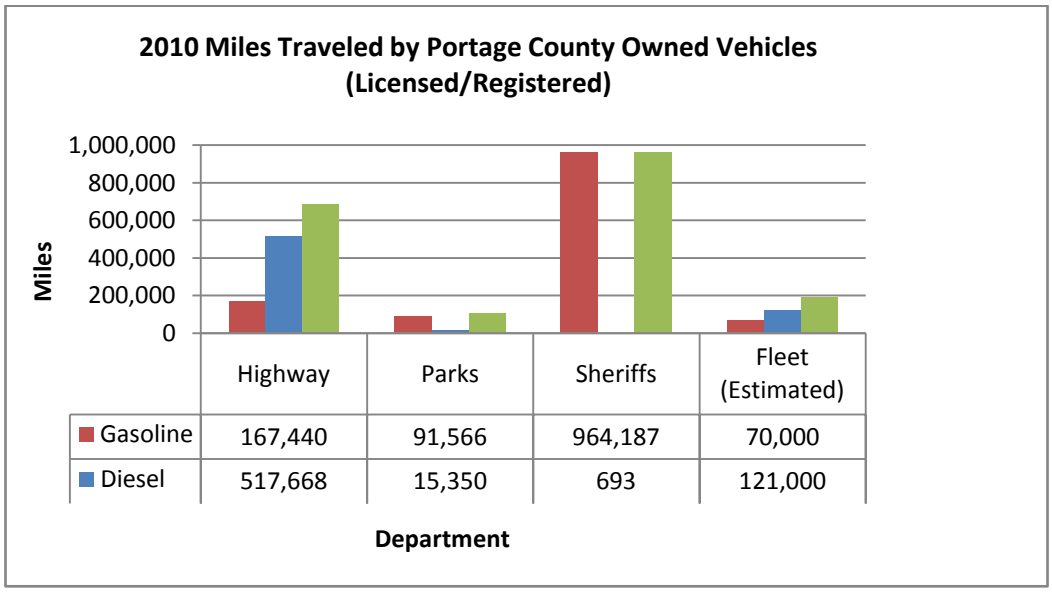


Source: Data gathered from County Departments, Fuel Purchasing Managers, and Finance Department.

CURRENT MILES TRAVELED

The total number of miles traveled by Highway, Parks, and Sheriff's Department vehicles, as well as Fleet vehicles, is shown in Figure 5. The 2010 total was 1,947,904 miles. Some of the Fleet mileage had to be estimated because of incomplete reporting; the mileage was not entered at the gas pump. As stated earlier, there are now log books within all the Fleet vehicles to maintain an accurate record of mileage in those vehicles.

Figure 5

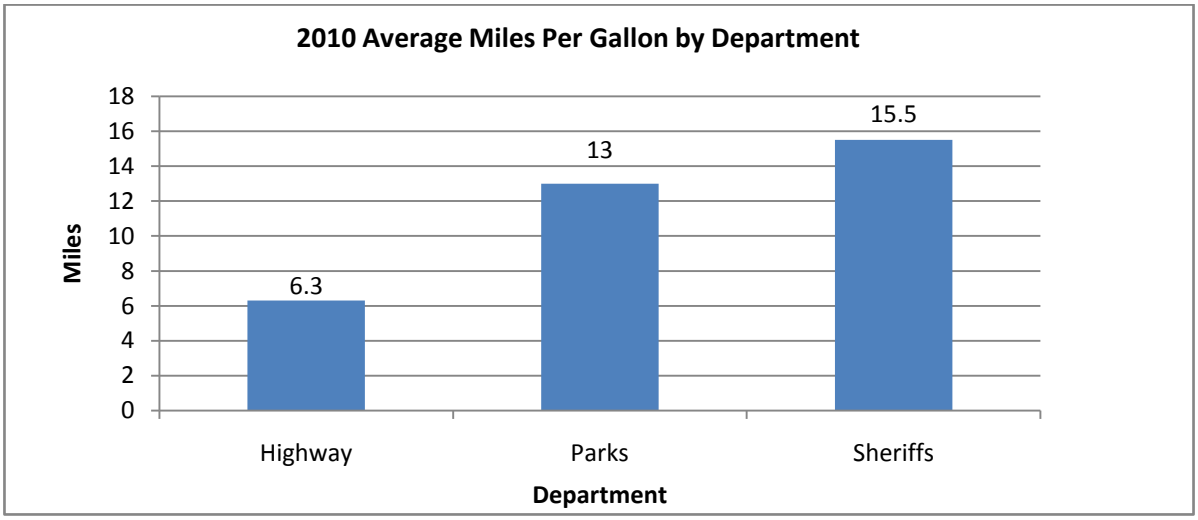


Source: Data gathered from County Departments, Fuel Purchasing Managers, and Finance Department.

Figure 6 shows the average miles per gallon for vehicles in the Highway, Parks, and Sheriff's Departments. There is a stark contrast in fuel economy between the Departments because they use very different vehicles on a daily basis to complete

work. The Highway Department uses a lot of large patrol trucks that are utilized for snow plowing, material hauling, heavy equipment towing, and road sign work. The Parks Department uses pickup trucks for hauling materials and towing equipment to complete their daily tasks. The Sheriff's Department has historically used cars (e.g. Ford Crown Victoria) for patrol. They get better mileage than pickup trucks, but are still heavy users of fuel because of the size of the engines needed for pursuit. Recently, the Sheriff's Department has been purchasing Sport Utility Vehicles (SUVs, e.g. Chevrolet Tahoe) to complete these tasks and is considering purchasing more in the future.

Figure 6



Source: Data gathered from County Departments, Fuel Purchasing Managers, and Finance Department.

Shown in Table 2 is the Sheriff's Department average miles per gallon by vehicle type per Sheriff's Department records. The 'Cars' category contains mainly Crown Victorias but also includes two Pontiac Bonnevilles, one Pontiac Grand Prix, and one Ford Taurus used for longer administrative and training trips. The 'SUVs' category contains Chevrolet Tahoes and Trailblazers, one Ford Explorer, one Dodge Caravan, and one Chevrolet Suburban. The 'Trucks' category includes all pickup trucks. Mileage is reduced by about two miles per gallon when moving from cars to SUVs, and four miles per gallon when moving from cars to trucks.

Table 2: Sheriff's Department Average Miles per Gallon by Vehicle Type

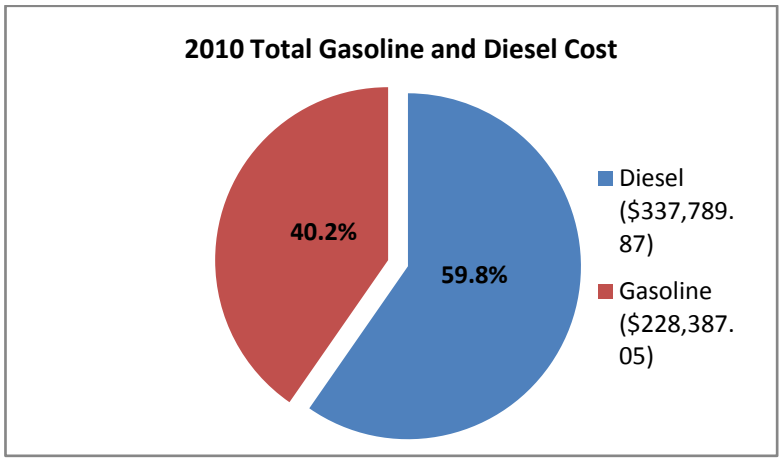
Vehicle Type	MPG
Cars	16.6
SUVs	14.6
Trucks	12.2

Source: Data gathered from County Departments, Fuel Purchasing Managers, and Finance Department.

CURRENT TRANSPORTATION FUEL COSTS BY FUEL TYPE

The cost of fuel used by Portage County-owned licensed and registered vehicles is shown in Figure 7. This $566,177 cost includes the total amount of fuel bought in bulk by the Highway and Parks Departments, as well as commercial gas station purchases by the Sheriff's Department and the Fleet vehicles.

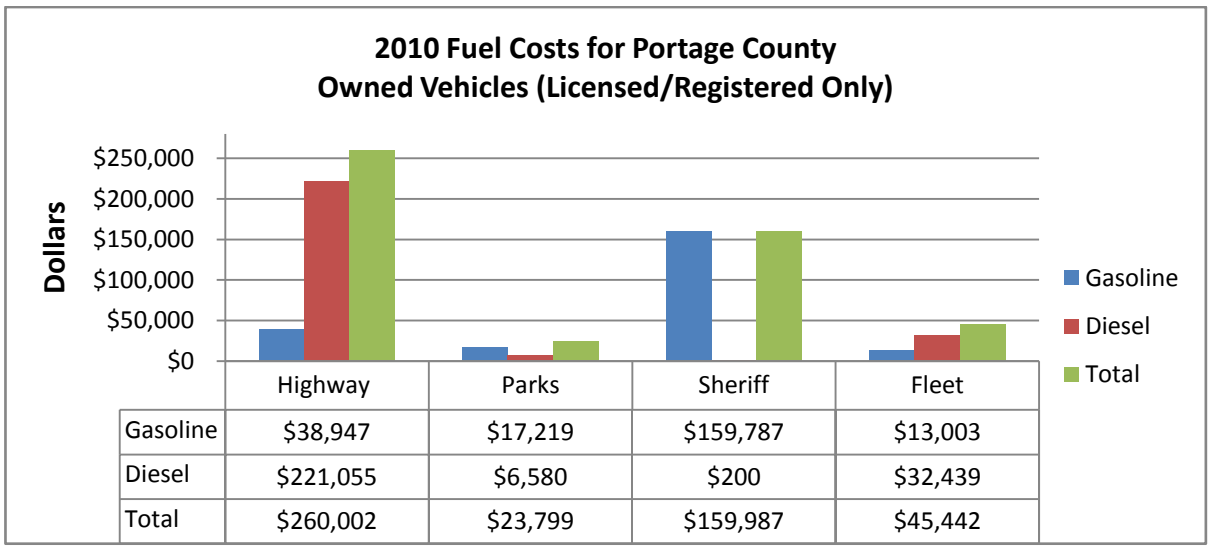
Figure 7



Source: Data gathered from County Departments, Fuel Purchasing Managers, and Finance Department.
Includes: Mowers, trimmers, tractors, heavy machinery, etc.

Gasoline and diesel based fuel costs for Highway, Parks, and Sheriff's Department vehicles, as well as Fleet vehicles, is shown in Figure 8. The Highway Department and the Fleet vehicles use mostly diesel fuel, the Parks Department uses mostly gasoline, and the Sheriff's Department uses nearly all gasoline.

Figure 8



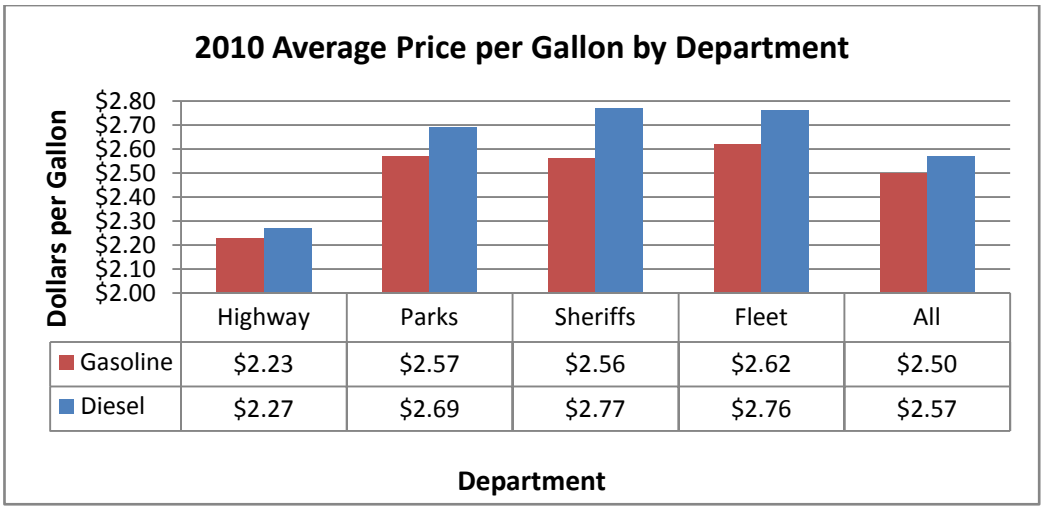
	Highway	Parks	Sheriff	Fleet
Gasoline	$38,947	$17,219	$159,787	$13,003
Diesel	$221,055	$6,580	$200	$32,439
Total	$260,002	$23,799	$159,987	$45,442

Source: Data gathered from County Departments, Fuel Purchasing Managers, and Finance Department.
Excludes: Mowers, trimmers, tractors, heavy machinery, etc.

Figure 9 shows the average price per gallon for gasoline and diesel fuel purchased by the Highway, Parks, and Sheriff's Departments. The data was calculated from averaging the price per gallon for all bulk fuel purchases by the Highway and Parks Departments and averaging the commercial gas station purchase price per gallon for the Sheriff's Department and Fleet vehicles throughout 2010. The dollar amounts shown in Figure 9 reflect just the fuel used in 2010 in County-owned licensed/registered vehicles and do not account for the fuel used in 2010 in off-road equipment; when the latter is factored in, the dollar amounts for the Highway and Parks Departments may be lower as both Departments are eligible for reimbursement of certain taxes paid on fuel used in off-road equipment. The Highway Department pays the least per gallon for their fuel, likely due to the fact that they buy fuel in the largest quantities and use a competitive bidding process with five different suppliers. The Parks Department also buys fuel in bulk but through a separate competitive bidding process. The Parks Department purchases 400-500 gallons at a time, whereas the Highway Department purchases 4,000-7,500 gallons at a time. Both of these circumstances contribute to why the Parks Department pays much more for bulk fuel than the Highway Department.

In general, Portage County has been buying diesel fuel at about $0.10 more per gallon compared to gasoline. This is expected because diesel fuel is typically more expensive than gasoline.

Figure 9



	Highway	Parks	Sheriffs	Fleet	All
Gasoline	$2.23	$2.57	$2.56	$2.62	$2.50
Diesel	$2.27	$2.69	$2.77	$2.76	$2.57

Source: Data gathered from County Departments, Fuel Purchasing Managers, and Finance Department.

Tables 3 and 4 provide more details on personal mileage and car rental reimbursements. "Personal Mileage" is reimbursed when County employees or elected officials use their private vehicle to conduct County business. This information represents the final two components of transportation data.

Table 3: Personal Mileage Reimbursements

Miles	Cost to County
337,047.8	$165,906.97

Source: Data gathered from County Departments, Fuel Purchasing Managers, and Finance Department.

Table 4: Enterprise Car Rental Occurrences, Rental Costs, and Fuel Costs

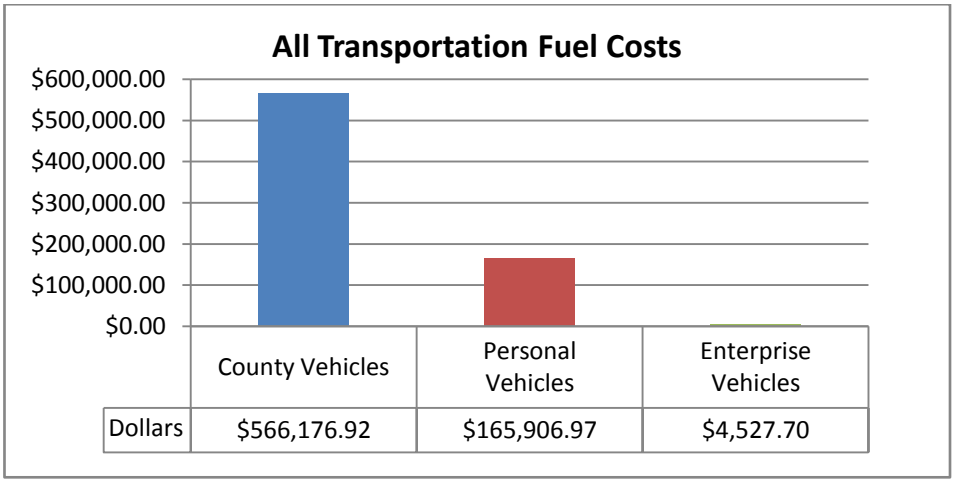
Duration	Vehicle Type	$ Per Occurrence	# of Occurrences	Cost of Rentals	Fuel Cost Charged	Fuel Bought w/ P-Cards
Daily	Compact	31	55	$1,705.00	$122.81	
Daily	Sedan	36	22	$792.00	$25.24	
Daily	Van	49	3	$147.00		
Weekly	Sedan	155	2	$310.00		
				$2,954.00	$148.05	$1,425.65
			Total Cost	**$4,527.70**		

Source: Data gathered from County Departments, Fuel Purchasing Managers, and Finance Department.

Displayed in Figure 10 is the total cost to Portage County of transportation fuel, personal mileage reimbursements, and car rentals from Enterprise. Fuel for Portage County owned vehicles, heavy machinery, and equipment costs the most. Personal vehicle mileage reimbursements were paid for 337,048 miles at a cost of $165,906.97. Unfortunately, this baseline report does not include any life cycle cost analysis of Portage County owned vehicles vs. personal vehicle mileage reimbursements vs. Enterprise car rentals. It is recommended to look at life cycle cost analysis of these in the future.

The 'Enterprise Vehicles' column in Figure 10 also includes more than just fuel costs; it factors in the overall cost of the car rental. The "Personal Vehicles" column in Figure 10 also includes more than just fuel costs; the per mile reimbursement rate takes into consideration the wear and tear on the employee's vehicle and preventative maintenance costs as well.

Figure 10



Source: Data gathered from County Departments, Fuel Purchasing Managers, and Finance Department.

PROJECTED TRANSPORTATION FUEL COSTS IF CURRENT PRACTICES ARE MAINTAINED

It is difficult to project transportation fuel costs into the future if none of the recommendations in this Strategic Energy Management Plan are implemented. This is

because transportation fuel prices have historically been very volatile and somewhat unpredictable. There are many factors that affect the global production of oil (supply), therefore affecting fuel prices, such as natural disasters, political intervention, corporate enterprise, and even war. There are also many factors that affect the global consumption of oil (demand), which consequently affect fuel prices, such as positive or negative economic market forces (both domestic and foreign), historic seasonal fluctuations in use, and more.

Figures 11 and 12 were created by the U.S. Energy Information Administration. Figure 11 shows annual average retail gasoline prices from 1990 to 2010. Figure 12 shows annual average diesel fuel retail prices from 1994 to 2010. These numbers represent prices at the pump. Portage County has historically received cheaper prices by buying in bulk and negotiating fuel contracts for gas cards.

Of interest are the high volatility of prices from year to year and the large jump in price from the early 2000s to the late 2000s. What will 2012 bring for fuel prices? What will 2017 bring for fuel prices? It is likely that petroleum produced fuel prices will continue to be volatile and ever increasing but by 'how much?' is the question.

Figure 11

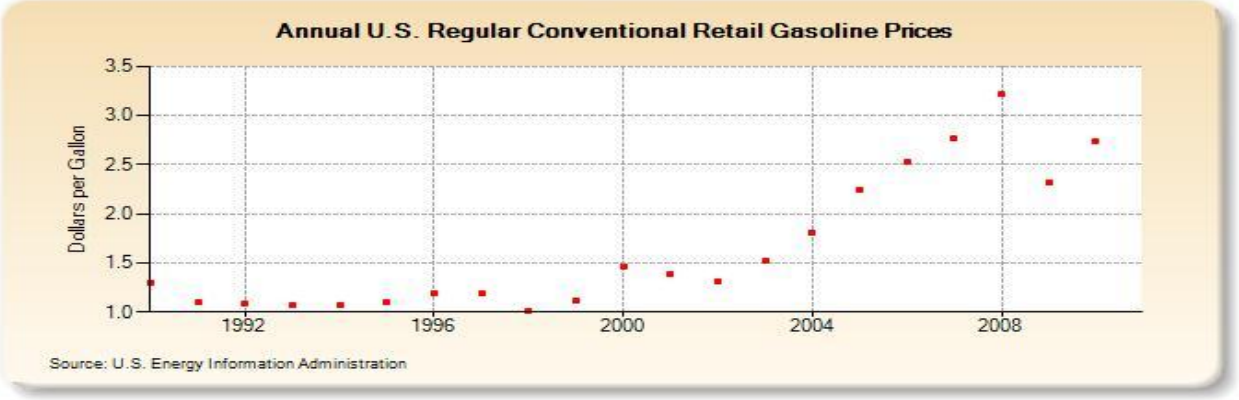
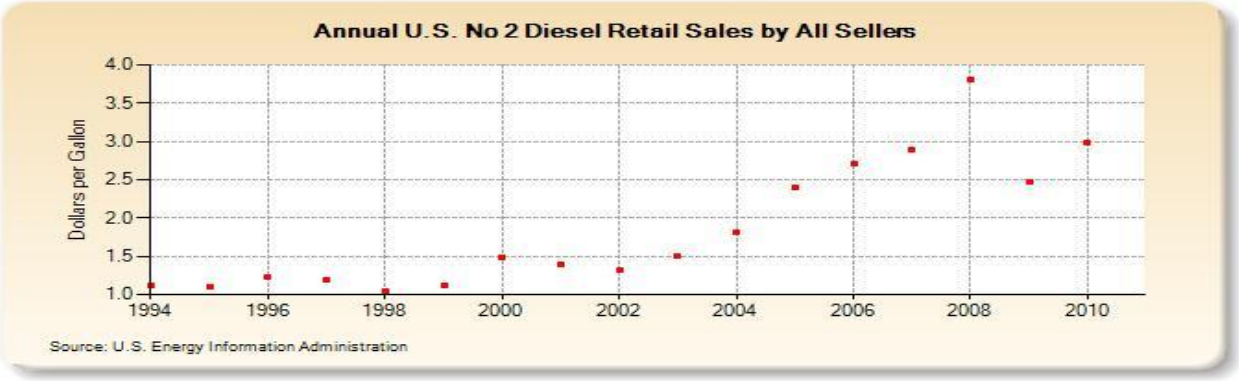


Figure 12



Regardless of the price of fuel, implementing strategies and policies across Portage County to conserve and reduce fuel consumption will lead to the most cost-effective use of the County's fiscal resources.

VARIANCE OF THE COST OF DIFFERENT TYPES OF FUEL

There is an array of fuel choices that can provide energy for transportation needs; several are listed in Table 5. Different fuels contain varying amounts of energy, measured here in Btu's. A Btu is a basic unit of energy. Different fuels also vary widely in cost. To put fuels on an even level with others in regards to cost, Table 5 shows different fuel costs per **gasoline gallon equivalent** (non-bulk) for the fuels that are discussed in the recommendations section of this plan. Fuel cost per gasoline gallon equivalent is the cost for an amount of fuel that has equivalent Btu's to a gallon of gasoline.

Comparing fuels on a Btu basis as the same as a gallon of gasoline does not mean the fuel is equally as efficient as that gallon of gasoline. It simply means it is the same amount of Btu's as that gallon of gasoline. The efficiency of the engine to convert the stored energy into kinetic energy is also a factor of how efficient the fuel choice will be per unit price.

Table 5: Fuel Types, Base Price, and Gasoline Gallon Equivalent Price

Fuel Type	Base Price (As of 10-14-2011)	$/Gasoline Gallon Equivalent
Reformulated Gasoline (10% ethanol)	$3.38 per gallon	$3.38
#2 Diesel	$3.72 per gallon	$3.23
BioDiesel (B20)	$3.73 per gallon	$3.39
BioDiesel (B99 – B100)	$3.80 per gallon	$3.76
CNG	$1.56 per therm	$1.74
Bio-CNG	NA	$2.44[1]

Source: Data from U.S. EPA and Energy Information Administration, and Clean Cities Alternative Fuel Price Report – Oct. 2011
One Btu is equal to 252 calories or .25 kilocalories (food calories)

ENERGY CONTENT WITHIN TRANSPORTATION FUEL USE

The energy contained in Portage County's transportation fuel use, as quantified in Btu's, is important to measure. Using this standard measure allows comparison of energy consumption across many years. If Portage County's transportation fuel comes from mixed sources in the future, it is important to compare on an even unit of energy, such as Btu's. Reformulated gasoline (containing 10% ethanol) contains 111,836 Btu's per gallon (U.S. EPA, Fuel Economy Impact Analysis of RFG). Contained in each gallon of #2 diesel fuel is 128,700 Btu's[2]. Multiplying these Btu concentrations by gallons consumed of each type of fuel equals the energy content within Portage County's transportation fuel use (not including mileage reimbursements or Enterprise car rentals).

Gasoline Btu's	10,177.41	MMBtu's
Diesel Btu's	18,772.70	MMBtu's
Total Btu's	28,950.11	MMBtu's

[1] It is estimated that, without subsidies, each GGE produced from landfill gas collected at the closed Portage County Sanitary Landfill would have a total cost of $2.44 to cover infrastructure and operational related expenses.
[2] Clean Cities Alternative Fuel Price Report, October 2011

SECTION 3: VEHICLE FUEL USE ANALYSIS

A Technical Work Group, made up of Heads from the Purchasing, Highway, Parks, and Sheriff's Departments, was formed to discuss Portage County transportation fuels use issues. The Work Group met twice. The first meeting was an introduction to alternative fuels the County could explore, and a review of principles, practices, and procedures the County could pursue that would limit energy use and save money. The second meeting included a discussion of possible solutions.

Thereafter, the Energy Team continued to get input from county staff, industry specialists, and others to build upon the information received from the Technical Work Group meetings. The compiled information is summarized below. The information is grouped into five action areas that the County could explore to decrease transportation fuel use and increase efficiency:

- Fuel Purchasing
- Alternative Fuel Analysis
- Fleet Analysis and Vehicle Purchasing (Right-Sizing)
- Driver Behavior
- Motor Pool and Personal Vehicle Options

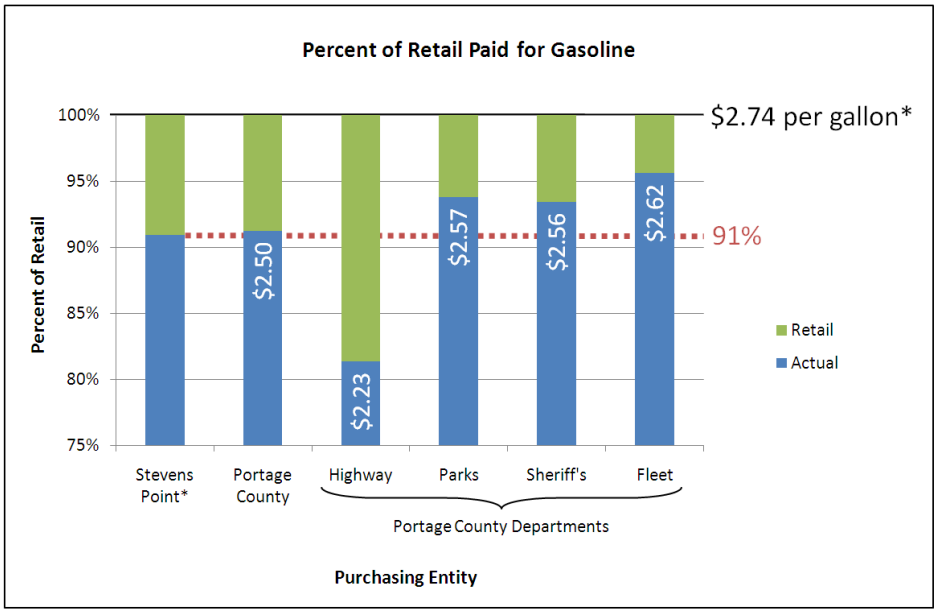
The following gives a brief overview of each action area in general, followed by Department specific information obtained from the Technical Work Group meetings and follow up discussions with Department Heads.

FUEL PURCHASING

Portage County currently uses gasoline and diesel fuel for all operations. Each Department purchases fuel separately. However, the Departments may find it beneficial to do a bulk bid together to increase their purchasing power.

Alternatively, Portage County could investigate the possibility of purchasing fuel from the City of Stevens Point. Stevens Point, like Portage County, uses fuel in significant quantities, having expended 58,510 and 134,847 gallons of gasoline and diesel respectively in 2009. The City, like some Portage County Departments, receives a discount on bulk fuel purchases; this makes actual fuel prices paid a fraction of retail. Regardless of Department, Stevens Point's discount amounts to paying approximately 90 percent of retail. For some Portage County Departments, fueling with the City may reduce per gallon prices or make fueling at bulk purchased fueling stations as opposed to commercial fueling stations more acceptable by providing an additional bulk purchased location centrally positioned within the City. Potential reductions in per gallon prices are identified in Figure 13, which shows the percent of retail paid for gasoline by Stevens Point in 2009 and Portage County in 2010.

Figure 13



*Stevens Point prices are from 2009, while all Portage County prices are from 2010. Twice, four retail prices each, representing the four quarters of the year, from Clean Cities and the U.S. Energy Information Administration were averaged together to create an annual average retail price for the years 2009 and 2010. The retail prices used were the average price offered by many U.S. Midwest public and private filling stations at the time. The actual prices used are an average of all the entity's fuel receipts from the respective years. Stevens Point's Departments are not distinguished as they typically paid a price nearly equal to that of the City as a whole.

Highway Department

The Highway Department purchases diesel and gasoline fuel in bulk. The Department receives a lower price per gallon for their fuel due to purchasing in bulk (7,500 gallons at a time).

Parks Department

The Parks Department purchases in bulk (400 gallons at a time) through a competitive bidding process but receives a price per gallon that is on average $0.30 to $0.40 higher than the Highway Department. The Parks Department could purchase fuel in bulk with the Highway Department to lower the price per gallon. However, their storage tank is smaller so they will still incur a higher price per gallon for storage. The Parks Department could also explore purchasing a larger storage tank.

Sheriff's Department

The Sheriff's Department does not purchase bulk fuel at this time. The Sheriff's Department could be included in the purchasing of bulk fuel. One option is to have the Sheriff's Department fuel their vehicles at either the Highway Department or the Parks Department. To do this, the Parks Department would have to install a larger capacity gasoline tank and purchase a digital key fueling system similar to the Highway Department's. All Sheriff's Department vehicles would have a key that could be used at the Highway Department or Parks Department pumps. A report produced monthly from the key fueling system would be used to sort out fuel billing by Department. However, an assessment would need to be done of the Sheriff's Department driving

behaviors to determine the efficiency of having the Sheriff's Department's vehicles travel to the Parks Department fueling tanks in Jordan Park or the Highway Department fueling tanks in Plover. Alternatively, the Sheriff's Department could purchase and install a bulk fuel storage tank for the Sheriff's Department in Stevens Point and refuel at the Department.

By purchasing fuel in bulk with the other Departments, the Sheriff's Department could fuel their vehicles at an average of $0.35 per gallon less than they paid in 2010 under the County's fuel contract with "The Store" commercial gas station.

Fleet Vehicles

The term Fleet Vehicles is a label for a specific set of vehicles owned by Portage County. Those vehicles that make up this category are the Facilities Department trucks, the Library vans, the Aging and Disabilities Resources Center (ADRC) buses, the Health Care Center van, ambulances, the Land Conservation Division truck, and the Motor Pool vehicles, which are discussed along with personal mileage reimbursements under the next heading. Fleet vehicles do not purchase bulk fuel at this time. All of these vehicles have assigned fuel cards which are used at a commercial gas station (Kwik Trip in 2011) to fuel the vehicles.

If the ADRC buses were to fuel from the Highway or Parks Department bulk fuel tanks, they would be fueling for a cheaper price per gallon (about $0.50 cheaper) than when they do from the commercial gas stations under contract.

ALTERNATIVE FUEL ANALYSIS

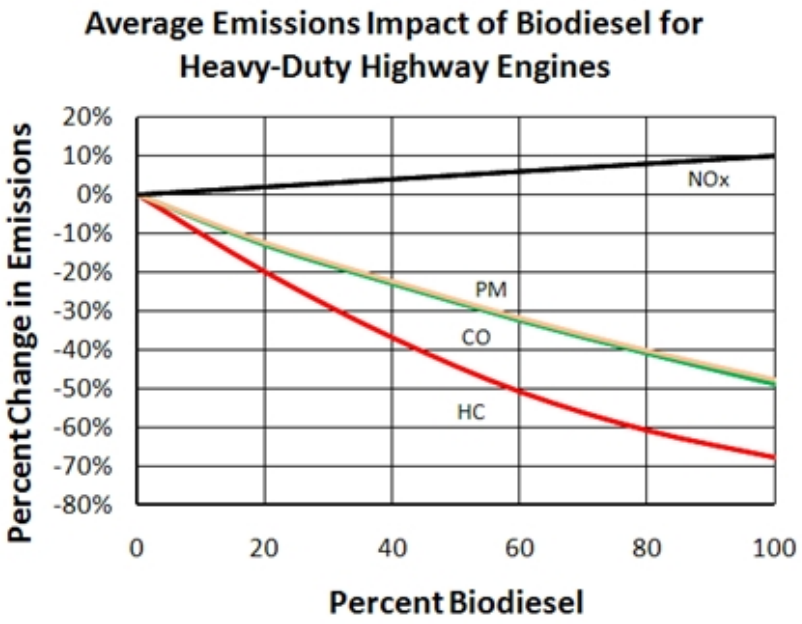
In addition to, or in place of, using gasoline or diesel, the Technical Work Group and Energy Team discussed the use of alternative fuels, specifically biodiesel and Bio-CNG (a form of Compressed Natural Gas).

Biodiesel

Biodiesel is a biodegradable, non-petroleum-based transportation fuel for use in diesel engines that is made from vegetable oils or animal fats that can be domestically produced. Biodiesel has lower levels of emissions, is non-toxic, and is less combustible than diesel. As shown in Figure 14 below, the levels of particulate matter (PM), carbon monoxide (CO), and unburned hydrocarbons (HC) emitted is reduced significantly when using biodiesel. Furthermore, the use of biodiesel can compensate for the nominal engine lubrication inherent to low-sulfur petroleum diesel and boost the cetane number of the engine's fuel, allowing the engine to run more smoothly. Lastly, Kenneth Gliszinski, County Patrol Superintendent at the Highway Department, believes that Highway Department vehicles using biodiesel may enjoy an extended interval between oil changes[3].

[3] County Patrol Superintendent Gliszinski also had the opportunity to discuss biodiesel use with City of Milwaukee Fleet Operations Manager Jeffery Tews, who oversaw the phasing in of biodiesel at the Milwaukee Department of Public Works, which is discussed further below.

Figure 14



Source: U.S. Department of Energy

According to the 2011 Wisconsin Biofuels and Alternative Fuels Use Report from the Wisconsin Office of Energy Independence (now known as the Wisconsin State Energy Office), there are four main biofuel production facilities/operations (Bio Blend Fuels in Manitowoc, Sanimax Energy in De Forest, Walsh Bio-fuels in Mauston, and SunPower Biodiesel in Cumberland), and 32 small-scale producers, in the state. ASTM International has created standards to legally register complying biodiesel fuels with the U.S. EPA and assure relative quality; satisfactory B1 through B5 blends and diesel have identical quality related specifications.

Biodiesel comes in different blends: B20 is composed of 20 percent biodiesel and 80 percent diesel, while B99 is 99 percent biodiesel and 1 percent diesel. According to the U.S. Department of Energy (DOE), B20 can be used in nearly all diesel equipment and storage equipment and does not generally require modifications. B99 can be used in some engines but may require modifications. Biodiesel has higher lubricity than #2 diesel, which can increase engine life and reduce wear and tear. B99 has about an 8.65 percent lower Btu content than #2 diesel (see Appendix A), therefore mileage reductions should be expected. A B20 blend has just 1.73 percent fewer Btu's than #2 diesel on a per gallon basis (see Appendix A).

The Wisconsin Biodiesel Association states that biodiesel can typically be stored in the same tanks used to store petroleum diesel. (The tanks cannot be lined with concrete, and the rubber components must be compatible with biodiesel, which is typically the case.) Running biodiesel during winter months always raises concerns about fuel gelling. Fuel gelling is the solidification of fuel in fuel lines, filters, and pumps, which causes the failure of the fueling system. If this occurs, fuel lines, pumps, and filters would have to be replaced. The Wisconsin Biodiesel Association does not recommend using a biodiesel

blend above B50 during the winter and notes that blends of B20 or less "behave almost identical" to petroleum diesel in cold weather. SunPower Biodiesel in Cumberland, WI offers a B20 blend, with additives to maintain the fuel's cold flow properties, for delivery throughout the winter months. They have tested this fuel in trucks at a temperature of minus 20 degrees Fahrenheit, with no reported problems. Part of the reason for this is SunPower biodiesel is made from first hand plant feed stocks such as canola and soybeans. Biodiesel products made with these feed stocks are considered higher quality and have better cold flow properties than biodiesel made from animal fats. Another reason for the high quality performance of this fuel at very cold temperatures is the additives.

The DOE states that biodiesel can be used in diesel engines and fuel injection equipment manufactured after 1994 with "little impact on operating performance." All engine warranties are valid with use of B5 or lower by law, and most engine companies have stated their warranties are valid for biodiesel blends of up to B20. Not all engine warranties, however, cover B20 through B99. The National Biodiesel Board lists major automaker's positions on biodiesel on their website. For example, General Motors and Ford approve B20 for all GM diesel vehicles for 2011 models and beyond. The manufacturers of trucks that are less than three years old (eight trucks in the Highway Department) should be contacted to ensure the warranty is not void with use of biodiesel blends over B5. Portage County Patrol Superintendent Gliszinski has researched this matter and has not encountered to date any known issues with B2 through B20 voiding Highway Department vehicle warranties. This ultimately may not be a large concern for Portage County (to run > B20 blends), because other municipalities across the United States have been operating diesel trucks with B99 for years and have reported no issues.

Biodiesel (B20) can be purchased for roughly the same price as diesel. While this would not lower costs, it would contribute to the County's environmental stewardship by reducing the County's emissions. Biodiesel (B99) can be purchased for a lower cost than #2 diesel (typically $0.20 cheaper), saving Portage County money on diesel fuel costs, and can drastically improve the quality of emissions from diesel burning engines. SunPower Biodiesel will ship to Portage County tanker load quantities (6,500 gallons) only.

Several local governments in Wisconsin are either considering or currently using biodiesel fuel. Some Wisconsin cities, including Oshkosh and La Crosse, are considering the use of biodiesel fuels in their operations. Specifically, La Crosse is researching fueling its diesel vehicles with either a B2 or B5 biodiesel blend[4].

The City of Milwaukee Department of Public Works, which is responsible for the City's vehicle fleet, uses biodiesel fuels for its operations[5]. Between May and September, a B20 biodiesel blend is expended, while a B5 biodiesel blend is used for the remainder of the

[4] City of Oshkosh Sustainability Plan August 2011 Draft, City of La Crosse & La Crosse County Strategic Plan for Sustainability

[5] Best Maintenance Practices for Snow Fleets Before, During, and After the Snow – City of Milwaukee Department of Public Works

year. In using these biodiesel fuels in 900 diesel pieces of equipment and vehicles, Milwaukee has the largest biodiesel fueled fleet in Wisconsin[6]. The Department of Public Works first began using biodiesel in July 2006, when it introduced a B2 biodiesel blend for use in all diesel vehicles. The percent pure biodiesel in the Department's biodiesel blends rose over the years; a B5 and B10 biodiesel blend was introduced in April and July 2007 respectively, with a B20 biodiesel blend currently used[7].

The state government of Wisconsin is another significant user of biodiesel fuels. The state government of Wisconsin purchased 56,000 gallons of B20 biodiesel fuel and 9,500 gallons of B5 biodiesel fuel in 2010. Part of Wisconsin's state government is the 26 campuses composing the University of Wisconsin (UW) System. The System's three largest four-year institutions (UW-Madison/Milwaukee/Oshkosh) all use biodiesel in their operations. UW-Oshkosh uses a B10 blend, and UW-Madison uses a B20 blend. UW-Stout is also a significant user of biofuel[8,9].

Furthermore, Portage County could explore making its own biodiesel. UW-River Falls makes biodiesel in an educational setting[10]. The city of Hoover, Alabama makes biodiesel by collecting waste cooking oil from restaurants. They also have a drop-off site for household waste cooking oil. The waste oil is processed into biodiesel by staff at the cost of $0.60 per gallon for chemicals and $0.30 per gallon for staff time. This means they use biodiesel in their trucks that costs $0.90 per gallon to make. They typically blend the biodiesel with #2 diesel in their storage tanks to create a 20 percent biodiesel blend.

Natural Gas

Interest in using natural gas as a transportation fuel has grown in recent years as the price of gasoline and diesel fuels have increased and technology has developed[11]. Pure natural gas is a colorless and odorless fuel composed almost entirely (99%) of methane, along with traces (~1%) of predominantly hydrocarbon gases and carbon dioxide. Natural gas is ultimately formed in two major manners: deep within the Earth under the crust and by organic material being chemically broken down by microorganisms. Natural gas formed within the Earth is a fossil fuel and is non-renewable[12]. It is stated that the United States has a 100 year domestic supply of fossil fuel natural gas[13]. A renewable source of natural gas is the biogenic methane in biogas produced by microbiological activity[12]. Biogenic methane can be purified to the point that it, for the discussion of transportation fuels, is essentially natural gas and can be used in vehicles capable of running on fossil fuel based natural gas.

[6] Great Lakes & St. Lawrence Cities Initiative (http://www.glslcities.org/initiatives/greencities/milwaukee.cfm)
[7] City of Milwaukee Department of Public Works Fleet Report August 2007
[8] Wisconsin Biofuels and Alternative Fuels Use Report 2011 Annual Report
[9] UW-Madison Sustainability Initiative Task Force Final Report October 2010
[10] History of Biodiesel Production at UWRF (http://www.uwrf.edu/Sustain/BiodieselHistory.cfm)
[11] Former Dane County Solid Waste Manager Mike DiMaggio
[12] NaturalGas.org: Overview of Natural Gas, Background (http://naturalgas.org/overview/background.asp)
[13] World CNG: "President Obama praises natural gas in his State of the Union Address" (http://www.worldcng.com/2012/01/25/president-obama-praises-natural-gas-in-his-state-of-the-union-address/)

To use natural gas as a transportation fuel, the natural gas is usually compressed to a pressure of 3,000 to 3,600 pounds per square inch to form compressed natural gas (CNG). This extreme pressure is required as a GGE of uncompressed natural gas occupies over 100 cubic feet[12]. Natural gas can also be super-cooled to a temperature of -260^{O}F to liquefy it and create liquefied natural gas (LNG), which is not pursued in this plan[14]. After the natural gas has been compressed or super-cooled, it is stored at a fueling station capable of dispensing the fuel to refuel vehicles.

While any natural gas that is compressed is, by definition, CNG regardless of its origins, CNG with biogenic methane origins can be specifically termed Bio-CNG. As transportation fuels, CNG and Bio-CNG behave identically and have equivalent performance; the main distinction is that Bio-CNG is renewable[15].

As of April 2010, it is estimated that approximately 11.2 million vehicles run on natural gas worldwide and that about 100,000 of these vehicles are based in the United States[14]. In January 2012, there were 975 CNG fueling stations in the United States, with 17 in Wisconsin[16].

Some entities regarded alternative energy in a way that caused them to be proactive about it, and began using natural gas powered vehicles to set an example and a precedent via leadership. As more entities use natural gas powered vehicles, infrastructure, including engine conversion kits, mechanic certifications, vehicles with OEM supplied natural gas running engines, and natural gas fueling stations, will expand, making natural gas propulsion more accessible and practical. The examples of natural gas applications are varied and exhaustive: CNG ambulances in Palm Desert, California; CNG tugs at Denver International Airport; CNG trams at the Bronx Zoo & Brooklyn Botanical Gardens; CNG trams at Disneyland Park in California; CNG school buses in Ardmore, Pennsylvania and Tulsa, Oklahoma; United Parcel Service CNG delivery trucks based around the United States; CNG shuttle buses at the University of California Davis; CNG taxis in Seattle, Washington; and CNG garbage trucks in Boise, Idaho[17,18].

Using natural gas as a transportation fuel has environmental benefits. Compared to gasoline, natural gas reduces carbon monoxide, ground-level ozone, and greenhouse gas vehicle emissions by 90, 75, and 25 percent respectively[19].

Because of these relatively low emissions and the higher, compared to gasoline, octane rating inherent to natural gas, natural gas powered vehicles comply with all

[14] U.S. Department of Energy, Vehicle Technologies Program: Natural Gas Basics (http://www.afdc.energy.gov/afdc/pdfs/48126.pdf)
[15] Dane County, during testing, used both fuels in vehicles run a dynamometer.
[16] U.S. Department of Energy, Alternative Fuels & Advanced Vehicles Data Center: Basic Station Search (http://www.afdc.energy.gov/afdc/locator/stations/)
[17] Natural Gas Vehicles for America: Media Center, Refuse (http://www.ngvc.org/media_ctr/photolibrary.html)
[18] U.S. Department of Energy, Alternative Fuels & Advanced Vehicles Data Center: Natural Gas Fleet Experiences (http://www.afdc.energy.gov/afdc/progs/fleet_exp_fuel.php/NG)
[19] U.S. Environmental Protection Agency: Clean Alternative Fuels: Compressed Natural Gas (http://www.afdc.energy.gov/afdc/pdfs/epa_cng.pdf)

current and foreseeable emissions regulations and can accumulate more miles before oil changes. Some suggest prolonging the time between oil changes in natural gas vehicles by a factor of up to 2.5 compared to non-natural gas counterparts[11,20]. Cummins Inc., manufacturer of natural gas specific engines and who originally suggested no time interval increase, is currently developing new recommendations for natural gas vehicles that will very likely suggest an increase in the time interval between oil changes[11]. Lastly, natural gas vehicles quite often operate with less noise than similar vehicles running on diesel fuel[18].

Building on environmental advantages are the economic benefits of running vehicles on natural gas. A report published in 2007 concluded CNG transit buses are less expensive to operate than diesel transit buses[21]. While this conclusion is largely a result of natural gas having a lower retail price than diesel or gasoline, which will be discussed in more depth later, it supports the notion that certain aspects of operating natural gas powered vehicles are less expensive than in diesel powered vehicles. One such element of operations is maintenance costs. While there is no overall consensus on whether a natural gas powered vehicle has decreased or increased maintenance costs as maintenance is dependent on the demands placed on the vehicle and the unique situation of the entity operating the vehicle, there are instances when natural gas powered vehicles have or have had lower maintenance costs versus comparable diesel powered vehicles; one transit authority in 2004 documented twelve-percent lower maintenance costs for the CNG transit buses it operated alongside and compared to its diesel transit buses[21,22,23]. Furthermore, as diesel powered vehicles become more complicated to meet emissions standards and natural gas powered vehicle hardware is made less expensive and further developed, it is likely natural gas will eventually offer a distinct maintenance cost advantage[11,21,22].

Grants are available for projects that implement natural gas as a transportation fuel, including those that concern CNG and Bio-CNG[24]. Moreover, in years past, the United States Federal Government has provided a 50¢ per gallon subsidy on the production of CNG/Bio-CNG to help offset costs. While its renewal status is currently undecided, this subsidy, which is renewed annually, may be renewed in 2012[11].

[20] Alabama Clean Fuels Coalition: Natural Gas . . . Operational Performance (http://www.alabamacleanfuels.org/Why_AFVs/Fuel_for_You/Natural_Gas/natural_gas.html)

[21] A 2007 U.S. DOT and WV University report found per mile total operating costs of 79¢ (CNG) and 80¢ (diesel) for transit buses. The report demonstrates CNG buses can cover their unique operating expenses (electricity for natural gas compressor) via a combination of fuel price savings and the lower maintenance costs illustrated by the WMATA in footnote 21.

[22] A National Renewable Energy Laboratory and Battelle report about Washington Metro Area Transit Authority (WMATA) CNG transit buses found the CNG buses experienced 3-11% higher and 2-12% lower fuel system/engine and total maintenance costs respectively versus simultaneously operated diesel transit buses.

[23] The UI – Chicago reports paying more for CNG vehicle maintenance and replacement parts versus diesel vehicles. Choice Environmental found that new diesel vehicle emissions equipment caused diesel vehicles more maintenance than CNG vehicles.

[24] The Capital Hill Publishing Corporation (Goode, Darren): DOT designates $776 million in bus grants (http://thehill.com/blogs/e2-wire/e2-wire/122407-dot-designates-776-million-in-bus-grants-)

The CNG vehicles Portage County would acquire to use transportation fuel natural gas would run on any natural gas in compressed form, whether the natural gas is sourced from biogenic methane or fossil fuel based, Bio-CNG or CNG, renewable or non-renewable. Besides the choice between converting a vehicle to run on CNG and purchasing a new vehicle specifically designed to run on CNG, there is the option of bi-fuel CNG vehicles, which can switch seamlessly between CNG and gasoline, and CNG only vehicles, which must always run on CNG. Today, vehicles bigger than a one half ton pickup truck are typically CNG only vehicles; nonetheless, bi-fuel CNG vehicles are more prevalent than CNG only vehicles[11,25]. Able to switch to gasoline when the CNG supply is exhausted, a bi-fuel CNG vehicle can comfortably be driven into areas without CNG fueling stations.

Gasoline engines are easily converted to run on CNG; the technology to convert diesel engines, while available, is less refined and developed in comparison[11,25]. Nonetheless, vehicles specifically designed to run on CNG may replace vehicles that have historically run on diesel, such as garbage/recycling trucks and transit buses[18].

Today, CNG compatible vehicles are more expensive to purchase; the premium varies depending on whether the vehicle is bi-fuel (~$10,000-$14,000 for a one half ton pickup truck or smaller vehicle) or CNG only (~$4,000-$7,000 for a one half ton pickup truck or smaller vehicle/~$20,000-$60,000 for larger vehicles [~Class 5-8 medium and heavy duty trucks])[11,25,26,27]. Nonetheless, certain instances feature much lower premiums; the technology needed to meet emissions regulations on the diesel refuse trucks Veolia Environmental Services was considering reduced the premium on CNG refuse trucks from $40,000, which fits in the range above, to $10,000. A smaller premium may also be obtained by purchasing a used CNG vehicle from a government surplus sale; Dane County once purchased a used CNG pickup truck from Fort McCoy for about $3,000[11].

If Portage County converts a current or future County gasoline vehicle to run on natural gas using an in-house mechanic with a CNG conversion certification, the premium on a bi-fuel CNG vehicle falls to about $6,000[28]. This in-house conversion takes approximately five hours to complete[11].

With, as of October 2011, CNG retail prices nearly half of gasoline and diesel retail prices, a CNG vehicle's quality of return on investment is dependent on fuel prices, the vehicle's fuel economy, and the number of miles the vehicle is driven annually and over a lifetime[2]. These factors suggest a focus on heavily used vehicles with poor fuel economy, and helps explain the prevalence of natural gas powered refuse trucks and transit buses. Veolia's new CNG refuse trucks illustrate this well; attaining just 3-4 mpg, they covered their $10,000 premium in less than a year[11].

[25] Mike Michels, Vice-President Cornerstone Environmental Group, LLC

[26] Dane County Recycling Manager/Bio-CNG Manager John Welch

[27] There are many calculators to help determine the expense and potential savings of using CNG vehicles.
+ Virginia Clean Cities: http://eerc.ra.utk.edu/etcfc/ngtoolkit/calculator.html
+ Kulp Energy Solutions: http://www.kulpenergy.com/online-cng-roi-calculator-for-light-duty-gasoline-vehicles/

[28] A 21 gallon CNG tank is included to facilitate fueling just once a week; a smaller tank requiring more frequent filling would reduce the ~$6,000 expense[18,36].

After initial interest, the first step in Portage County using CNG vehicles is a commitment to use CNG vehicles; this allows the County to, when needed, respond quickly to potential opportunities, such as grants with quick turnaround times. Numerous resources can assist the County in deciding whether CNG is worth pursuing[29].

CNG

Portage County could, as mentioned before, use non-renewable fossil fuel CNG as a transportation fuel. As there are currently no fueling stations in Portage County selling fossil fuel CNG, the County could either install a fueling station to own or wait for a business to install a fueling station; many new fossil fuel CNG fueling stations are soon set to open in Wisconsin, with Green Bay, Menomonie, and Wausau as examples[30,31,32]. A fossil fuel CNG fueling station built along a natural gas pipeline would cost Portage County about $500,000 to build. Such a fueling station could generate up to 96 GGE per hour[25]. There has been discussion about locating this fueling station at the Portage County Highway Department, the potential County user with likely the largest demand.

Bio-CNG

Portage County could consider producing Bio-CNG through collection of biogenic methane at the former Portage County Sanitary Landfill in the Town of Stockton[33]. Located between Stevens Point and Amherst, the landfill opened in 1982 and vents most of its biogenic methane through just one third of the site's extraction wells[34,35]. The landfill's biogenic methane is presently controlled through destruction via flaring. The flare requires about $2,000 worth of electricity each month to operate. The landfill's biogas, and its associated biogenic methane, could be routed through a Bio-CNG conditioning system and made available as Bio-CNG for vehicle fueling on site[36]. The resulting Bio-CNG could also be piped over a mile, at extra cost, to a fueling station on U.S. Highway 10 to improve access. The use of the landfill's biogenic methane to produce Bio-CNG would largely, if not completely, eliminate the flare's monthly electrical expense[37]. A potential Bio-CNG production project at the Portage County Sanitary Landfill would require the support and consent of the Town of Stockton.

[29] Some resources include Clean Cities Wisconsin, the State of Wisconsin State Energy Office, ngvamerica.org, and regional CNG informational meetings held by Bob Kulp in Wausau, WI.

[30] Green Fleet Magazine: CNG Fueling Station Coming to Wisconsin's Green Bay Area (http://www.greenfleetmagazine.com/news/50934/cng-fueling-station-coming-to-wisconsin-s-green-bay-area)

[31] Wausau Daily Herald: Riiser Energy plans compressed natural gas refueling station for Rib Mountain Travel Center (http://www.wausaudailyherald.com/article/20120119/WDH03/301190074/Riiser-Energy-plans-compressed-natural-gas-refueling-station-Rib-Mountain-Travel-Center)

[32] The Chippewa Herald: Truly 'grand' opening is expected (http://chippewa.com/truly-grand-opening-is-expected/article_023c2aa6-5cbb-11e1-8159-001871e3ce6c.html)

[33] Data from Portage County Solid Waste Administrator John Gardner and WDNR's 2007 Landfill Tonnage Report indicate the Portage County Sanitary Landfill reached capacity in 2007 and had 1.5 million yd^3 of capacity; the 70 operational WI landfills in 2007 had an average 2.25 million yd^3 initial capacity.

[34] John Gardner, Portage County Solid Waste Administrator

[35] Town of Stockton (http://townofstockton.com/)

[36] A Bio-CNG conditioning system raises the methane concentration in biogas to approximately 90% for use as Bio-CNG.

[37] Portage County Solid Waste Manager Jeff Lodzinski

A simple study conducted by Cornerstone Environmental Group, L.L.C. estimated the Portage County Sanitary Landfill could produce 217 GGE a day for five to seven years, after which the flow of collectable biogas would fall below 50 standard cubic feet per minute (SCFM), dropping GGE production by two to four percent per year[25]. Based on this estimate, the landfill would produce, for five to seven years, 79,205 GGE annually; a quantity of fuel about equal to 54 percent of the County's diesel use, 87 percent of the County gasoline use, or 33 percent of the County's total fuel use in 2010. Furthermore, at the levels of production estimated, the landfill would produce between 746,986 and 782,671 GGE over Cornerstone's estimated 10 year period for initial investment payback of a Bio-CNG conditioning system project there.

The above simple study and associated estimates utilize sample data collected once monthly by the Solid Waste Department. To more accurately explore the feasibility of Bio-CNG production, the Solid Waste Department would need to conduct a new study utilizing sample data collected daily for one month (30 days); this effort would ensure adequate biogas quantity and quality for Bio-CNG conditioning[25].

County verification of a sufficient number of users for any Bio-CNG produced further studies the feasibility of Bio-CNG production. Users could include area private and municipal entities, such as solid waste service providers, and Portage County Departments. To predict potential Portage County use of Bio-CNG, an assessment determining for each applicable Portage County Department which current vehicles to convert to CNG and possible future purchases of CNG vehicles could be completed. The following State Statute addresses the legality for the Portage County Solid Waste Management Board to sell Bio-CNG for public use:

Wisconsin State Statute 59.70(2)(p) *states "… the Solid Waste Management Board may exercise the following powers:*

(p) Utilize or dispose of by sale or otherwise all products or bi-products of the solid waste management system"

Producing Bio-CNG at the Portage County Sanitary Landfill for use in CNG vehicles requires significant infrastructure-related investment, including the purchase and installation of a Bio-CNG conditioning system and fuel dispenser. Presently, Cornerstone Environmental Group alone produces a system appropriately sized for Portage County's potential Bio-CNG production; this system, the Bio-CNG 50, can process 200-275 GGE a day[38]. Should the landfill's biogas be found acceptable, Cornerstone Environmental Group can be contacted for a free Bio-CNG 50 feasibility study. Nonetheless, Portage County will incur minor expenses in the form of staff time, testing the site for nitrogen, and site visits.

According to Cornerstone Environmental Group, LLC, which installed the Bio-CNG system in Dane County, Bio-CNG 50 is the smallest system available and produces 200-

[38] Cornerstone designed and builds its Bio-CNG conditioning system in concert with Unison Solutions of Dubuque, IA, which has a joint patent with Cornerstone on the synthesis of components to create a Bio-CNG conditioning system.

275 GGE/day. This type of system costs approximately $778,000 (including $690,000 for the equipment and $88,000 in services). See economic pro forma from Cornerstone Environmental Group (Appendix E). Note that this estimate assumes that the biogenic methane formed at the closed Portage County Sanitary Landfill contains less than five percent Nitrogen, which would need to be confirmed by the Solid Waste Department through minor testing. Currently, Cornerstone Environmental Group is the only vendor selling systems of this size. Dane County, which currently has a system in operation, estimated that they spend about $1.50/GGE to cover all their costs, including operating and financing, when the operation is at full production (see Table 6 below). That assumes a federal subsidy of $0.50/GGE that expires 12/31/11 that may or may not be extended.

Table 6: Dane County Bio-CNG 50 Station Costs

Cost to Operate and Maintain Bio-CNG and Fueling Station	$0.99	per GGE.
Cost to Finance	$1.16	per GGE (includes, finance charge, cap X, and services). 10 year finance period.
Subtotal	$2.15	per GGE (during the finance period).
Federal Excise Tax	$0.18	per GGE.
State Road/Excise Tax	$ -	per GGE. Most states exempt this fuel from tax.
Cost to Purchase Raw Biogas	$ -	per GGE.
Value of RIN's	$ (0.32)	per GGE (depends on system size & ownership model).
Total	**$ 2.00**	**per GGE (during the finance period).**
A Federal Subsidy of 50¢/GGE is available until 12/31/11, and might be extended.	$ (0.50)	http://www.ngvc.org/pdfs/FederalFuelTaxCredit01-11.pdf
Total with federal subsidy	**$ 1.50**	**per GGE (during the finance period).**
Source: John Welsh, Recycling Manager, Dane County		

In addition to the other expenses listed in the economic pro forma, it is necessary for Portage County to extend 3-Phase electricity capacity to the closed Portage County Sanitary Landfill, at an estimated expense of approximately $70,000, to run the Bio-CNG50 system's compressor[25,34]. The cost of doing so, when added with the other operational and infrastructure based expenses, yields a price of $2.44 per GGE with no grant awarded, $2.00 per GGE with a $255,000 grant, and $1.69 per GGE with a grant award of $435,000.

In addition to 3-Phase electricity capacity, the County may elect to purchase a trailer to transport the Bio-CNG made at the closed Portage County Sanitary Landfill to the Highway Department, the largest potential user of natural gas in the County. The price of purchasing this trailer and its associated CNG tanks is estimated to be $210,000[11,25,39]. When added with the other mentioned costs, the total cost of the project yields a price

[39] The flatbed trailer costs $30,000 and the two sets of three CNG tanks cost $90,000 per set.

of $2.81 per GGE with no grant awarded, $2.50 per GGE with a $175,000 grant, and $2.00 per GGE with a grant award of $465,000. See Appendix E for economic pro forma covering these scenarios. The trailer would enable refueling with Bio-CNG away from the landfill, easing concerns about numerous heavy trucks on County Highway QQ.

The 2010 fuel cost for County-owned licensed/registered vehicles was $489,230. Assuming that Portage County could produce Bio-CNG for a total cost of $2.50 per GGE and the cost of diesel was $3.72, the fuel savings could be $1.22 per GGE or about $96,630 a year on the potential 79,205 gallons produced annually in the first five to seven years by a Bio-CNG system in operation at the Portage County Sanitary Landfill.

As noted previously, a Bio-CNG or CNG project's infrastructure expenses could be partially paid for by State and Federal government grants, reducing the per GGE price of those projects[40]. For example, the Wisconsin State Energy Office had a Request for Applications in October 2011 for the Wisconsin CNG Infrastructure Challenge. The maximum award amount was $500,000[41]. The U.S. Department of Energy's Clean Cities Program, accessible through membership in Wisconsin Clean Cities, also competitively awards millions of dollars of funding each year, a portion of which is for CNG projects. In Wisconsin, Bayfield County, Dane County, Milwaukee County, the City of Milwaukee, and the Milwaukee Metropolitan Sewage District have received funding for CNG projects in partnership with Wisconsin Clean Cities[42]. At current fuel prices, a Bio-CNG project at the Portage County Sanitary Landfill without a grant to cover some of the initial infrastructure expenses may not compete economically with pipeline CNG retail prices.

Should a Bio-CNG project not be pursued at the landfill, yet interest in using the biogas produced there still exists, Portage County may consider using the biogas to generate electricity[43]. This is relatively easily done; however, a project like this would present a unique set of expenses and difficulties[44]. Lastly, the expense of purifying biogas to natural gas pipeline standards would likely offset the potential savings[11].

Natural Gas Benefits Analysis

There are two options for the County should it decide to install a Bio-CNG/CNG filling station. The County could decide to not make the station "public". Instead, the fuel would be used by companies and entities that have a fuel contract with the County.

[40] Moreover, government entities often desire to expand CNG infrastructure and will assist other entities considering CNG projects. Lastly, the United States Federal Government provides more support for Bio-CNG projects than fossil fuel CNG projects because Bio-CNG is renewable.

[41] Wisconsin State Energy Office: Wisconsin CNG Infrastructure Challenge (http://energyindependence.wi.gov/docview.asp?docid=22214&locid=160)

[42] Wisconsin Clean Cities – Southeast Area: What is WCTP? (http://www.wicleancities.org/wct_program.php)

[43] Dane County expends biogas in large internal combustion engines to create electricity and will soon use the resulting byproduct heat to warm a few facilities. The City of Stevens Point Waste Treatment Plant is preparing to generate electricity in this way from biogas produced at the plant (Mike DiMaggio and Mike Michels).

[44] Unprocessed biogas with a methane concentration ≥ 50%, like that found at the Portage County Sanitary Landfill, can be used to generate electricity. The extension of 3-phase capacity is more expensive when electricity is planned to be sold to the grid, as opposed to purchased from it. There are no potential County electricity users in the landfill's vicinity (Mike DiMaggio, John Gardner, and Jeff Lodzinski).

Such an arrangement would involve drivers from the contracted entities receiving a onetime lesson in how to properly and safely use a Bio-CNG/CNG station and fill a Bio-CNG/CNG vehicle. With the filling station not being "public", the County would not need to have an attendant present at the filling station. Instead, drivers from the contracted entities would simply be issued fuel cards that could be swiped at the filling station at the time of fuel purchase. There are different types of refueling systems at CNG filling stations. One type is a fast-fill refueling system, which can fill a 60 gallon CNG tank in eight to nine minutes. This rate is comparable to the speed at which a diesel refueling system operates[11]. The hardware of the Bio-CNG 50 conditioning system featured in the economic pro forma created by Cornerstone Environmental Group has a life expectancy of about 20 years; this estimate is approximately 10 years greater than the expected duration of a Bio-CNG project at the Portage County Sanitary Landfill. This presents the possibility of using the hardware in another potential Portage County CNG/Bio-CNG or selling the hardware to another user[25].

The installation of a natural gas fueling station in Portage County would present geographical and market based advantages. In essence, the installed natural gas fueling station would be the only in Portage County and one of just a few in Central Wisconsin[16]. Despite the fact that many of the other landfills in the region are too small for Bio-CNG production, there exist other options for Bio-CNG production in Central Wisconsin, and a CNG fueling station is theoretically possible anywhere there is a natural gas pipeline. As a result, a CNG or Bio-CNG fueling station built by Portage County would likely be joined in the future by other new CNG and Bio-CNG fueling stations throughout Central Wisconsin. Nonetheless, selling an in demand fuel with scarce availability in Central Wisconsin would likely make it possible for Portage County to find non-County users to purchase CNG or Bio-CNG fuel[25,34].

Regional shipping company Paper Transport Inc., from Green Bay, Wisconsin, operates a fleet of 18 CNG trucks. The trucks are currently limited in where they can travel by the availability of CNG fueling stations. As it has looked as far as the Madison area for CNG, and because it already picks up goods at the Portage County Material Recovery Facility, Paper Transport represents one of many private companies that may be interested in purchasing CNG at a Portage County owned natural gas fueling station[34]. Often, such companies will pay a price premium on CNG fuel to obtain it in the specific location they need it most[11,25]. The opportunity to sell pipeline CNG or landfill Bio-CNG to non-County users could give Portage County extra time to acquire vehicles able to run on CNG by securing other users of the fuel for the meantime.

These companies will also often enter collaborations with other businesses to create CNG fueling stations in regions of perceived need; Paper Transport and Inegrys Transportation Fuels opened a CNG fueling station in the Green Bay area together and Chesapeake Energy, which is currently converting its 4,200 vehicle fleet to CNG, joined OnCue Marketing L.L.C. and Love's Travel Stops & Country Stores to open 14 public CNG fueling stations in Oklahoma. An opportunity may exist for Portage County to open a natural gas fueling station together with another entity in the future, helping to defray expenses. Lastly, opening a fueling station with another entity would make natural gas more accessible to other potential users in Portage County, allowing the County to succeed as an environmental steward and leader.

In some cases governments can encourage private sector institutions to use CNG via contract renewals that stipulate that whomever the contract is awarded to must use, to some degree, CNG during operations[45].

APPLICABILITY OF ALTERNATIVE FUELS TO PORTAGE COUNTY DEPARTMENTS

Highway Department

The Highway Department operates 12 pickup trucks and 47 heavy duty patrol trucks; more than half of the Department's vehicles are heavy duty trucks. Of these, 50 operate on diesel fuel and 9 operate on gasoline. They also have many pieces of heavy equipment such as dozers, backhoes, scrapers, and tractors, which operate almost exclusively on diesel fuel. The Highway Department is the largest consumer of fuel in Portage County government, consuming over 16,000 gallons of gasoline and over 128,000 gallons of diesel fuel in 2010.

The Highway Department could purchase B20 or B99 biodiesel from SunPower Biodiesel or another biodiesel production facility. B20 does not require vehicle conversion in most cases, and the Department could use existing vehicles. The Highway Department has 10,000 gallons tanks and typically orders fuel when they are around 2,000 to 3,000 gallons left, so 6,500 gallon tanker load minimum purchases may be feasible. County Patrol Superintendent Gliszinski will be contacting the Wisconsin State Government to explore what a hypothetical competitive bid for biodiesel purchase for Portage County might look like. This would allow the Highway Department to better understand what the actual price per gallon could be, should the Department decide to seriously consider utilizing biodiesel.

If the CNG facility proves feasible, the Highway Department could begin converting some of its larger, less efficient vehicles to CNG once the station is built. There are 47 vehicles in the Highway Department alone that get under seven mpg. In addition, the Highway Department could begin purchasing CNG vehicles during regular replacement cycles; the Department currently phases out two patrol trucks annually[46]. If truck traffic to the landfill will greatly increase, the County will need to have discussions with local community members to alleviate concerns.

Parks Department

The diesel fuel used at the Parks Department is used in four trucks as well as equipment such as lawn mowers, snow groomers, and tractors. The Department could begin using B20 or B99. Just two trucks and three mowers out of the 20 vehicles and many pieces of equipment in the Parks Department inventory can run on biodiesel. Because not all of the Department's diesel engines can run on biodiesel, a new fuel tank to exclusively store biodiesel for the two trucks and three mowers would need to be constructed

[45] Phoenix, Arizona required the company awarded the contract for collecting the entire city's garbage to use CNG (Mike Michels). Portage County contracts with a company for waste management services and could explore in the future
whether the contract could require using CNG to some degree.

[46] Portage County Patrol Superintendent Kenneth Gliszinski

alongside the Park Department's diesel fuel tank. Moreover, because the four diesel trucks at the Parks Department date to the mid 1990s, there is concern whether biodiesel use would potentially void the truck's warranties. Rather than pursuing the new biodiesel tank at this time, the Parks Department is interested in running the Department's mowers on Compressed Natural Gas (CNG). Nonetheless, as vehicle replacement cycles occur and new vehicles are purchased, and when all the diesel engines used by the Parks Department are able to run on biodiesel, the Parks Department would consider the future purchase of biodiesel when and where practical.

One issue with using B20 at the Parks Department is they have a 500 gallon tank and some suppliers require purchases of at least 6,500 gallons at a time. If purchasing was coordinated between the Parks and Highway Departments, they could purchase a tanker load and it could be split between storage sites at potentially a little more expensive delivery cost. Please refer to the 'Highway Department' section above for more information on biodiesel analysis and opportunities.

A more involved option for the Parks Department diesel trucks is for Portage County to make its own biodiesel. The Parks Department could be a prime candidate to initiate a small scale pilot project such as this because they do not use much diesel fuel (2,445 gallons in 2010). If they blended the biodiesel in their diesel tank with #2 at a 20 percent blend, they could offset almost 500 gallons of diesel fuel, or almost $1,500 dollars in fuel costs. If they ran higher percentages of biodiesel the cost savings could be greater. If a pilot project were pursued, the Department would need to determine the impact on staffing and fuel use to collect the waste vegetable oil.

The Parks Department could also use CNG vehicles if a station is built. When regular vehicle replacement cycles arrive, the Parks Department could convert to CNG vehicles and fill at the station with no cost to Portage County. As previously mentioned, the Parks Department has expressed interest in powering mowers with CNG. Converting existing gasoline or diesel mowers to run on CNG or purchasing a mower with an OEM equipped CNG power plant are two options[47]. Based on market's number of new mowers with OEM equipped propane power plants since 2008, it is likely the number of CNG powered mowers from OEM's will increase in the near future[48]. Any Parks Department mowers using CNG would additionally be able to take advantage of any Bio-CNG produced in Portage County, which is discussed below. Lastly, as mentioned, propane, which is easier to handle than CNG, could be used as a fuel in mowers and, when purchased in bulk, offers possible cost savings.

Sheriff's Department

As recently as the 1990s, the Sheriff's Department experimented with powering Department vehicles on liquefied propane, but found insufficient economic savings and has since abandoned the project[49]. Currently, the Sheriff's Department has two

[47] Dixie Chopper: Xcaliber – Eco-Eagle (http://www.dixiechopper.com/mowers/view-mowers/xcaliber-eco-eagle)

[48] Inside INdiana Business: Dixie Chopper Receives Award From Clean Cities Alliance (https://www.insideindianabusiness.com/newsitem.asp?ID=27860)

[49] Portage County Sheriff John Charewicz

diesel vehicles. These vehicles are rarely used. B5 could be considered for use with these vehicles. The Sheriff's Department could also convert the fleet to CNG vehicles over time. As it can be more cost effective to use CNG for larger vehicles, the County would need to prioritize which vehicles should be converted to CNG first. In addition, the impact of going to the landfill to refuel on the Sheriff's Department's operations would need to be evaluated.

Fleet Vehicles
Of the fleet vehicles, 11 use diesel fuel. Of those 11, seven are ambulances and three are buses. Biodiesel could potentially be considered for use with these vehicles. In general, Departments with emergency vehicles prefer the use of a lower biodiesel blend such as B5 to eliminate the risk of uncertainty.

The conversion of some or all of the Fleet to Bio-CNG vehicles could be an option that would save County dollars. If the Bio-CNG project was implemented, the ADRC buses would be great candidates to convert to CNG and use the fuel from the Bio-CNG fueling station at no cost to Portage County. This is because Bio-CNG buses typically only cost $8,000 more (ADRC pays $1,600) than diesel buses compared to hybrid diesel-electric which cost $50,000 more (ADRC pays $10,000).

FLEET ANALYSIS AND VEHICLE PURCHASING

The Technical Work Group and Energy Team discussed fleet analysis, specifically the need for the County and/or each Department to: 1) Determine the adequate number of vehicles per Department (and downsize, if appropriate) and, 2) Identify and use the "Right Vehicle for the Right Use" in as many cases as possible. Additional assessment needs to be conducted with each Department to right-size the fleet.

Right-sizing is defined as "an approach in purchasing the most efficient fleet to accomplish the tasks required. It takes into consideration such factors as engine size, passenger and carrying capacity, weight and maintenance and fuel costs. The practice of right-sizing allows for savings on capital and operating costs as well as reducing vehicle emissions[50]." The process of right-sizing during a vehicle purchase can result from what the Fraser Basin Council, a Canadian non-profit organization that sponsors Canada's sole nationwide program designed to assist vehicle fleets in lowering their respective environmental impacts, calls a Fuel Efficient Vehicle Purchasing Strategy. Here, right-sizing narrows the choice to vehicles with the most impressive fuel economy and lowest greenhouse gas emissions after all candidate vehicles have been screened for both economical, as well as logistical, practicality and the capability to complete the activities the vehicle is tasked with. Additionally, economic practicality is approached holistically by considering initial purchase price, repair and operational expenses, lifespan and reliability, warranties, depreciation, and anticipated resale value[51].

[50] Pierce County Fuel Reduction Policy (http://www.mrsc.org/policyprocedures/p5frp.pdf)
[51] (Fraser Basin Council; BC Climate Action Toolkit)
(http://www.toolkit.bc.ca/tool/fuel-efficient-vehicle-purchasing-strategy)

Some Counties have implemented purchasing polices that require departments to consider right-sizing in their purchasing decisions. For example, in the Pierce County, WA Fuel Reduction Policy, departments are directed to engage in right-sizing (see a copy of the policy in Appendix F).

An aspect of right-sizing is selecting the most efficient vehicle for the intended use. The Technical Team discussed the types of vehicles that are purchased in their Departments, including hybrids. Portage County currently has no hybrid vehicles in its fleet. Hybrid vehicles are vehicles that use more than one power source to move the vehicle and therefore consume less petroleum than their respective non-hybrid versions. (For availability of hybrid and other alternative vehicles, consult the U.S. Department of Energy (DOE) Clean Cities 2011 Vehicle Buyers' Guide, or the Model Year 2012: Alternative Fuel and Advanced Vehicles guide on the Clean Cities website.)

The initial purchase price of a hybrid vehicle can be more expensive than other types of vehicles. However, additional factors must be taken into consideration, including the reduced cost of fuel and the reduction in emissions. There are several tools available to help County staff determine when a hybrid might be worthwhile to purchase, including the following:

• The U.S. DOE vehicle search tools allow you to search and compare light duty and heavy duty hybrid or alternative fuel vehicles by manufacturer, fuel type, and/or application (http://www.afdc.energy.gov/afdc/vehicles/index.html).

• The U.S. DOE has a Vehicle Cost Calculator which can be used to calculate total cost of ownership and emissions for makes and models of most vehicles, including alternative fuel and advanced technology vehicles. http://www.afdc.energy.gov/afdc/calc/. This tool allows the user to make adjustments based on the type of driving the user does.

• University of Minnesota Extension has developed an Alternative Vehicle Decision Tool to assess whether to buy a hybrid or conventional vehicle: http://www.extension.umn.edu/distribution/naturalresources/M1269.html. This tool takes into account the cost of fuel and battery service.

A hybrid may not be appropriate in every scenario, and these tools can help the County determine the best vehicles for the best use.

Highway Department

The Highway Department has 47 heavy duty patrol trucks. The role of these trucks is truly heavy duty work, hauling construction materials and tools for vehicle servicing, trailering large equipment, and inspecting partially unplowed roads during the winter. There is limited opportunity to downsize these vehicles. For the most part, all the pickup trucks are used every day. During the winter months, all patrol trucks are assigned to specific sections of the County for plowing.

If there is opportunity for employees to use pickup trucks instead of patrol trucks, this could realize fuel savings. Ford F150s get about 15.5 miles per gallon, F250s get about 11 miles per gallon, F350s get about seven miles per gallon, and patrol trucks get about five miles per gallon.

Another option that will be available soon is Ford F Series Super Duty diesel-electric and gas-electric hybrids. In early 2013, the F550 will be available in a hybrid version and soon thereafter the F450 and F350 will be available. The fuel economy of these vehicles is expected to be higher than a conventional diesel or gasoline engine, but the purchase price will most likely be higher as well (possibly $10,000 more). The Highway Department keeps their pickup trucks for 10-15 years. Most of their pickup trucks travel 10,000 miles or more per year. These two factors (miles per year and truck replacement cycle) are essential factors when calculating whether or not the higher purchase price of a hybrid will be paid back through fuel savings. In the Highway Department's case, the savings WILL pay back the higher purchase price. Though it is not guaranteed, the hybrid truck, when auctioned, should have a higher re-sale value than the regular, gasoline truck. This also helps pay back the higher purchase price.

The Highway Commissioner uses a 2006 4WD GMC Yukon for taking people around to job and disaster sites and to inspect roads in winter. In 2010, the Commissioner's vehicle traveled 12,361 miles on 784.7 gallons of gasoline, achieving 15.75 miles per gallon, which is slightly above the vehicle's 15 miles per gallon EPA combined mileage rating[52]. That quantity of fuel expended at the current $3.38 per gallon of gasoline price creates a $2,653 annual fuel cost. A possible solution to save fuel and money is to purchase a vehicle that is not a GMC Yukon but has a relatively similar gross vehicle weight rating (GVWR), towing capacity, ground clearance, passenger capacity, and EPA trunk or cargo volume. For example, the 2012 AWD Ford Explorer SUV tows a 5,000 pound payload, has 7.6 inches of ground clearance, holds seven adult passengers, and contains 80.7 cubic feet of EPA cargo volume[53]. Nonetheless, the Ford Explorer has a 19 miles per gallon EPA combined mileage rating[54]. Fulfilling the Commissioner's 2010 duty, the Ford Explorer would have expended 134.1 fewer gallons of gasoline versus the GMC Yukon. At the current $3.38 per gallon price of gasoline, this reduction repeated translates into savings of $452.92 per year[2].

If passenger seating is of sole concern, a minivan could provide further fuel savings. For example, the Kia Sedona seats seven adult passengers and has a 21 miles per gallon EPA combined mileage rating[54]. Having fulfilled the Commissioner's 2010 duty, the Kia Sedona would have expended 196 fewer gallons of gasoline compared to the GMC Yukon. At the current $3.38 per gallon price of gasoline, this reduction repeated translates into savings of $662.48 per year[2]. The Ford Explorer ($30,374) and the Kia Sedona ($24,800) are substantially less expensive than a replacement 4WD GMC Yukon ($37,497)[53].

[52] HWY052R 5/16/2011: Highway Department Fuel Transactions By Unit, 01/01 – 12/31/2010

[53] Kelley Blue Book: New Cars, Car Prices (http://www.kbb.com/new-cars/)

[54] U.S. Department of Energy & U.S. Environmental Protection Agency: Find and Compare Cars (http://www.fueleconomy.gov/feg/findacar.shtml)

Lastly, with a 6,150 pound GVWR, a 3,500 pound towing capacity, an eight inch ground clearance, seating for five adults, and 94.1 cubic feet of EPA cargo volume, the 2012 Toyota Highlander Hybrid may be a viable option. The 28 miles per gallon EPA combined mileage rating of the Toyota Highlander Hybrid would have fulfilled the Commissioner's 2010 duty expending 343.2 fewer gallons of gasoline versus the GMC Yukon[54]. At the current $3.38 per gallon price of gasoline, this reduction repeated translates into savings of $1,660.02 per year. At 12,000 miles annually and $3.38 per gallon of gasoline, the Toyota Highlander Hybrid ($36,710) would need the following number of years to cover the purchase price differential between itself and the other options presented based on fuel expenditures alone: 24.7 years versus the Kia Sedona, 9.3 years versus the Ford Explorer, and 0.0 years versus the 2012 GMC Yukon[2,53]. At $4.00 per gallon of gasoline, the number of years drops to 20.9 versus the Kia Sedona and 7.9 versus the Ford Explorer.

Parks Department

The Parks Department uses 19 Ford trucks of different sizes, of which two are diesel. They also use a large dump truck, which is diesel as well. Of the Parks Department's 20 vehicles, 16, including the large dump truck, are kept at Jordan Park, two are kept at Lake Emily Park, and one each is kept at Collins Park and DuBay Park. The trucks are used for plowing snow, hauling tools, equipment, waste, and other large objects. The large trucks are used for trailering larger equipment such as tractors. This requires adequate torque and power so downsizing all of the large trucks is not an option. Nonetheless, downsizing some of the large trucks may be an option. The annual fuel consumption is varied for the trucks, from 200 gallons up to 1,200 gallons per vehicle in 2010. The fuel consumption is understandably high for some trucks because they are traveling to and from parks all around Portage County.

Ford Rangers (4-cylinder and 6-cylinder versions) have been used over the past 10 years within the Parks Department. The Parks Director indicated there could be additional opportunities to replace large trucks with smaller trucks to increase overall fuel economy. Where applicable, the Parks Department trucks could be replaced with smaller or newer trucks to save fuel.

Purchasing hybrid trucks in the future is an option that may increase fuel economy in Parks Department trucks. Ford does not currently make a gas-electric hybrid version of the Ranger or F-150, but plans to release hybrid versions of the Ford F Series Heavy Duty trucks (F350, F450, F550) in early 2013. Chevrolet does currently make hybrid versions of their Silverado trucks. While a Chevrolet Silverado hybrid would improve EPA combined mileage ratings by approximately five miles per gallon over some of the trucks currently used by the Parks Department, the over $15,000 initial purchase price difference between a 2012 non-hybrid F-150 (a possible replacement for certain trucks currently in use) keeps the Silverado hybrid from ever being cost effective[53,54].

As mentioned, the 2012 Ford F-150 is a possible replacement for current Parks Department trucks, and, with a 19 miles per gallon EPA combined mileage rating, has higher fuel economy than certain F-150's currently used by the Department. Assuming 12,000 miles annually and a $3.38 per gallon of gasoline price, the 2012 Ford F-150 would save $400.19-$762.53 in fuel costs annually compared to the Department's 1999

F-150, depending on the engine size in the 1999 F-150. In essence, simply replacing one F-150 with another has the potential to save fuel. Another alternative is to purchase smaller pickup trucks when the Department's older F-150's expire. Ford no longer produces the Ranger, but there are mid-size pickup truck alternatives that offer better fuel economy than the 2012 F-150. However, the 2012 Ford F-150 has impressive fuel economy, and mid-size trucks have just slightly better fuel economy in comparison. For example, the Toyota Tacoma, equipped with a 2.7 L engine, provides a 21 miles per gallon EPA combined mileage rating[54]. Consequently, the Toyota Tacoma saves an additional $203.14 only in fuel costs annually over the 2012 F-150, assuming 12,000 miles annually and a $3.38 per gallon of gasoline price[2]. The capabilities of the Toyota Tacoma are less than the F-150, which may preclude it from serving with the Parks Department. The Toyota Tacoma ($20,653) is significantly less expensive than the 2012 F-150 ($23,985)[53].

Sheriff's Department

The Sheriff's Department has a total of 46 vehicles. About 16 of these 46 vehicles are squad cars and are used for patrolling. Of the 16 squad cars, thirteen are Ford Crown Victorias and three are Flex-Fuel Chevrolet Tahoes. The Chevrolet Tahoes were purchased in 2010. Any given squad car consumes a large amount of fuel (500 – 2,000 gallons per vehicle per year) and will typically be replaced after two or three years of service. The other 30 vehicles used by the Sheriff's Department are a mix of sedans, SUVs, and trucks. Some of these other vehicles are used by undercover drug units, while some are used for administrator travel and for other miscellaneous purposes.

All 30 other vehicles (besides squad cars) used by the Sheriff's Department could be analyzed for opportunities to be downsized. In the past, the Sheriff's Department has purchased these vehicles because they have received good prices on them. They have a Pontiac Bonneville, Pontiac Grand Prix, Dodge Caravan, Ford Taurus, Chevrolet Suburban, and two Chevrolet Trailblazers that are not used for patrolling. The average fuel economy between these vehicles is 15.8 miles per gallon. The average distance traveled in these vehicles is 8,700 miles per year. There are smaller or hybrid vehicles available that would increase fuel economy and they could be considered on a vehicle by vehicle basis when the replacement cycle comes, especially if the Sheriff's Department can get a good price on them. If the Sheriff's Department was able to raise the average miles per gallon to 20 or more, there would be a savings of $3,000 to $5,000 depending on which vehicles they are replacing and what vehicles they are replacing them with.

The Crown Victoria gets about 19 miles per gallon compared to the 17 miles per gallon the Chevrolet Tahoe gets[54]. Currently, there is a 2013 Evaluation Committee discussing the type of pursuit vehicles that will be purchased. Fuel economy is used as one of the criteria for evaluation and it is given considerable weight.

Fleet Vehicles

The Facilities Department trucks are used to plow snow, haul tools, supplies, and other large objects to various locations, so downsizing is not necessarily an option. Purchasing gas-electric hybrid trucks in the future is an option that may increase fuel economy by about five miles per gallon[54]. The specs, including horsepower and torque, of new

hybrid version trucks are similar to regular, gasoline trucks of the same size. Plowing snow and trailering should be non-problematic with hybrid versions. When purchased new, hybrids can be $10,000 more expensive than regular gasoline trucks depending on features[53]. The Facilities trucks do not typically use a large amount of fuel (200 to 500 gallons per year per vehicle) so the question is, will the increased fuel efficiency pay for the increased price of the vehicle? The Facilities Department trucks are kept for about 10 years but the lack of miles per year does not provide for pay back of the additional purchase price of a hybrid. If fuel prices continue to increase, the pay back would look better. When auctioned, the hybrid version truck should have a higher resale value than a regular gasoline truck, but that is not guaranteed. Hybrid trucks could be considered for Facilities Department trucks when the vehicle replacement cycle arrives.

The Library vans are used to transport miscellaneous items, including books and library equipment, to and from the different branches. They are also used for traveling to meetings and general employee transportation. These vehicles are purchased by the library and fuel is paid for by the library budget. One of the vans could be downsized to a station wagon or hatchback on the next vehicle replacement cycle. The greatest fuel savings would be achieved by purchasing a hybrid vehicle when a van is replaced. The ideal hybrid hatchback available for this purpose is the Toyota Prius. With an EPA combined mileage rating 33 miles per gallon better than the Library vans, the 2012 Toyota Prius has the potential to save around $1,500 in fuel expenses annually assuming each vehicle is driven 12,000 miles annually and a gallon of gasoline costs $3.38. Costing approximately $10,000 less than the 2012 Toyota Prius is the 2012 Hyundai Accent GS, a hatchback/station wagon with a more conventional setup of a gasoline power plant only[53]. Still assuming 12,000 miles annually and gasoline priced at $3.38 per gallon, the Hyundai Accent GS, with its 33 miles per gallon EPA combined mileage rating, has the potential to save a little over $1,000 annually on fuel costs versus the current Library vans[2,54].

The ADRC buses (4) are used to transport elderly who cannot drive to the ADRC in the morning and back to their homes in the afternoon. Each bus uses a large quantity of fuel (900 to 1,500 gallons per year). The buses are purchased by the State Department of Transportation (DOT) 85.21 grant program on a ten year rotation, so every three years a new bus purchased. The ADRC budget pays 20 percent of the cost of the bus. The fuel is paid for by the ADRC budget. Conversation with the State DOT about purchasing hybrid buses has been initiated. Converting the fleet to diesel-electric hybrids could prove to produce significant savings in fuel costs for Portage County.

The Health Care Center van is a specialized handicap accessible van. The van does not use much fuel (100 to 200 gallons per year) so purchasing a gas-electric hybrid would probably not validate the greater purchase price of the hybrid vehicle.

The Land Conservation Division truck is used for site inspections and field visits. In 2010 it consumed 350 gallons of fuel. A gas-electric hybrid could be purchased to increase the fuel economy of this vehicle, but the question remains, will the increased fuel economy pay for the increased purchase price over time?

The fuel used by ambulances in the City of Stevens Point and other municipalities, such as the Villages of Amherst and Whiting, is paid for by Portage County. There is a very large difference in fuel used by each ambulance. Some use 400 gallons per year and some use 3,500 gallons per year. Additional battery installations (discussed below in the 'Emergency Vehicles' section) have been done in ambulances by others across the United States, but their effectiveness is debatable since the cab of the vehicle needs to be heated or cooled to a proper temperature at all times. As such, the vehicle cannot be turned off during emergency calls, just at limited and specific times. The elimination of "frequent flier" calls, or those trips to people who call for ambulatory help at times when not necessarily needed, would save on trips. The Health and Human Services and Emergency Management Departments are working to identify those "frequent fliers" and educate them about proper emergency call situations, with hopes of reducing ambulance trips.

Motor Pool Vehicles

There are four mid/full-size sedans in the County's Motor Pool: two examples of the 2002 Ford Taurus, one 1997 Ford Taurus, and one 1998 Chevrolet Lumina. A possible solution to save fuel and money is to purchase mid-size sedans that have better fuel economy, but relatively similar performance, passenger room dimensions, and cargo space, compared to the Ford Taurus and Chevrolet Lumina.

For example, the 2012 Toyota Camry has similar dimensions (head, leg, and shoulder room all within +/- <1.5 inches), volume (just -2 cubic feet EPA passenger), and performance (+23 horsepower/-15 pound-foot torque) to the 2002 Ford Taurus, but significantly better fuel economy (28 miles per gallon EPA combined mileage rating versus 21)[53,54]. Assuming 12,000 miles annually and a $3.38 per gallon of gasoline price, the Toyota Camry replacing the Ford Taurus would annually save $483 in fuel costs[2].

Replacing the four existing sedans with diesel powered sedans would provide further fuel savings. For example, although the 2012 Volkswagen Jetta TDI has slightly smaller dimensions than the 2002 Ford Taurus (head, leg, and shoulder room all within - ≤3 inches and -12.3 cubic feet EPA passenger), it excels in a fuel economy comparison (34 miles per gallon EPA combined mileage rating versus 21)[53,54]. Assuming 12,000 miles annually and a $3.38/$3.72 per gallon of gasoline/diesel respectively price, the Volkswagen Jetta replacing the Ford Taurus would annually save $618.51 in fuel costs[2].

Furthermore, a hybrid sedan may offer even greater fuel savings. For example, the 2012 Toyota Prius has similar dimensions to the Ford Taurus (head, leg, and shoulder room all within +/- ≤3.5 inches and -11.0 cubic feet EPA passenger), but offers improved fuel economy (50 miles per gallon EPA combined mileage rating versus 21)[53,54]. Assuming 12,000 miles annually and a $3.38 per gallon of gasoline price, the Toyota Prius replacing the Ford Taurus would annually save $1,120.47 in fuel costs[2].

Nonetheless, the Toyota Prius ($24,760) and the Volkswagen Jetta ($23,356) are more costly to purchase than the Toyota Camry ($21,154)[53]. Continuing with 12,000 miles annually and a $3.38/$3.72 per gallon of gasoline/diesel respectively price, the Toyota Prius and Volkswagen Jetta need 5.7 and 16.3 years respectively to cover the initial purchase cost difference versus the Toyota Camry through fuel savings alone[2].

Assuming 12,000 miles annually and a $4.00 per gallon of gasoline/diesel price, the Toyota Prius and Volkswagen Jetta now need just 4.8 and 7.3 years respectively.

DRIVER BEHAVIOR

A large part of fuel economy is attributed to driver behavior. According to the Department of Energy, aggressive driving can lower gas mileage by 33 percent at highway speeds and by five percent around town. Therefore, some private and public fleets have incorporated educational programs and driver policies to address driver behavior.

A popular model that has been adopted by counties, municipalities, businesses, and individuals is EcoDriving: www.EcoDrivingUSA.com. It's estimated that EcoDriving can reduce fuel use by an average of 15 percent. The city of Milwaukee adopted a first-of-its-kind EcoDriving training program in its Department of Public Works. The Department estimated the following savings: "The amount of gallons of saved fuel can range from 4 to 20 percent and [EcoDriving] can be expected to save approximately $150 per vehicle per year."A 15 percent fuel reduction for Portage County would be over 35,000 gallons/year. Estimating a cost savings of $150/vehicle per year for 155 vehicles would be $23,250. The training offered by the City of Milwaukee consisted of classroom instruction, behind-the-wheel learning, and distribution of hardcopy manuals for reference on EcoDriving techniques. This style of instruction is applicable to Portage County, where many employees at the Highway and Parks Departments do not have regular computer access, making computer based training difficult.

Idling is one aspect of EcoDriving. Some counties and municipalities have policies that address idling and encourage EcoDriving behaviors across all Departments. Employees could be instructed not to idle more than 3-5 minutes. Counties that implement a no-idling policy for county vehicles often include exceptions for public safety vehicles. Lee County, Florida has an extensive idling policy (see Appendix G).

Portage County does not currently have any written idling policies, though some Departments have discussed the issue at staff meetings and made efforts to reduce it.

Emergency Vehicles (Sheriff's Department and EMS Vehicles within the Fleet)
Some emergency responders need to idle at emergency sites to power the computers or lights in their vehicles as part of scene protection. The EMS vehicles, primarily the ambulances, may idle during calls and/or event assistance in which they are on standby, such as a sports event, in case of a medical emergency. They must idle at times in order to have a conditioned space for patient care and to properly store medicine.

The Sheriff's Department currently has technology that allows the Department to estimate how long their squad cars spend idling. When a squad car is receiving maintenance, the vehicle can be plugged into a computer system that formulates an idling estimate. While the Sheriff's Department currently has no formal policy on idling, such information is discussed in staff meetings and could help inform the Department on what potential cost savings are possible through the implementation of a formal

idling policy or the installation in squad cars of high capacity, deep cycle batteries, which are discussed below, designed to reduce idling time[49].

The installation in squad cars of a high capacity, deep cycle battery, paired with a solenoid, or the replacement of the original ignition battery with a high capacity, deep cycle battery (e.g. AGM [Absorbent glass mat] type battery) would reduce idling time and help to save fuel in the squad cars. An AGM type battery has been installed in supervisor's squad cars and has worked very well in the past. The objective is for one or more AGM type batteries to handle the vehicle's electrical load, with the engine shut off, for longer periods of time than are possible with a more conventional automotive battery. The use of this technology, which could be used to support a future Portage County no idling policy, can result in substantial fuel savings.

Todd Hornick, a Sheriff's Department mechanic, estimated that each idling Crown Victoria squad car expends 0.59 gallons of gasoline per hour supplying the ~50 amp/~12 volt electrical load of the vehicle. AGM type batteries come in varying sizes and one with an approximate 200 amp/hour capacity when discharged within a 20 hour interval, such as the Lifeline GPL-4DA or Rolls Surrette S12-230AGM, is capable of supplying that ~50 amp/~12 volt electrical load for two hours. Reducing fuel consumption by about 1.2 gallons per day through the negation of two hours of idling, an AGM type battery would recoup its initial and installation costs, roughly $300 and $15 respectively, in as little as approximately two months with gasoline priced at $3.38 per gallon. The same AGM type battery would still recoup its initial and installation costs in less than one year if installed in a vehicle that spends one half hour idling each day[2].

An example of using high capacity, deep cycle batteries to reduce idling in squad cars can be found in the City of Austin, Texas. The Austin Chronicle reports that the city purchased at least 567 anti-idling battery units via a contract worth about $1.82 million[55]. The City of Dallas, Texas finished a similar project by installing a high capacity, deep cycle battery unit in the trunk of the city's Dodge Charger squad cars. In Dallas, the units work by waiting for the gasoline engine to be shut off and, consequently, the ignition battery's output to drop below 12.6 volts before using two power cells to accommodate the full electrical load of the squad car for at least four hours[56]. In an interview, CEO Devin Scott of EnergyXtreme, the maker of the battery units used by Austin and Dallas, suggests that each battery unit purchased by Dallas will pay for itself through fuel savings in two year's time, even if used for just two hours a day[57]. Because each unit is usually used by Dallas for three to five hours a day, the actual payback time is shorter[58].

[55] The Austin Chronicle: "The Xtreme Solution", 12/02/2011 (http://www.austinchronicle.com/news/2011-12-02/the-xtreme-solution/)

[56] U.S. Department of Energy, Alternative Fuels & Advanced Vehicles Data Center: Dallas Police Department Strives to Reduce Idling (http://www.afdc.energy.gov/afdc/progs/ddown_exp.php/POLICE/211)

[57] EnergyXtreme: Austin To Install Anti-Idling Technology In Patrol Vehicles (http://www.energyxtreme.net/blog/2011/06/austin-to-install-anti-idling-technology-in-patrol-vehicles/)

[58] Earthgarage: Earthgarage Interviews Energy Xtreme (http://blog.earthgarage.com/2010/06/earthgarage-interviews-energy-xtreme.html)

OPTIONS FOR MOTOR POOL AND PERSONAL VEHICLES

Personal Mileage Reimbursement and Motor Pool Vehicles

Portage County has historically reimbursed personal vehicle miles at the Federal IRS standard rate. For most of 2010 the rate was $0.50 per mile. Toward the end of 2010 the rate increased to $0.51 per mile. In July, 2011 the rate increased to $0.555 per mile. The IRS uses algorithms to figure the cost per mile incurred from employees using personal vehicles. These algorithms include price of fuel, maintenance costs incurred, miles added to vehicle, and eventual vehicle replacement cost due to mileage. Nearly $166,000 dollars was paid out in 2010 in personal mileage reimbursements. If there are Motor Pool vehicles available, it is beneficial for Portage County to have employees take them instead of their personal vehicle.

Portage County is currently making it more attractive for employees to use Motor Pool vehicles instead of their personal vehicles. The price per mile to Departments for use of a Motor Pool vehicle has historically been the same as personal mileage reimbursements. In 2012 the price per mile has been reduced to $0.40 per mile. This will hopefully encourage more sustained use of the Motor Pool.

Another way for Portage County to incentivize the use of Motor Pool vehicles is to set up a standard reservation and check-out procedure for them. Currently, all employees are not uniformly instructed on how to reserve one of the Motor Pool vehicles. By making a standard calendar and incorporating it into the County computer system, Motor Pool vehicle availability information and reservations could be easily accessible. The Portage County Information Technology Department and Facilities Department were taking steps to do this in fall of 2011 and spring of 2012.

To REQUIRE employees to use Motor Pool vehicles at all times is not practical, however. There are cases where an employee may live closer to a morning destination, and it would be more efficient to use a personal vehicle instead of having to travel to the Portage County Annex, secure a Motor Pool vehicle, then travel back to the destination. Also, if all Motor Pool vehicles are reserved, it would be impossible to use one. Lastly, if you have an early morning departure and the Motor Pool vehicle key is not available to secure the day before, there is no way to obtain the key that early in the morning. Using Motor Pool vehicles can be slightly problematic, but their more full use should be encouraged and facilitated.

Alternative Forms of Transportation Policy

The County could create an Alternative Forms of Transportation Policy for staff. This policy could include allowing employees to bike to and from meetings when possible, for example between the Ruth Gilfry building and the Annex (a distance of 1.5 miles). Some employees feel that biking more than 15 minutes to and from meetings is not allowed. If there was policy that states it is acceptable, the employee would not have to use a Motor Pool vehicle or personal vehicle. This can save the County money and promote employee health. In addition, the County could consider an alternative transportation policy to inform employees about the appropriate use of public transportation.

Enterprise Car Rentals

Portage County, under an agreement between the State of Wisconsin and Enterprise Rent-a-Car, is eligible for reduced rate rentals with Enterprise Rent-a-Car.

A fuel analysis was completed by the Stevens Point Area Public School District in summer of 2011 to answer the question, "At what point (# of miles) is it more cost-effective to choose a rental car over taking a personal or Motor Pool vehicle[59]?" The study is directly applicable to Portage County because it receives the same rates from Enterprise and uses the same IRS standard mileage reimbursement rate as the Stevens Point Area Public School District. They found that for one-day trips of over 100 miles, or two-day trips of over 200 miles, renting a car would be cheaper than employees taking personal vehicles with reimbursement at $0.51 per mile or Motor Pool vehicles with charges of $0.40 per mile. Now that the IRS standard mileage reimbursement rate is $0.555 per mile it is likely the breakpoint is lower than 100 miles per day.

The Stevens Point Area Public School District found that another advantage of Enterprise rentals is they are available for one way trips. Employees planning to catch a flight in Milwaukee or Minneapolis can rent a car for a one way trip and drop it off at the airport, therefore not having to pay airport parking costs (which are reimbursed by Portage County) and saving Portage County money. When the employee returns, they are able to rent another vehicle for a one way trip back to Stevens Point.

To REQUIRE employees to rent a car all the time for trips over 100 miles is not practical. If Enterprise Rent-a-Car has a high volume of business on a certain day, there may not be any rentals available. There are no cars specifically reserved for Portage County use. There are also cases where conferences may take place on Fridays and the employee may want to "continue on for a personal weekend instead of returning directly to Stevens Point"[59].

For a summary on when to utilize Motor Pool vehicles and Enterprise rentals over personal vehicles to save Portage County money, please see Guidelines for Making a Transportation Choice (Appendix D).

Enterprise Rent-a-Car offers a reduced rate for fuel if it is pre-paid; typically $0.60 cheaper per gallon. Portage County employees could take advantage of this, instead of taking time to refuel the vehicle at a gas station where prices are higher. Typically, when calling Enterprise to reserve a vehicle, the planned number of miles for the trip will be translated into gallons consumed. The number of gallons will be charged to the rental cost at the current discounted price per gallon. If the renter uses less or more gas than planned, the money will either be added (charged) to or subtracted (refunded) from the rental cost.

[59] The Stevens Point Journal: "Schools aim to save $10,000 through car rentals", 06/27/2011 – Section A/3

SECTION 4: ISSUES AND CONCLUSIONS REGARDING TRANSPORTATION FUEL USE

The following issues and conclusions were identified as a result of the analysis detailed in the preceding plan sections.

1. Much like the County's use of natural gas and electricity related to heating, cooling, and lighting its buildings and facilities (analyzed in Phase I of the Strategic Energy Management Plan in 2011), transportation fuel use plays an important part in ongoing Portage County operations. Understanding how Portage County government consumes gasoline and diesel fuel can help to maximize efficiency in use of fiscal resources.
2. Analysis of transportation fuel use allows for a more in-depth evaluation of the nature and number of vehicles and equipment required for Portage County to perform its overall service mission for taxpayers and residents.
3. Annual expenditures on fuel and transportation are considerable, and likely to increase over time. It will take specific actions to control expenditures.
4. There is a certain level of vehicle use that is required to conduct Portage County services and duties. Understanding that level is crucial to determining specific needs for transportation.
5. The overall efficiency of County vehicle and equipment assets (and related capital items) needs to be better understood. A right-sizing assessment should include (at a minimum):
    - Minimum number of vehicles needed to perform services and duties;
    - Minimum number of miles traveled to perform services and duties;
    - Fuel efficiency of vehicles;
    - "Life Cycle Costs" for County-owned vehicles, use of personal vehicles, and use of rental vehicles;
    - Whether equipment from other Wisconsin counties, such as wood chippers, can be borrowed or rented for maintenance projects.
6. Baseline fuel use data collected for this plan should be tracked on an annual basis to allow for continual assessment of transportation policies.
7. Fuel alternatives need to be continually assessed for possible use where found to be feasible and appropriate. Some fuel alternatives such as biodiesel and Bio-CNG are significantly "cheaper" and/or better for the environment, but the implementation costs and effects on County operations are variable. These fuels should be assessed further.
8. The fleet will perform more economically and environmentally if the most fuel efficient vehicles are selected for their intended uses.
9. Driver behavior significantly impacts fuel efficiency.

These issues and conclusions form the basis for the Goals, Objectives and Actions detailed in Section 5.

SECTION 5: GOALS, OBJECTIVES AND ACTIONS

As with Portage County Strategic Energy Management Plan Phase I: Electricity and Natural Gas, Phase II Goals, Objectives and Actions are divided into three areas: Management/ Efficiency; Leadership; and Environmental Protection.

GOAL 1: OVERALL TRANSPORTATION MANAGEMENT AND EFFICIENCY. Portage County will create and incorporate into its methods of operations and accounting a system of analysis that identifies and promotes transportation-related expenditures to maximize efficient use of resources.

Objective 1.1: Portage County shall monitor transportation fuel use and costs on an annual basis.

Action a: A centralized fuel billing and tracking process shall be created and instituted for Portage County by no later than December 31, 2012. This billing and tracking process shall then be annually reviewed by the Portage County Space and Properties Committee and the Finance Committee at or prior to their June meeting.

Action b: An annual transportation fuel use report will be developed by the Portage County Facilities Director (in conjunction with the Central Wisconsin Resiliency Project – Energy Specialist, if available), for presentation to the Portage County Space and Properties Committee, at or prior to their June meeting starting in 2012.

Action c: By December 31, 2012, an assessment of current bulk fuel and commercial fuel purchase practices shall be completed and presented to the Portage County Space and Properties Committee and the Finance Committee. This assessment study shall also include recommendations for methods to improve the efficiency of fuel delivery and availability, and opportunities for cost savings. This fuel purchase assessment shall then be annually reviewed by the Portage County Space and Properties Committee at or prior to their June meeting.

Objective 1.2: Portage County shall pursue improvement of fleet management systems.

Action a: By December 31, 2012, a right-sizing assessment of the County vehicle and equipment fleet shall be completed by the Department Heads in conjunction with the Facilities Director and the Central Wisconsin Resiliency Project – Energy Specialist for presentation to the Portage County Space and Properties Committee. This assessment study shall include analysis of: general services and duties performed by Portage County Departments; number of miles traveled or other "use measures" required to accomplish the services and duties; an optimum number of vehicles and equipment required for each Portage County Department, and whether certain pieces of equipment, such as wood chippers, can be borrowed or rented from other Wisconsin counties for maintenance projects. County Department Heads shall submit information documenting efforts/policies instituted to reduce vehicle use. The assessment shall also set a quantifiable goal regarding the reduction in County fuel use. This fleet assessment shall then be annually

reviewed by the Portage County Space and Properties Committee at or prior to their June meeting.

Action b: By December 31, 2012, an assessment of current vehicle and equipment purchase practices shall be completed by the Purchasing Director and presented to the Portage County Space and Properties Committee. This assessment study shall also include recommendations for methods to improve the vehicle purchasing system to match performance requirements with possible increases in fuel economy and resale value, and reduction in maintenance costs, and any other "life cycle" considerations deemed appropriate. This purchase system assessment shall then be annually reviewed by the Portage County Space and Properties Committee at or prior to their June meeting.

Objective 1.3: Portage County shall strive to incorporate alternative fuel sources to reduce transportation related fuel costs.

Action a: An annual alternate transportation fuel report will be developed by the Portage County Facilities Director for presentation to the Portage County Space and Properties Committee, at or prior to their June meeting. The report shall detail comparisons between conventional gas and diesel fuel and reformulations or new fuel sources that may be able to reduce or replace conventional fuel use. More frequent presentations may be appropriate as innovations in alternative fuels occur. As appropriate, the Central Wisconsin Resiliency Project – Energy Specialist will assist in the preparation of this report.

Action b: Information contained in the annual alternative transportation fuel report shall be included whenever selection of preferred fuel type is being considered by the Space and Properties Committee, and justification established as to whether or not the alternative fuel(s) are selected for use.

Objective 1.4: Portage County will systematically move towards implementation of strategies and practices to improve transportation management and efficiency.

Action a: The Space and Properties Committee shall annually review and monitor progress toward implementation of Strategic Energy Management Plan goals, objectives, and actions, and recommend revisions as needed.

Action b: Initial recommendations for implementation actions are listed in Section 6 of this Strategic Energy Management Plan Phase II document. Priority shall be given to projects with rapid return on investment. The Oversight Committees and Departments listed under the "Responsibility" column within the tables shall submit input for the evaluation and prioritization of recommendations to the Portage County Space and Properties Committee by December 31, 2012. Further input will be collected as needed on an on-going basis.

Action c: A funding strategy for transportation fuel management, efficiency and alternative fuel recommendations shall be proposed by December 31, 2012. The

strategy for funding will include identifying a process to pursue grants and incentives.

Action d: Portage County Board shall adopt transportation "principles, practices, and procedures" guidelines that will promote fuel conservation, efficiency, and education, which aim to reduce costs. The County Executive will be responsible for including the necessary training in the Master Training Schedule for all County employees who drive personal or County vehicles for County business.

Action e: The Space and Properties Committee shall annually review, and revise where necessary, the goals for Phase II of the energy plan to ensure continued movement toward implementation of fiscally and environmentally responsible management of the County fleet and transportation fuel use as conditions and priorities change. Furthermore, the Space and Properties Committee shall set, by March 2013, a quantifiable overall goal concerning the reduction of transportation fuel use in Portage County.

GOAL 2: LEADERSHIP. Portage County Government will lead and set an example for transportation fuel management, efficiency, and alternative sources resulting in reduced costs.

Objective 2.1: Portage County will share transportation fuel management, efficiency, and alternative sources strategies with stakeholders, employees, and the public.

Action a: The Portage County Executive will educate employees about transportation fuel management, efficiency, and alternative sources utilizing various educational techniques, e.g., distributing a monthly employee newsletter that often includes energy tips or updates.

Action b: Portage County Department Heads and building managers will familiarize themselves and employees with the Strategic Energy Management Plan – Phase II and bring forth transportation fuel management, efficiency, and alternative sources issues and opportunities to the County Executive.

Action c: The Portage County Executive will engage the public by sharing transportation fuel management, efficiency, and alternative sources progress and soliciting feedback on transportation fuel related issues and plans.

Action d: The Central Wisconsin Resiliency Project – Energy Specialist, in concert with the County Executive, will share the lessons learned from implementation of Phase II of the plan with municipalities in Portage County, Wisconsin.

Objective 2.2: Portage County will collaborate with other municipal governments, transportation fuel agencies (e.g. Clean Wisconsin, WDNR, etc.), and businesses (e.g. SunPower Biodiesel, etc.) on transportation fuel management, efficiency, and alternative fuel source projects.

Action a: Portage County will work cooperatively on transportation fuel management, efficiency, and alternative fuel source projects with the City of Stevens Point, Village of Plover, Village of Rosholt, and other municipal governments that may result in transportation fuel cost savings.

Action b: Portage County will collaborate with other municipal governments throughout the State as well as transportation fuel agencies (e.g. Clean Cities Wisconsin, WDNR, etc.), and businesses (e.g. SunPower Biodiesel, etc.) to pursue transportation fuel management, efficiency, and alternative fuel source projects.

GOAL 3: ENVIRONMENTAL PROTECTION. Portage County will utilize transportation fuel management, efficiency, and alternative sources to be a steward of our natural resources.

Objective 3.1: Portage County will implement the Strategic Energy Management Plan – Phase II Transportation Fuels.

Objective 3.2: Portage County will pursue other actions, not included in the Strategic Energy Management Plan – Phase II, Transportation Fuels, which improve our stewardship of natural resources.

SECTION 6: PLAN IMPLEMENTATION

The following Section identifies possible methods for plan implementation based on the discussion, analysis, and conclusion and guidelines detailed in the preceding sections. Also included are estimates of cost to implement, annual savings realized, and responsibility for implementation.

RECOMMENDATIONS RANKINGS

The Energy Team developed the following recommendations based on background research, recommendations from Clean Cities Wisconsin, and input from Department Heads and the Oversight Committees (Highway, Parks, Public Safety, Solid Waste, Space and Properties and Executive Committees). Criteria considered included ease of installation, implementation feasibility, operating costs, estimated savings, and environmental impact.

The Energy Team prioritized each task from 1 – 4. Priority 1 signified that implementation should be pursued within one year of plan adoption, priority 2 should be pursued within 2-3 years, priority 3 should be pursued within 4-5 years, and priority 4 should be pursued more than five years from now.

A few things to note about this Section are:

- When replacing vehicles, it should be done within the normal vehicle replacement cycle to not incur any unneeded upfront costs or interfere with the current vehicle replacement cycle.
- Some of these recommendations need to be further evaluated before implementing. The estimated annual savings for the recommendations such as the Bio-CNG pilot project, converting fleets to CNG vehicles, and waste vegetable oil to biodiesel pilot project are a first brush estimate and should be evaluated in depth before implementing a full project. All other recommendations have a fairly accurate estimated annual savings calculation.
- All fuel cost savings are based on $3.50 per gallon (the Highway Department bulk fuel price in 2011). Parks Department, with its higher bulk fuel price, and the fleet vehicles that fuel at Kwik Trip have been paying more than $3.50 per gallon in 2011.
- If a project or recommendation is not cost effective, it is not included in this section.
- If a project or recommendation jeopardizes the mission of the Department, it is not included in this section.

County

Priority	Description	Responsibility	Estimated Cost	Estimated Annual Savings
1	Implement the Fleet Principles, Practices and Procedures document (See Appendix B). • Write and adopt fleet policies. • Implement a No Idling policy with allowances for emergency vehicles. • Implement Alternative Forms of Transportation policy. •Train all County drivers.	County Executive	$500[60]	$36,800 - $73,600[61]
1	Conduct "right-sizing" assessment of the fleet Department by Department	All Departments and Oversight Committees	$0[60]	$0
1	Implement county-wide purchasing policy that requires Departments to purchase fuel-efficient, right-sized vehicles	All Departments, employees and Oversight Committees	$0[60]	Ongoing
2	Feasibility Study of Bio-CNG, including 30 day site testing and identification of potential users	Solid Waste Management Board and Staff, Planning & Zoning Department, UW Extension, and the Smart Energy Team in concert with potential fuel users	To be determined[62]	$0
3	Bio-CNG pilot project and converting part of fleet to CNG	Solid Waste Management Board, Solid Waste Staff, Planning & Zoning Department, UW Extension, and the Smart Energy Team in concert with potential fuel users	$500,000 to $1 million[63] for station; CNG vehicles vary in cost[64]	Over $66,000/year- (more if Bio-CNG sold at profit to businesses)[65]

[60] This figure does not include staff costs.

[61] This number is based on an estimated 5-10% of overall annual fuel costs. EcoDriving.org estimates an overall 15% overall reduction in fuel use by modifying driver behavior. The city of Milwaukee's Public Works Department estimated from 4% to 20% reduction in fuel use and approximately $150/vehicle. Fueleconomy.gov notes that excessive idling alone can cost $0.02/minute. Aggressive driving (speeding, rapid acceleration and braking) can lower gas mileage by 33% at highway speeds and by 5% around town. The EPA estimates that you pay an additional $0.24/gallon for each 5 mph you drive over 60 mph.

[62] Cornerstone Environmental Group, LLC provides feasibility studies free of charge; however, there may be some costs associated with the study such as testing the site for Nitrogen or site visits. Furthermore, the study should determine which Portage County entities could potentially use Bio-CNG, and whether the Bio-CNG produced could be sold commercially.

[63] $500,000 in grants were available from the State in 2011 for CNG infrastructure and may be renewed in 2012.

[64] The garages where CNG vehicles will be worked on will need to have sensors and safety equipment installed at extra cost to comply with code. CNG vehicles that are purchased during regular replacement cycles are generally not more expensive. The cost to convert a vehicle to bi-fuel or dual-fuel or dedicated CNG varies depending on the vehicle as noted in Section 3.

[65] The estimate assumes that 73,000 GGE are produced annually and that the Bio-CNG would be used primarily for diesel vehicles. The financing and operating costs for Bio-CNG are estimated at $2.44/GGE and the diesel is $3.23/GGE. See Section 3 for more information.

Highway Department

Priority	Description	Responsibility	Estimated Cost	Estimated Annual Savings
1	Purchase biodiesel (B20) at same price per gallon as we get now (but with lower emissions)	Highway Department, Highway Committee and Fuel Purchasing Manager	$0	$0
1	Purchase a new vehicle with better fuel economy for the Highway Commissioner	Highway Commissioner and Purchasing Department	$0	$450 - $1,660 or $4,500 - $16,600 in 10 years
2	Purchase biodiesel (B99)during summer months at $0.20 less per gallon	Highway Department, Highway Committee and Fuel Purchasing Manager	$0	$20,500
See "County " section above	Convert fleet to CNG vehicles and fuel them from Bio-CNG pilot project if implemented	Highway Commissioner and Oversight Committee	See above	Varies depending on vehicles

Sheriff's Department

Priority	Description	Responsibility	Estimated Cost	Estimated Annual Savings
Ongoing	Downsize all vehicles where possible and practical	Sheriff and Purchasing Department	$0	$3,000 - $5,000
2	Install a high performance, deep cycle battery in 10 squad cars to reduce idling	Sheriff and E.M.S. Oversight Committee	$3,150[66]	$10,000 - $20,000
See "County" section above	Convert fleet to CNG vehicles and fuel them from Bio-CNG pilot project if implemented	If CNG station implemented, Sheriff and E.M.S. Oversight Committee	See above	Varies depending on vehicles (Up to $160,000 for converting fleet)

[66] This estimated cost covers the price of the 10 batteries ($3,000) and their installation ($150).

Parks Department

Priority	Description	Responsibility	Estimated Cost	Estimated Annual Savings
Ongoing	Continue replacing existing trucks with their latest model or with trucks that have better fuel economy	Parks Director and Parks Commission	$0	$400 - $600
1	Purchase, when and where practical, biodiesel (B20) at same price per gallon as we get now (but with lower emissions)[67]	Parks Department, Parks Director and Parks Commission and Fuel Purchasing Manager	$0	$0
2	Purchase, when and where practical, biodiesel (B99) during the summer months[67]. Combine purchase with Highway Department.	Parks Department, Parks Director and Parks Commission	$0	$350 - $450
See "County" section above	Bio-CNG pilot project and converting Parks fleet to CNG	Parks Director and Parks Commission	See above	Varies depending on vehicles (approximately $32,000)

[67] Pending the ability of the Parks Department to run all Department diesel engines on biodiesel.

Bulk Fuel Purchasing

Priority	Description	Responsibility	Estimated Cost	Estimated Annual Savings
1	Merge Highway Department and Parks Department Bulk Fuel Purchases when possible	Parks and Highway Department Fuel Purchasing Managers	$0	$0
2	Merge Sheriff's Department fueling with Parks and Highway Departments to obtain bulk fuel prices	Parks, Highway and Sheriff's Departments and Oversight Committees	$50,000 - $100,000[68]	$25,000 - $30,000

Fleet Vehicles

Priority	Description	Responsibility	Estimated Cost	Estimated Annual Savings
1	Replace one Library van with a high efficiency hatchback	Library Director and Purchasing Department	$24,760[53]	~$1,000 - $1,500
See "County" section above	Convert the ADRC buses to CNG and fuel from Bio-CNG pilot project if implemented	ADRC Transportation Coordinator and State DOT	See above; $8,000 more per bus (ADRC pays $1,600)	$4,000 per bus
See "County" section above	Purchase CNG trucks for Facilities and Land Conservation Departments	Facilities Director, Land Conservation and Purchasing Departments	See above	Varies depending on vehicles (approximately $1,500 per truck)

Motor Pool Vehicles

Priority	Description	Responsibility	Estimated Cost	Estimated Annual Savings
Ongoing	Purchase high efficiency vehicles for Motor Pool – follow Principles, Practices and Procedures document	Purchasing Department	$0	~$400 - $1,100
In Progress	Develop a standard reservation system for all Motor Pool vehicles (AS400)	Facilities Department and other pertaining Departments	$0	Unknown

[68] Cost includes larger fuel tanks and a digital key fueling system.

GLOSSARY

Absorbent Glass Mat (AGM) Battery	A type of lead acid battery that uses sheets of absorbent glass fibers to soak up acid and hold it in place alongside the lead plates of the battery, improving contact, and thus battery performance, and not allowing the acid to diffuse throughout the volume of the battery, which ultimately ends the useful life of a lead acid battery.
Ampere (Amp [A])	The occurrence of a set quantity of electrons (electric charge) passing a particular place in an electrical system per second. The more amperes, the greater the quantity of electrons (electrical charge) passing that place in the electrical system each second. In short, amperes determine how fast (the rate at which) electrons/electrical charge move through an electrical system. In a battery, the more amperes, the faster the battery discharges and the faster the electronics using that battery are able to do work. This is seen in the following equation when the "Volts" variable is held constant: (Amperes X Volts = Watts).
Ampere/Hour (Ah)	The quantity of electrons/electrical charge that passed a particular place in an electrical system in one hour. Similarly, an ampere/hour is the total quantity of electrons (electrical charge) that has accumulated in a particular place after an electrical system supplied that place with electrons/electrical charge at one amp. A four ampere/hour battery completely discharged in one hour created a four ampere current, and the same battery will be completely charged in two hours if charged at two amperes.
Bi-Fuel Vehicle	Any vehicle capable of running on either CNG or gasoline. Bi-fuel vehicles often can switch seamlessly between CNG and gasoline.
Bio-Compressed Natural Gas (Bio-CNG)	A fuel that can be used to power cars or trucks and is derived from biomass. When cleaned, the gas is typically 98 percent methane. It is used at pressures of 3,100 lbs per square inch and remains clear, odorless, and non-corrosive at that state.
Biodiesel	A type of fuel that can be burned in diesel engines and is made from vegetable oils, animal fats, or recycled grease. Biodiesel is available in differing biodiesel blends, described in terms of B"X", where X is a number between 2 and 100 and refers to the percentage of pure biodiesel versus diesel fuel in the biofuel blend.

Biogas	A gas containing some of the byproducts from the breakdown of organic material by microorganisms. One component of biogas is biogenic methane. Biogas can be purified to create natural gas for use as a transportation fuel.
Biogenic Methane	A type of methane produced by the breakdown of organic material by microorganisms. Biogenic methane is a component of biogas. Biogenic methane is one of two sources of natural gas, and can be used to create Bio-CNG. Because biogenic methane is constantly being produced and has organic origins, it is considered a renewable resource.
Bulk Fuel Purchases	A process in which transportation fuel is purchased in large quantities, typically at a discount, and stored in a large fuel holding tank to be later accessed, often using a digital key refueling system.
British Thermal Unit (Btu)	A unit used in the measurement of energy. A 100 watt light bulb lit for one hour consumes an amount of energy equivalent to approximately 341 Btu's, and a gallon of gasoline containing 90 percent gasoline and 10 percent ethanol contains 111,836 Btu's.
Compressed Natural Gas (CNG)	A fuel that can be used to power cars or trucks and is typically 98 percent methane. It is used at pressures of 3,100 lbs per square inch and remains clear, odorless, and non-corrosive at that state.
Diesel-Electric Hybrid	A vehicle that teams one or more electric motors either partially or fully capable of propelling the vehicle with the vehicle's diesel powered internal combustion engine. Such an arrangement reduces the load on the diesel power plant, thereby increasing fuel economy and reducing emissions.
Driver Behavior	The driving style and technique an individual uses while driving. The way a vehicle is driven has an important effect on that vehicle's fuel economy. Aggressive driving can lower fuel economy by as much as 33 percent on the highway and five percent in city driving. The City of Milwaukee has noticed that education designed to encourage driver behavior that maximizes fuel economy reduces fuel expenditures by four to 20 percent.

Fleet Vehicles	County owned vehicles that are designated to a specific Department (Land Conservation truck, ADRC buses, Library vans, Emergency Management ambulances, and Facilities trucks) and the Motor Pool (see 'Motor Pool') vehicles.
Fuel Cards	Used by Portage County Departments and fleet vehicles to obtain fuel from commercial gas stations having contracts with the County. The use of fuel cards allows the number of miles on a vehicle, as well as that vehicle's fuel use, to be tracked over time.
Fuel Economy	A reference to the distance a vehicle can travel on a determined amount of fuel. U.S. Environmental Protection Agency fuel economy figures detail how many miles a vehicle can travel on a gallon of gasoline at both urban (city) and highway speeds, and use miles per gallon (mpg) as a unit.
Gasoline-Electric Hybrid	A vehicle that teams one or more electric motors either partially or fully capable of propelling the vehicle with the vehicle's gasoline powered internal combustion engine. Such an arrangement reduces the load on the gasoline power plant, thereby increasing fuel economy and reducing emissions.
Gasoline Gallon Equivalent (GGE)	"A GGE is a factor that describes the number of gallons of a fuel that has the equivalent amount of energy as 1 gallon of gasoline. If 1 gallon of the fuel has less energy than 1 gallon of gasoline, you will need more of that fuel to drive the same distance as you would drive on 1 gallon of gasoline[69]".
Heavy Equipment	Pieces of machinery used by Portage County that expend fuel in their operation. The fuel use of heavy equipment contributes to the total fuel use of Portage County. Heavy equipment may include mowers, trimmers, heavy machinery, construction machinery, tractors, dozers, backhoes, and scrapers.
Hybrid Vehicle	A vehicle that uses one or more power sources in addition to its internal combustion engine in propelling the vehicle and therefore consume less petroleum than their respective non-hybrid versions.
Idling	"The operation of a vehicle or equipment while they are not in motion and not being used to operate auxiliary equipment[50]."

[69] Alternative Fuels & Advanced Vehicles Data Center, U.S. Department of Energy (https://www.afdc.energy.gov/afdc/prep/popups/gges.html)

Idling Policy	A resolution written to reduce idling, and therefore fuel expenditures, that spells out specific operating procedures and methods of enforcement. Most idling policies have exemptions for special case vehicles, such as police squad cars and EMS ambulances.
Life Cycle Costs	"[I]nclude[s], but is not limited to, the applicable costs of energy efficiency, acquisition and conversion, money, transportation, warehousing and distribution, training, operation and maintenance, and disposition or resale[70]."
Liquefied Natural Gas (LNG)	Any natural gas that has been super-cooled to a temperature of -260^{O}F and consequently liquefied.
Motor Pool	County owned vehicles that can be reserved and used by County employees for general use.
Natural Gas	A colorless and odorless gas based fuel made largely of methane. Select vehicles are able to use natural gas as a transportation fuel. Natural gas can be a fossil fuel or come from organic sources, in which case it is a renewable resource (See 'Biogenic Methane', 'Biogas', and 'Bio-Compressed Natural Gas').
Natural Gas Vehicle (NGV)	Any vehicle capable of using natural gas as a transportation fuel. A vehicle is a natural gas vehicle regardless of whether it uses compressed or liquefied natural gas. Moreover, a vehicle is a natural gas vehicle regardless of how the natural gas it runs on was created.
P-Card	See 'Fuel Cards'.
Personal Mileage Reimbursement	A system that allows individuals using personal vehicles for County business to receive compensation for their fuel purchases at an IRS rate of $0.555 per mile.
Public Transportation	In this case, the intra-metro bus services available in Stevens Point and the surrounding communities. While Portage County personnel may use the bus system to commute, the buses used belong to Stevens Point, and are thus under Stevens Point's jurisdiction.
Resale Value	The price a vehicle can be purchased or sold at when it is no longer new and is used.

[70] Wisconsin Statute 66.0131 (5) (http://docs.legis.wi.gov/statutes/statutes/66/I/0131)

Right-Sizing	"[A]n approach in purchasing the most efficient fleet to accomplish the tasks required. It takes into consideration such factors as engine size, passenger and carrying capacity, weight and maintenance and fuel costs. The practice of right-sizing allows for savings on capital and operating costs as well as reducing vehicle emissions[50]."
Smart Energy Team	A council of different individuals from Portage County created by Resolution 5-2010-2012 and committed to fiscal and environmental stewardship. The Smart Energy Team assists with the development of Portage County's Strategic Energy Management Plan.
Trailering	The act of pulling a trailer with an appropriately capable vehicle.
Vehicle Replacement Cycle	A predetermined timeframe after which one vehicle is retired and the funds set aside for a new vehicle are used to purchase a replacement.
Volt	A unit used to refer to the potential energy an electrical charge within an electrical system has. The greater the number of volts, the greater the potential energy of the electrical charge. This is seen in the following equation when the "Amperes" variable is held constant: (Amperes X Volts = Watts).
Watt	A unit that measures work and energy against the passage of time. A watt represents the rate, or speed, at which work is completed or energy is expended.

Appendix A

Energy Content

The energy content (also referred to as heating value) of diesel fuel is its heat of combustion; the heat released when a known quantity of fuel is burned under specific conditions.

In the U.S., the heating value is usually expressed as British thermal units (Btu) per pound or per gallon at 60°F (International metric [SI] units are kilojoules per kilogram or per cubic meter at 15°C). For gross (high) heating value, the water produced by the combustion is assumed to be recondensed to a liquid. For the net (lower) heating value, the water remains as a gas. Since engines exhaust water as a gas, the net heating value is the appropriate value for comparing fuels.

The three main factors that affect vehicle fuel economy, torque, and horsepower are the type of engine (i.e. gasoline or diesel), the efficiency of the engine turning energy in the fuel into usable work, and the fuel's volumetric energy content or heating value.

The energy content of conventional diesel can vary up to 15% from supplier to supplier or from summer to winter. This variability in conventional diesel is due to changes in its composition which are determined by refining and blending practices. Number 2 diesel fuel usually has higher energy content than Number 1 diesel fuel, with blends of Number 1 and Number 2 varying between the two parent fuel values.

The efficiency of diesel engines is the same whether using biodiesel, diesel, or biodiesel blends so differences in horsepower, torque or fuel economy are due entirely to volumetric energy content[1]. The energy content of biodiesel is much less variable than that of petrodiesel, and with biodiesel meeting D 6751 standards the energy content is more dependent upon the feedstocks used than the particular process. Blends of biodiesel and diesel fuel fall between the parent fuels.

The values below represent those of energy content of average No. 2 diesel fuel and average biodiesel in the US.[2] While BTU changes of 1-2% can be picked up in lab tests for horsepower, torque, and fuel economy, in practice it is difficult to detect any differences with a 1-2% change in fuel BTU content outside normal variability experienced from day to day operations, even in closely monitored fleets.

Average Density and Heating Value of Biodiesel and Diesel Fuel

Fuel	Density, g/cm3	Net Heating Value Avg., Btu/gal.	% Difference vs. No. 2 Diesel Avg.
No. 2 Diesel	0.850	129,500	
Biodiesel (B100)	0.880	118,296	8.65 %
B20 Blend (B20)	0.856*	127,259*	1.73 %*
B2 Blend (B2)	0.851*	129,276*	0.17 %*

* Calculated Values from those of No. 2 Diesel and Biodiesel (B100)

[1] "2004 Biodiesel Handling and Use Guidelines", US Department of Energy, US Department of Energy, DOE/GO-102004-1999 Revised 2004.
[2] "A Comprehensive Analysis of Biodiesel Impacts on Exhaust Emissions", US Environmental Protection Agency, EPA420-P-02-001, October 2002.

Appendix B

Portage County Fleet
Principles, Practices, and Procedures

Principles

Portage County is committed to fiscal and environmental stewards, as demonstrated by the adoption of Resolution 5-2010-2012 which established the Portage County Smart Energy Team and called for the development of a Strategic Energy Management Plan. Phase II – Transportation Fuels commits Portage County to improving fleet efficiency and reducing transportation related costs where possible. Two other goals are: for Portage County to be leaders in transportation fuel efficiency, management, and alternative sources; and for Portage County to be stewards of our natural resources.

Practices and Procedures

For all Portage County staff:

1. Employees shall be familiar with and follow the Fleet Principles, Practices, and Procedures. Employees should utilize fuel efficient vehicle operating techniques. Training shall be provided to all County employees through the Human Resources Department and employees shall have periodic refresher courses on the Department level.

   SEE: **"Fuel Efficient Driving Strategies"** in Appendix C.

2. Vehicle maintenance is a shared responsibility of each person utilizing a fleet vehicle, including checking for appropriate tire pressure, adhering to established maintenance schedules, reporting any potential operating concerns, and utilizing technologies and supplies that increase fuel efficiency.

   SEE: **"Fuel Efficient Driving Strategies"** in Appendix C.

3. Fleet vehicle trips shall be reduced or consolidated whenever possible. The use of *GoToMeeting* online meeting software is encouraged to decrease necessary travel. Webinar trainings are encouraged to reduce necessary travel. Car pooling is encouraged whenever possible.

4. Use of alternative forms of transportation, such as bicycles or the transit system, to go to and from meetings is encouraged whenever possible. Reimbursement shall be given for using the Stevens Point transit system.

   SEE: **"Alternative Forms of Transportation" policy** (To be written, adopted, and amended into the Appendix in 2012).

5. Employees shall be familiar with and follow the no idling policy.

   SEE: **"No Idling" policy** (To be written, adopted, and amended into the Appendix in 2012).

6. Employees shall be familiar with and follow the Guidelines for Making a Transportation Choice. This includes the use of personal vehicles, Motor Pool vehicles, and Enterprise rental vehicles at the appropriate times. This also includes the preference of utilizing Enterprise Rental Car's gas pre-pay option.

   SEE: **"Guidelines for Making a Transportation Choice"** in Appendix D.

<u>For Department Heads and Supervisors</u>

1. Department Heads and senior staff shall work with other employees to develop an awareness of methods for optimizing work related trips and routes to maximize efficiency, minimize vehicle use and also engage in continuous evaluations of related work practices.

2. All vehicles purchased, leased, rented or otherwise obtained by Portage County shall be the most energy efficient vehicle possible, taking into account the functional and operational needs for which the vehicle is intended. A life cycle cost-benefit analysis should be performed prior to choosing a vehicle to ensure fiscal stewardship. The following considerations should be included in decision making:

   a. Higher miles per gallon
   b. Lower emissions
   c. Minimum size and/or load rating needed for the task
   d. Alternative fuel source such as hybrid, CNG, biofuel, etc.
   e. Conditions under which the vehicle will be used
   f. Price of the vehicle vs. life cycle cost.

3. When assessing the need to replace an existing vehicle, the following criteria shall be considered in the life cycle analysis:

   a. Current fuel usage versus the fuel efficiency of a replacement
   b. Repair and maintenance history to determine if it is excessive
   c. Return on investment when compared to a replacement
   d. Compatibility with the current task to which it is assigned
   e. Mileage
   f. Price of replacement vehicle and resale value of the replacement

4. Department Heads shall facilitate training in Fleet Principles, Practices, and Procedures as well as related policy and fuel efficient driving strategies for their staff and themselves.

   SEE **"Fuel Efficient Driving Strategies"** in Appendix C.

Appendix C

From the U.S. Environmental Protection Agency's Office of Transportation & Air Quality and the U.S. Department of Energy's Energy Efficiency & Renewable Energy[71]:

FUEL EFFICIENT DRIVING STRATEGIES

Drive Sensibly

Aggressive driving (speeding, rapid acceleration and braking) wastes gas. It can lower your gas mileage by 33 percent at highway speeds and by 5 percent around town. Sensible driving is also safer for you and others, so you may save more than gas money.

Drive in the highest gear you can, at the lowest possible speed. The slower your engine turns, the less gas you use. Don't accelerate when driving uphill — it makes your mileage per gallon plummet. Instead, try to drive at the same speed, or even a little slower.

Try to brake less by anticipating stops. When you brake, you waste the acceleration you've already used. Instead, try to accelerate slowly when leaving a stoplight, and then coast to the next light.

Fuel Economy Benefit: **5-33%**
Equivalent Gasoline Savings: **$0.20-$1.35/gallon**

Use Cruise Control and Overdrive Gears

Using cruise control on the highway helps you maintain a constant speed and, in most cases, will save gas. When you use overdrive gearing, your car's engine speed goes down. This saves gas and reduces engine wear.

Maintain Your Vehicle

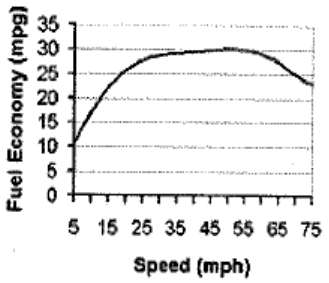
Keeping up with routine car maintenance can help your fuel efficiency. Be sure your tire pressure is at the recommended PSI according to manufacturer's specifications. Change your air filter regularly. A properly functioning car will result in better gas mileage.

Observe the Speed Limit

While each vehicle reaches its optimal fuel economy at a different speed (or range of speeds), gas mileage usually decreases rapidly at speeds above 60 mph.

For every mile you drive above 55 mph, your fuel economy drops by 2 percent. You can assume that each 5 mph you drive over 60 mph is like paying an additional $0.30 per gallon for gas.

Fuel Economy Benefit: **7-23%**
Equivalent Gasoline Savings: **$0.29-$0.94/gallon**



[71] (http://www.fueleconomy.gov/feg/driveHabits.shtml)

Remove Excess Weight

Avoid keeping unnecessary items in your vehicle, especially heavy ones. An extra 100 pounds in your vehicle could reduce your MPG by up to 2%. The reduction is based on the percentage of extra weight relative to the vehicle's weight and affects smaller vehicles more than larger ones.

Remove your car's luggage rack, roof rack and related outdoor gear and put it away until you actually need to use it. The drag created from this gear can reduce your mileage per gallon by up to 5 percent.

Fuel Economy Benefit:	**1-2%/100 lbs**
Equivalent Gasoline Savings:	**$0.04-$0.08/gallon**

Avoid Excessive Idling

- **Turn off you ignition if you're waiting more than 10 seconds.** Contrary to popular belief, restarting your car does not burn more fuel than leaving it idling. In fact, idling for just 10 seconds wastes more gas than restarting the engine.
- **Warm up your engine by driving it, not by idling.** Today's electronic engines do not need to warm up, even in winter. The best way to warm the engine is by easing into your drive and avoiding excessive engine revving. After just a few seconds, your vehicle is safe to drive. The vehicle's engine warms twice as quickly when driven. A cold engine produces dirtier exhaust since the catalytic converter does not function properly when the car is idling.
- **Warm up the cabin interior by driving, not idling.** Easing into your drive is also the best way to get your vehicle's heating system delivering warmer air faster. Sitting in an idling car means you are breathing in more of the exhaust that leaks into the car cabin. Any warmth you may get from a car heater is not worth the damage to your health. If parked and waiting, it is healthier to get out of your car and go inside a store or building.
- **Protect your car engine by idling less.** Frequent restarts are no longer hard on a car's engine and battery. The added wear is much less costly than the cost of fuel saved. Worse, an idling engine is not operating at peak temperature, which causes fuel residue to condense on engine cylinder walls and leads to damage.

Note: Cost savings are based on an assumed fuel price of $4.00/gallon.

Appendix D

Guidelines for Making a Transportation Choice

1. When traveling under 100 miles in a day employees should first try reserving and using a Motor Pool vehicle.

2. If all Motor Pool vehicles are being utilized, then it is OK to use your personal vehicle for travel under 100 miles in a day.

3. For traveling over 100 miles in one day or 200 miles in two days, employees should reserve an Enterprise rental car for the trip. It is less costly to Portage County by doing this.

4. If traveling to an airport for a flight, employees should reserve a one way Enterprise rental car for the trip. When arriving at the airport, drop the rental off at the Enterprise store. By doing this, parking fees at the airport are typically avoided. A one way Enterprise rental car should be reserved for the trip back from the airport.

4. When reserving an Enterprise rental car, employees should opt for the gas pre-pay option with Enterprise. Portage County will typically save $0.60 per gallon from employees opting with the Enterprise gas pre-pay option.

5. If traveling over 100 miles in a day and there are no Enterprise rental cars available, employees shall reserve a Motor Pool vehicle for the trip.

6. If traveling over 100 miles in a day and there are no Enterprise rental cars or Motor Pool vehicles available, then it is OK to use your personal vehicle for the trip.

7. If it is not practical for employees to use Motor Pool vehicles or Enterprise Rental vehicles in the circumstances written for guidelines one through six, then it is OK to use your personal vehicle for the trip. Some impractical instances may be:

    a. If employees live closer to a morning meeting destination and it would be better to use a personal vehicle instead of traveling into Stevens Point, then traveling to the destination. (Use the 100 mile Enterprise car guideline to determine applicability).
    b. If employees have a meeting or conference and would like to continue on for personal business in the area, instead of returning directly to Stevens Point.

Appendix E

BioCNG System - Turnkey Estimate

Equipment Size: 50
Site: Portage County Landill or WWTP
Date: 12/30/2011

Cap X	$	Notes
BioCNG 50 equipment	$350,000	Gas compression to 100 psig, & gas cleanup, chilled to 40 degrees F, H2S tank for 1000 ppm concentration
Full Winterization	$65,000	Heat tracing & insulation of H2S vessel. Heated and insulated structure over other equipment
Fast Filling Station	$250,000	includes one compressor, 50 GGE storage, dryer, dual hose dispenser, etc..
Extra Storage at Fueling Station	$55,000	Includes 50 GGE additional storage so you can fill more trucks during daylight hours
Subtotal	$720,000	50% due upon written PO, 25% due before shipping, 15% due at install, 10% due within 30 days after startup
Tax credit for alternative fueling equipment	($30,000)	http://www.law.cornell.edu/uscode/26/usc_sec_26_00000030---C000-.html
Other Biofuel Grant	$0	http://www.ngvamerica.org/incentives/stateNGV.html
Subtotal with credits and grants	$690,000	Use in the proforma below
Sales Tax	$0	Assumes project is exempt from all sales tax. If not exempt, purchaser agrees these costs will be paid by purchaser

Services from Cornerstone	$	Notes
Site Design/Layout	$10,000	Budgetary costs below will be finalized after this task. Assumes Seismic Zone 0 for design and equipment
Installation of BioCNG Skid	$18,000	Budgetary - Mech & Electrical and Crane
Installation of Fueling Station	$18,000	Budgetary - Connect BioCNG within 100 feet
Permitting	$18,000	Budgetary - Fire, Building, and Solid Waste Permits
Startup Services & Training	$24,000	Budgetary - 3 days on-site
Subtotal	$88,000	To be billed T&M on a monthly basis

CapX is firm for 30 days and subject to change thereafter

BioCNG50 - O&M Estimate

Cost Item	GGE Operating Costs
Media and Equipment Replacements	$0.48
Parasitic Elect Load for BioCNG and Fueling Station	$0.60
O&M Total (per GGE)	***$1.07***
O&M Costs (monthly)	$ 6,299

See attached for detail

Assumes elec power purchased at $7 cents/kWh from the grid (optional micro turbine systems are available).

Preliminary Financial Analysis

Assumptions:	Value	Notes
Assumed Methane Concentration of Raw Biogas	52.0%	
BioCNG Fuel Production (GGE per hour)	9.4	Assumes 67% Conversion Efficiency
Hours per day in operation	24	Assumes fast fill by day and store fuel by night
Days of Operation/week	6	Assumes down on Sunday for maintenance and inactivity
Weeks per year	52	
Desired finance period (months)	120	Variable as desired by Client. Equipment will have a 20 year life if properly maintained
Cost to purchase biogas from owner	$ -	per MMBTU. N/A if biogas is owned by BioCNG equipment owner.
Annual Interest on CapX	4.00%	Use 10% if equity money from an outside investor. Use 4% if clients time value of money.

Calculations:	Value	Notes
GGE/day produced	225.6	
GGE/month produced	5,865	
Cap X (from above)	$ 690,000	
Cumulative Interest on Cap X	$ 148,310	
Services (from above)	$ 88,000	
total Capital	$ 926,310	
Waste Gas - expected flow to be destroyed in a Microturbine, flare, or other device	33	scfm. Will have 30 to 40% CH4 concentration in the waste gas. Costs for supplying microturbine or modifying the flare are **not** included.

Renewable Fuel Credits		http://www.epa.gov/otaq/fuels/renewablefuels/compliancehelp/rfs2-aq.htm
Note: BioCNG is qualified to receive Renewable Fuel Standard Credits via RIN's. RIN's for this operating scenario (after broker fees & 3rd Party Verification costs,) will amount to approx.	$ 34,786	per year
RIN value per GGE	$ 0.49	http://www.carbonsolutionsgroup.com/bf.html

Cost of Raw Biogas		
Amount of biogas purchased per year (excludes methane returned to the flare or other destruction device)	7,826	MMBTU at methane content & operational hours listed above
Cost of biogas purchased from the owner	$ -	per year
Cost of biogas purchased from the owner	$ -	per GGE

Summary

Cost to Operate and Maintain BioCNG and Fueling Station =	$ 1.07	per GGE
Cost to Finance =	$ 1.32	per GGE (includes, finance charge, cap X, and services)
Subtotal	$ 2.39	per GGE (during the finance period)
Federal Excise Tax	$ 0.18	per GGE.
State Road/Excise Tax	$ 0.247	per GGE.
Cost to Purchase Raw Biogas	$ -	per GGE
Value of RIN's	$ (0.49)	per GGE
Total	**$ 2.32**	**per GGE (during the finance period)**
A Federal Subsidy of $0.50/GGE is available but not included above because it is due to expire on 12/31/11, but might be extended	$ (0.50)	http://www.ngvc.org/pdfs/FederalFuelTaxCredit01-11.pdf
Total with federal subsidy	**$ 1.82**	**per GGE (during the finance period)**

BioCNG System with Power Upgrade

Equipment Size: 50
Site: Portage County Landill or WWTP
Date: 12/30/2011

Cap X	$	Notes
BioCNG 50 equipment	$350,000	Gas compression to 100 psig, & gas cleanup, chilled to 40 degrees F, H2S tank for 1000 ppm concentration
Full Winterization	$65,000	Heat tracing & insulation of H2S vessel. Heated and insulated structure over other equipment
Fast Filling Station	$250,000	includes one compressor, 50 GGE storage, dryer, dual hose dispenser, etc..
Extra Storage at Fueling Station	$55,000	Includes 50 GGE additional storage so you can fill more trucks during daylight hours
Power Upgrade at Landfill	$70,000	From Phase I to Phase III (estimate)
Subtotal	$790,000	50% due upon written PO, 25% due before shipping, 15% due at install, 10% due within 30 days after startup
Tax credit for alternative fueling equipment	($30,000)	http://www.law.cornell.edu/uscode/26/usc_sec_26_00000030---C000-.html
Other Biofuel Grant	$0	http://www.ngvamerica.org/incentives/stateNGV.html
Subtotal with credits and grants	$760,000	Use in the proforma below
Sales Tax	$0	Assumes project is exempt from all sales tax. If not exempt, purchaser agrees these costs will be paid by purchaser

Services from Cornerstone	$	Notes
Site Design/Layout	$10,000	Budgetary costs below will be finalized after this task. Assumes Seismic Zone 0 for design and equipment
Installation of BioCNG Skid	$18,000	Budgetary - Mech & Electrical and Crane
Installation of Fueling Station	$18,000	Budgetary - Connect BioCNG within 100 feet
Permitting	$18,000	Budgetary - Fire, Building, and Solid Waste Permits
Startup Services & Training	$24,000	Budgetary - 3 days on-site
Subtotal	$88,000	To be billed T&M on a monthly basis

CapX is firm for 30 days and subject to change thereafter

BioCNG50 - O&M Estimate

Cost Item	GGE Operating Costs
Media and Equipment Replacements	$0.48
Parasitic Elect Load for BioCNG and Fueling Station	$0.60
O&M Total (per GGE)	***$1.07***
O&M Costs (monthly)	$ 6,299

See attached for detail

Assumes elec power purchased at $7 cents/kWh from the grid (optional micro turbine systems are available).

Preliminary Financial Analysis

Assumptions:	Value	Notes
Assumed Methane Concentration of Raw Biogas	52.0%	
BioCNG Fuel Production (GGE per hour)	9.4	Assumes 67% Conversion Efficiency
Hours per day in operation	24	Assumes fast fill by day and store fuel by night
Days of Operation/week	6	Assumes down on Sunday for maintenance and inactivity
Weeks per year	52	
Desired finance period (months)	120	Variable as desired by Client. Equipment will have a 20 year life if properly maintained
Cost to purchase biogas from owner	$ -	per MMBTU. N/A if biogas is owned by BioCNG equipment owner.
Annual Interest on CapX	4.00%	Use 10% if equity money from an outside investor. Use 4% if clients time value of money.

Calculations:	Value	Notes
GGE/day produced	225.6	
GGE/month produced	5,865	
Cap X (from above)	$ 760,000	
Cumulative Interest on Cap X	$ 163,356	
Services (from above)	$ 88,000	
total Capital	$ 1,011,356	
Waste Gas - expected flow to be destroyed in a Microturbine, flare, or other device	33	scfm. Will have 30 to 40% CH4 concentration in the waste gas. Costs for supplying microturbine or modifying the flare are **not** included.

Renewable Fuel Credits		http://www.epa.gov/otaq/fuels/renewablefuels/compliancehelp/rfs2-aq.htm
Note: BioCNG is qualified to receive Renewable Fuel Standard Credits via RIN's. RIN's for this operating scenario (after broker fees & 3rd Party Verification costs,) will amount to approx.	$ 34,786	per year
RIN value per GGE	$ 0.49	http://www.carbonsolutionsgroup.com/bf.html

Cost of Raw Biogas		
Amount of biogas purchased per year (excludes methane returned to the flare or other destruction device)	7,826	MMBTU at methane content & operational hours listed above
Cost of biogas purchased from the owner	$ -	per year
Cost of biogas purchased from the owner	$ -	per GGE

Summary

Cost to Operate and Maintain BioCNG and Fueling Station =	$ 1.07	per GGE
Cost to Finance =	$ 1.44	per GGE (includes, finance charge, cap X, and services)
Subtotal	$ 2.51	per GGE (during the finance period)
Federal Excise Tax	$ 0.18	per GGE.
State Road/Excise Tax	$ 0.247	per GGE.
Cost to Purchase Raw Biogas	$ -	per GGE
Value of RIN's	$ (0.49)	per GGE
Total	**$ 2.44**	**per GGE (during the finance period)**
A Federal Subsidy of $0.50/GGE is available but not included above because it is due to expire on 12/31/11, but might be extended	$ (0.50)	http://www.ngvc.org/pdfs/FederalFuelTaxCredit01-11.pdf
Total with federal subsidy	**$ 1.94**	**per GGE (during the finance period)**

BioCNG System with Power Upgrade and $255,000 Grant

Equipment Size: 50
Site: Portage County Landill or WWTP
Date: 2/23/2012

Cap X	$	Notes
BioCNG 50 equipment	$350,000	Gas compression to 100 psig, & gas cleanup, chilled to 40 degrees F, H2S tank for 1000 ppm concentration
Full Winterization	$65,000	Heat tracing & insulation of H2S vessel. Heated and insulated structure over other equipment
Fast Filling Station	$250,000	includes one compressor, 50 GGE storage, dryer, dual hose dispenser, etc..
Extra Storage at Fueling Station	$55,000	Includes 50 GGE additional storage so you can fill more trucks during daylight hours
Power Upgrade at Landfill	$70,000	From I Phase to III Phase (estimate)
Subtotal	$790,000	50% due upon written PO, 25% due before shipping, 15% due at install, 10% due within 30 days after startup
Tax credit for alternative fueling equipment	($30,000)	http://www.law.cornell.edu/uscode/26/usc_sec_26_00000030---C000-.html
Other Biofuel Grant	($255,000)	http://www.ngvamerica.org/incentives/stateNGV.html
Subtotal with credits and grants	$505,000	Use in the proforma below
Sales Tax	$0	Assumes project is exempt from all sales tax. If not exempt, purchaser agrees these costs will be paid by purchaser

Services from Cornerstone	$	Notes
Site Design/Layout	$10,000	Budgetary costs below will be finalized after this task. Assumes Seismic Zone 0 for design and equipment
Installation of BioCNG Skid	$18,000	Budgetary - Mech & Electrical and Crane
Installation of Fueling Station	$18,000	Budgetary - Connect BioCNG within 100 feet
Permitting	$18,000	Budgetary - Fire, Building, and Solid Waste Permits
Startup Services & Training	$24,000	Budgetary - 3 days on-site
Subtotal	$88,000	To be billed T&M on a monthly basis

CapX is firm for 30 days and subject to change thereafter

BioCNG50 - O&M Estimate

Cost Item	GGE Operating Costs
Media and Equipment Replacements	$0.48
Parasitic Elect Load for BioCNG and Fueling Station	$0.60
O&M Total (per GGE)	*$1.07*
O&M Costs (monthly)	$ 6,299

See attached for detail

Assumes elec power purchased at $7 cents/kWh from the grid (optional micro turbine systems are available).

Preliminary Financial Analysis

Assumptions:	Value	Notes
Assumed Methane Concentration of Raw Biogas	52.0%	
BioCNG Fuel Production (GGE per hour)	9.4	Assumes 67% Conversion Efficiency
Hours per day in operation	24	Assumes fast fill by day and store fuel by night
Days of Operation/week	6	Assumes down on Sunday for maintenance and inactivity
Weeks per year	52	
Desired finance period (months)	120	Variable as desired by Client. Equipment will have a 20 year life if properly maintained
Cost to purchase biogas from owner	$ -	per MMBTU. N/A if biogas is owned by BioCNG equipment owner.
Annual Interest on CapX	4.00%	Use 10% if equity money from an outside investor. Use 4% if clients time value of money.

Calculations:	Value	Notes
GGE/day produced	225.6	
GGE/month produced	5,865	
Cap X (from above)	$ 505,000	
Cumulative Interest on Cap X	$ 108,546	
Services (from above)	$ 88,000	
total Capital	$ 701,546	
Waste Gas - expected flow to be destroyed in a Microturbine, flare, or other device	33	scfm. Will have 30 to 40% CH4 concentration in the waste gas. Costs for supplying microturbine or modifying the flare are not included.

Renewable Fuel Credits		http://www.epa.gov/otaq/fuels/renewablefuels/compliancehelp/rfs2-aq.htm
Note: BioCNG is qualified to receive Renewable Fuel Standard Credits via RIN's. RIN's for this operating scenario (after broker fees & 3rd Party Verification costs,) will amount to approx.	$ 34,786	per year
RIN value per GGE	$ 0.49	http://www.carbonsolutionsgroup.com/bf.html

Cost of Raw Biogas		
Amount of biogas purchased per year (excludes methane returned to the flare or other destruction device)	7,826	MMBTU at methane content & operational hours listed above
Cost of biogas purchased from the owner	$ -	per year
Cost of biogas purchased from the owner	$ -	per GGE

Summary

Cost to Operate and Maintain BioCNG and Fueling Station =	$ 1.07	per GGE
Cost to Finance =	$ 1.00	per GGE (includes, finance charge, cap X, and services)
Subtotal	$ 2.07	per GGE (during the finance period)
Federal Excise Tax	$ 0.18	per GGE.
State Road/Excise Tax	$ 0.247	per GGE.
Cost to Purchase Raw Biogas	$ -	per GGE
Value of RIN's	$ (0.49)	per GGE
Total	**$ 2.00**	**per GGE (during the finance period)**
A Federal Subsidy of $0.50/GGE is available but not included above because it is due to expire on 12/31/11, but might be extended	$ (0.50)	http://www.ngvc.org/pdfs/FederalFuelTaxCredit01-11.pdf
Total with federal subsidy	**$ 1.50**	**per GGE (during the finance period)**

BioCNG System with Power Upgrade and $435,000 Grant

Equipment Size: 50
Site: Portage County Landill or WWTP
Date: 2/23/2012

Cap X	$	Notes
BioCNG 50 equipment	$350,000	Gas compression to 100 psig, & gas cleanup, chilled to 40 degrees F, H2S tank for 1000 ppm concentration
Full Winterization	$65,000	Heat tracing & insulation of H2S vessel. Heated and insulated structure over other equipment
Fast Filling Station	$250,000	includes one compressor, 50 GGE storage, dryer, dual hose dispenser, etc..
Extra Storage at Fueling Station	$55,000	Includes 50 GGE additional storage so you can fill more trucks during daylight hours
Power Upgrade at Landfill	$70,000	From I Phase to III Phase (estimate)
Subtotal	$790,000	50% due upon written PO, 25% due before shipping, 15% due at install, 10% due within 30 days after startup
Tax credit for alternative fueling equipment	($30,000)	http://www.law.cornell.edu/uscode/26/usc_sec_26_00000030---C000-.html
Other Biofuel Grant	($435,000)	http://www.ngvamerica.org/incentives/stateNGV.html
Subtotal with credits and grants	$325,000	Use in the proforma below
Sales Tax	$0	Assumes project is exempt from all sales tax. If not exempt, purchaser agrees these costs will be paid by purchaser

Services from Cornerstone	$	Notes
Site Design/Layout	$10,000	Budgetary costs below will be finalized after this task. Assumes Seismic Zone 0 for design and equipment
Installation of BioCNG Skid	$18,000	Budgetary - Mech & Electrical and Crane
Installation of Fueling Station	$18,000	Budgetary - Connect BioCNG within 100 feet
Permitting	$18,000	Budgetary - Fire, Building, and Solid Waste Permits
Startup Services & Training	$24,000	Budgetary - 3 days on-site
Subtotal	$88,000	To be billed T&M on a monthly basis

CapX is firm for 30 days and subject to change thereafter

BioCNG50 - O&M Estimate

Cost Item	GGE Operating Costs	
Media and Equipment Replacements	$0.48	See attached for detail
Parasitic Elect Load for BioCNG and Fueling Station	$0.60	
O&M Total (per GGE)	*$1.07*	
O&M Costs (monthly)	$ 6,299	

Assumes elec power purchased at $7 cents/kWh from the grid (optional micro turbine systems are available).

Preliminary Financial Analysis

Assumptions:	Value	Notes
Assumed Methane Concentration of Raw Biogas	52.0%	
BioCNG Fuel Production (GGE per hour)	9.4	Assumes 67% Conversion Efficiency
Hours per day in operation	24	Assumes fast fill by day and store fuel by night
Days of Operation/week	6	Assumes down on Sunday for maintenance and inactivity
Weeks per year	52	
Desired finance period (months)	120	Variable as desired by Client. Equipment will have a 20 year life if properly maintained
Cost to purchase biogas from owner	$ -	per MMBTU. N/A if biogas is owned by BioCNG equipment owner.
Annual Interest on CapX	4.00%	Use 10% if equity money from an outside investor. Use 4% if clients time value of money.

Calculations:	Value	Notes
GGE/day produced	225.6	
GGE/month produced	5,865	
Cap X (from above)	$ 325,000	
Cumulative Interest on Cap X	$ 69,856	
Services (from above)	$ 88,000	
total Capital	$ 482,856	
Waste Gas - expected flow to be destroyed in a Microturbine, flare, or other device	33	scfm. Will have 30 to 40% CH4 concentration in the waste gas. Costs for supplying microturbine or modifying the flare are not included.

Renewable Fuel Credits		http://www.epa.gov/otaq/fuels/renewablefuels/compliancehelp/rfs2-aq.htm
Note: BioCNG is qualified to receive Renewable Fuel Standard Credits via RIN's. RIN's for this operating scenario (after broker fees & 3rd Party Verification costs,) will amount to approx.	$ 34,786	per year
RIN value per GGE	$ 0.49	http://www.carbonsolutionsgroup.com/bf.html

Cost of Raw Biogas		
Amount of biogas purchased per year (excludes methane returned to the flare or other destruction device)	7,826	MMBTU at methane content & operational hours listed above
Cost of biogas purchased from the owner	$ -	per year
Cost of biogas purchased from the owner	$ -	per GGE

Summary

Cost to Operate and Maintain BioCNG and Fueling Station =	$	1.07	per GGE
Cost to Finance =	$	0.69	per GGE (includes, finance charge, cap X, and services)
Subtotal	$	1.76	per GGE (during the finance period)
Federal Excise Tax	$	0.18	per GGE.
State Road/Excise Tax	$	0.247	per GGE.
Cost to Purchase Raw Biogas	$	-	per GGE
Value of RIN's	$	(0.49)	per GGE
Total	**$**	**1.69**	**per GGE (during the finance period)**
A Federal Subsidy of $0.50/GGE is available but not included above because it is due to expire on 12/31/11, but might be extended	$	(0.50)	http://www.ngvc.org/pdfs/FederalFuelTaxCredit01-11.pdf
Total with federal subsidy	**$**	**1.19**	**per GGE (during the finance period)**

BioCNG System with Power Upgrade and Trailer

Equipment Size: 50
Site: Portage County Landill or WWTP
Date: 12/30/2011

Cap X	$	Notes
BioCNG 50 equipment	$350,000	Gas compression to 100 psig, & gas cleanup, chilled to 40 degrees F, H2S tank for 1000 ppm concentration
Full Winterization	$65,000	Heat tracing & insulation of H2S vessel. Heated and insulated structure over other equipment
Fast Filling Station	$250,000	includes one compressor, 50 GGE storage, dryer, dual hose dispenser, etc..
Extra Storage at Fueling Station	$55,000	Includes 50 GGE additional storage so you can fill more trucks during daylight hours
Power Upgrade at Landfill	$70,000	From Phase I to Phase III (estimate)
Trailer and 2 sets of tanks	$210,000	For transport of Bio-CNG to Highway Department for fueling (estimate)
Subtotal	$1,000,000	50% due upon written PO, 25% due before shipping, 15% due at install, 10% due within 30 days after startup
Tax credit for alternative fueling equipment	($30,000)	http://www.law.cornell.edu/uscode/26/usc_sec_26_00000030---C000-.html
Other Biofuel Grant	$0	http://www.ngvamerica.org/incentives/stateNGV.html
Subtotal with credits and grants	$970,000	Use in the proforma below
Sales Tax	$0	Assumes project is exempt from all sales tax. If not exempt, purchaser agrees these costs will be paid by purchaser

Services from Cornerstone	$	Notes
Site Design/Layout	$10,000	Budgetary costs below will be finalized after this task. Assumes Seismic Zone 0 for design and equipment
Installation of BioCNG Skid	$18,000	Budgetary - Mech & Electrical and Crane
Installation of Fueling Station	$18,000	Budgetary - Connect BioCNG within 100 feet
Permitting	$18,000	Budgetary - Fire, Building, and Solid Waste Permits
Startup Services & Training	$24,000	Budgetary - 3 days on-site
Subtotal	$88,000	To be billed T&M on a monthly basis

CapX is firm for 30 days and subject to change thereafter

BioCNG50 - O&M Estimate

Cost Item	GGE Operating Costs	
Media and Equipment Replacements	$0.48	See attached for detail
Parasitic Elect Load for BioCNG and Fueling Station	$0.60	
O&M Total (per GGE)	***$1.07***	
O&M Costs (monthly)	$ 6,299	

Assumes elec power purchased at $7 cents/kWh from the grid (optional micro turbine systems are available).

Preliminary Financial Analysis

Assumptions:	Value	Notes
Assumed Methane Concentration of Raw Biogas	52.0%	
BioCNG Fuel Production (GGE per hour)	9.4	Assumes 67% Conversion Efficiency
Hours per day in operation	24	Assumes fast fill by day and store fuel by night
Days of Operation/week	6	Assumes down on Sunday for maintenance and inactivity
Weeks per year	52	
Desired finance period (months)	120	Variable as desired by Client. Equipment will have a 20 year life if properly maintained
Cost to purchase biogas from owner	$ -	per MMBTU. N/A if biogas is owned by BioCNG equipment owner.
Annual Interest on CapX	4.00%	Use 10% if equity money from an outside investor. Use 4% if clients time value of money.

Calculations:	Value	Notes
GGE/day produced	225.6	
GGE/month produced	5,865	
Cap X (from above)	$ 970,000	
Cumulative Interest on Cap X	$ 208,493	
Services (from above)	$ 88,000	
total Capital	$ 1,266,493	
Waste Gas - expected flow to be destroyed in a Microturbine, flare, or other device	33	scfm. Will have 30 to 40% CH4 concentration in the waste gas. Costs for supplying microturbine or modifying the flare are **not** included.

Renewable Fuel Credits		http://www.epa.gov/otaq/fuels/renewablefuels/compliancehelp/rfs2-aq.htm
Note: BioCNG is qualified to receive Renewable Fuel Standard Credits via RIN's. RIN's for this operating scenario (after broker fees & 3rd Party Verification costs,) will amount to approx.	$ 34,786	per year
RIN value per GGE	$ 0.49	http://www.carbonsolutionsgroup.com/bf.html

Cost of Raw Biogas		
Amount of biogas purchased per year (excludes methane returned to the flare or other destruction device)	7,826	MMBTU at methane content & operational hours listed above
Cost of biogas purchased from the owner	$ -	per year
Cost of biogas purchased from the owner	$ -	per GGE

Summary

Cost to Operate and Maintain BioCNG and Fueling Station =	$ 1.07	per GGE
Cost to Finance =	$ 1.80	per GGE (includes, finance charge, cap X, and services)
Subtotal	$ 2.87	per GGE (during the finance period)
Federal Excise Tax	$ 0.18	per GGE.
State Road/Excise Tax	$ 0.247	per GGE.
Cost to Purchase Raw Biogas	$ -	per GGE
Value of RIN's	$ (0.49)	per GGE
Total	**$ 2.81**	**per GGE (during the finance period)**
A Federal Subsidy of $0.50/GGE is available but not included above because it is due to expire on 12/31/11, but might be extended	$ (0.50)	http://www.ngvc.org/pdfs/FederalFuelTaxCredit01-11.pdf
Total with federal subsidy	**$ 2.31**	**per GGE (during the finance period)**

BioCNG System with Power Upgrade, Trailer, and $175,000 Grant

Equipment Size: 50
Site: Portage County Landill or WWTP
Date: 12/30/2011

Cap X	$	Notes
BioCNG 50 equipment	$350,000	Gas compression to 100 psig, & gas cleanup, chilled to 40 degrees F, H2S tank for 1000 ppm concentration
Full Winterization	$65,000	Heat tracing & insulation of H2S vessel. Heated and insulated structure over other equipment
Fast Filling Station	$250,000	includes one compressor, 50 GGE storage, dryer, dual hose dispenser, etc..
Extra Storage at Fueling Station	$55,000	Includes 50 GGE additional storage so you can fill more trucks during daylight hours
Power Upgrade at Landfill	$70,000	From Phase I to Phase III (estimate)
Trailer and 2 sets of tanks	$210,000	For transport of Bio-CNG to Highway Department for fueling (estimate)
Subtotal	$1,000,000	50% due upon written PO, 25% due before shipping, 15% due at install, 10% due within 30 days after startup
Tax credit for alternative fueling equipment	($30,000)	http://www.law.cornell.edu/uscode/26/usc_sec_26_00000030---C000-.html
Other Biofuel Grant	($175,000)	http://www.ngvamerica.org/incentives/stateNGV.html
Subtotal with credits and grants	$795,000	Use in the proforma below
Sales Tax	$0	Assumes project is exempt from all sales tax. If not exempt, purchaser agrees these costs will be paid by purchaser

Services from Cornerstone	$	Notes
Site Design/Layout	$10,000	Budgetary costs below will be finalized after this task. Assumes Seismic Zone 0 for design and equipment
Installation of BioCNG Skid	$18,000	Budgetary - Mech & Electrical and Crane
Installation of Fueling Station	$18,000	Budgetary - Connect BioCNG within 100 feet
Permitting	$18,000	Budgetary - Fire, Building, and Solid Waste Permits
Startup Services & Training	$24,000	Budgetary - 3 days on-site
Subtotal	$88,000	To be billed T&M on a monthly basis

CapX is firm for 30 days and subject to change thereafter

BioCNG50 - O&M Estimate

Cost Item	GGE Operating Costs	
Media and Equipment Replacements	$0.48	See attached for detail
Parasitic Elect Load for BioCNG and Fueling Station	$0.60	
O&M Total (per GGE)	***$1.07***	
O&M Costs (monthly)	$ 6,299	

Assumes elec power purchased at $7 cents/kWh from the grid (optional micro turbine systems are available).

Preliminary Financial Analysis

Assumptions:	Value	Notes
Assumed Methane Concentration of Raw Biogas	52.0%	
BioCNG Fuel Production (GGE per hour)	9.4	Assumes 67% Conversion Efficiency
Hours per day in operation	24	Assumes fast fill by day and store fuel by night
Days of Operation/week	6	Assumes down on Sunday for maintenance and inactivity
Weeks per year	52	
Desired finance period (months)	120	Variable as desired by Client. Equipment will have a 20 year life if properly maintained
Cost to purchase biogas from owner	$ -	per MMBTU. N/A if biogas is owned by BioCNG equipment owner.
Annual Interest on CapX	4.00%	Use 10% if equity money from an outside investor. Use 4% if clients time value of money.

Calculations:	Value	Notes
GGE/day produced	225.6	
GGE/month produced	5,865	
Cap X (from above)	$ 795,000	
Cumulative Interest on Cap X	$ 170,879	
Services (from above)	$ 88,000	
total Capital	$ 1,053,879	
Waste Gas - expected flow to be destroyed in a Microturbine, flare, or other device	33	scfm. Will have 30 to 40% CH4 concentration in the waste gas. Costs for supplying microturbine or modifying the flare are **not** included.

Renewable Fuel Credits		http://www.epa.gov/otaq/fuels/renewablefuels/compliancehelp/rfs2-aq.htm
Note: BioCNG is qualified to receive Renewable Fuel Standard Credits via RIN's. RIN's for this operating scenario (after broker fees & 3rd Party Verification costs,) will amount to approx.	$ 34,786	per year
RIN value per GGE	$ 0.49	http://www.carbonsolutionsgroup.com/bf.html

Cost of Raw Biogas		
Amount of biogas purchased per year (excludes methane returned to the flare or other destruction device)	7,826	MMBTU at methane content & operational hours listed above
Cost of biogas purchased from the owner	$ -	per year
Cost of biogas purchased from the owner	$ -	per GGE

Summary

Cost to Operate and Maintain BioCNG and Fueling Station =	$ 1.07	per GGE
Cost to Finance =	$ 1.50	per GGE (includes, finance charge, cap X, and services)
Subtotal	$ 2.57	per GGE (during the finance period)
Federal Excise Tax	$ 0.18	per GGE.
State Road/Excise Tax	$ 0.247	per GGE.
Cost to Purchase Raw Biogas	$ -	per GGE
Value of RIN's	$ (0.49)	per GGE
Total	**$ 2.50**	**per GGE (during the finance period)**
A Federal Subsidy of $0.50/GGE is available but not included above because it is due to expire on 12/31/11, but might be extended	$ (0.50)	http://www.ngvc.org/pdfs/FederalFuelTaxCredit01-11.pdf
Total with federal subsidy	**$ 2.00**	**per GGE (during the finance period)**

BioCNG System with Power Upgrade, Trailer, and $465,000 Grant

Equipment Size: 50
Site: Portage County Landill or WWTP
Date: 12/30/2011

Cap X	$	Notes
BioCNG 50 equipment	$350,000	Gas compression to 100 psig, & gas cleanup, chilled to 40 degrees F, H2S tank for 1000 ppm concentration
Full Winterization	$65,000	Heat tracing & insulation of H2S vessel. Heated and insulated structure over other equipment
Fast Filling Station	$250,000	includes one compressor, 50 GGE storage, dryer, dual hose dispenser, etc..
Extra Storage at Fueling Station	$55,000	Includes 50 GGE additional storage so you can fill more trucks during daylight hours
Power Upgrade at Landfill	$70,000	From Phase I to Phase III (estimate)
Trailer and 2 sets of tanks	$210,000	For transport of Bio-CNG to Highway Department for fueling (estimate)
Subtotal	$1,000,000	50% due upon written PO, 25% due before shipping, 15% due at install, 10% due within 30 days after startup
Tax credit for alternative fueling equipment	($30,000)	http://www.law.cornell.edu/uscode/26/usc_sec_26_00000030---C000-.html
Other Biofuel Grant	($465,000)	http://www.ngvamerica.org/incentives/stateNGV.html
Subtotal with credits and grants	$505,000	Use in the proforma below
Sales Tax	$0	Assumes project is exempt from all sales tax. If not exempt, purchaser agrees these costs will be paid by purchaser

Services from Cornerstone	$	Notes
Site Design/Layout	$10,000	Budgetary costs below will be finalized after this task. Assumes Seismic Zone 0 for design and equipment
Installation of BioCNG Skid	$18,000	Budgetary - Mech & Electrical and Crane
Installation of Fueling Station	$18,000	Budgetary - Connect BioCNG within 100 feet
Permitting	$18,000	Budgetary - Fire, Building, and Solid Waste Permits
Startup Services & Training	$24,000	Budgetary - 3 days on-site
Subtotal	$88,000	To be billed T&M on a monthly basis

CapX is firm for 30 days and subject to change thereafter

BioCNG50 - O&M Estimate

Cost Item	GGE Operating Costs	
Media and Equipment Replacements	$0.48	See attached for detail
Parasitic Elect Load for BioCNG and Fueling Station	$0.60	
O&M Total (per GGE)	***$1.07***	
O&M Costs (monthly)	$ 6,299	

Assumes elec power purchased at $7 cents/kWh from the grid (optional micro turbine systems are available).

Preliminary Financial Analysis

Assumptions:	Value	Notes
Assumed Methane Concentration of Raw Biogas	52.0%	
BioCNG Fuel Production (GGE per hour)	9.4	Assumes 67% Conversion Efficiency
Hours per day in operation	24	Assumes fast fill by day and store fuel by night
Days of Operation/week	6	Assumes down on Sunday for maintenance and inactivity
Weeks per year	52	
Desired finance period (months)	120	Variable as desired by Client. Equipment will have a 20 year life if properly maintained
Cost to purchase biogas from owner	$ -	per MMBTU. N/A if biogas is owned by BioCNG equipment owner.
Annual Interest on CapX	4.00%	Use 10% if equity money from an outside investor. Use 4% if clients time value of money.

Calculations:	Value	Notes
GGE/day produced	225.6	
GGE/month produced	5,865	
Cap X (from above)	$ 505,000	
Cumulative Interest on Cap X	$ 108,546	
Services (from above)	$ 88,000	
total Capital	$ 701,546	
Waste Gas - expected flow to be destroyed in a Microturbine, flare, or other device	33	scfm. Will have 30 to 40% CH4 concentration in the waste gas. Costs for supplying microturbine or modifying the flare are not included.

Renewable Fuel Credits		http://www.epa.gov/otaq/fuels/renewablefuels/compliancehelp/rfs2-aq.htm
Note: BioCNG is qualified to receive Renewable Fuel Standard Credits via RIN's. RIN's for this operating scenario (after broker fees & 3rd Party Verification costs,) will amount to approx.	$ 34,786	per year
RIN value per GGE	$ 0.49	http://www.carbonsolutionsgroup.com/bf.html

Cost of Raw Biogas		
Amount of biogas purchased per year (excludes methane returned to the flare or other destruction device)	7,826	MMBTU at methane content & operational hours listed above
Cost of biogas purchased from the owner	$ -	per year
Cost of biogas purchased from the owner	$ -	per GGE

Summary

Cost to Operate and Maintain BioCNG and Fueling Station =	$ 1.07	per GGE
Cost to Finance =	$ 1.00	per GGE (includes, finance charge, cap X, and services)
Subtotal	$ 2.07	per GGE (during the finance period)
Federal Excise Tax	$ 0.18	per GGE.
State Road/Excise Tax	$ 0.247	per GGE.
Cost to Purchase Raw Biogas	$ -	per GGE
Value of RIN's	$ (0.49)	per GGE
Total	**$ 2.00**	**per GGE (during the finance period)**
A Federal Subsidy of $0.50/GGE is available but not included above because it is due to expire on 12/31/11, but might be extended	$ (0.50)	http://www.ngvc.org/pdfs/FederalFuelTaxCredit01-11.pdf
Total with federal subsidy	**$ 1.50**	**per GGE (during the finance period)**

Appendix F

PIERCE COUNTY [Washington] FUEL REDUCTION POLICY

1.0 Purpose and Objective:

Pierce County is committed to sustainability and protecting our environment. The purpose of this policy is to protect public and employee health by preventing exposure to potentially harmful exhaust fumes, to improve the environment by reducing emissions of greenhouse gases and toxic air contaminants, and to lower costs by reducing fuel expenditures and equipment wear. By creating a Right-Sized fleet and limiting idling time, air pollution and greenhouse gas emissions will be reduced, thus promoting a healthier work and world environment and the efficient use of county resources.

2.0 Scope:

This policy applies to all staff operating vehicles and equipment owned or leased by Pierce County.

3.0 Definitions:

3.1 **Idling**

Idling means the operation of a vehicle or equipment while they are not in motion and not being used to operate auxiliary equipment.

3.2 **Fuels**

This includes fossil fuels which include gasoline, diesel, propane, hydrogen and natural gas used to operate vehicles or equipment.

3.3 **Layover**

Layover refers to a stop or breaks in a trip typically due to scheduling.

3.4 **Vehicles**

Vehicles or equipment refers to cars, light trucks, vans, heavy truck, snow equipment, transit buses, loaders, backhoes, street sweepers, and any other equipment operated by staff and utilizing fossil fuels.

3.5 **Right-Sizing**

Right-sizing is an approach in purchasing the most efficient fleet to accomplish the tasks required. It takes into consideration such factors as engine size, passenger and carrying capacity, weight and maintenance and fuel costs. The practice of right-sizing allows for savings on capital and operating costs as well as reducing vehicle emissions.

4.0 Responsibilities:

The following guidelines pertain to all county employees. Specific group responsibilities are outlined and address issues such as fuel and resource efficiency, economy of resources, air quality, driving conditions and legality. Pierce County Idle-Free Policy

All Pierce County employees who drive a county vehicle:

4.1 Shall not cause or permit gas-powered vehicles covered by this policy to idle for more than 30 seconds or a diesel-powered vehicle for more than three minutes in a 60-minute period, except as allowed under policy exemptions described in section 5.0. Vehicles idling within these allowed limits must do so outside of buildings and away from fresh air intakes, air conditioners, and windows.

4.2 Shall avoid sudden stops and quick acceleration, whenever possible, while driving on County business.

4.3 Shall efficiently schedule and plan meetings, appointments, and site visits, and shall carpool when practical. Meeting times and locations shall be scheduled so as to minimize travel distances for the

participants. Public Transportation should be used in lieu of rental cars where practical when traveling out of state.
4.4 Shall obey posted speed limits while driving on County business, except in emergency or law-enforcement responses.
4.5 Shall shut off vehicle engines immediately upon reaching their destination, except Heavy Duty diesel engines, which require a two minute "cool down" period.
4.6 Shall not idle while waiting for passengers, attending meetings, or during layovers.
4.7 Shall not idle solely for the purpose of heating or cooling the inside of the vehicle before operation unless the use of the defroster is required to clear snow and ice from windows for safety:
4.7.1 If the temperature is between 10 degrees F and 32 degrees F, vehicle may idle long enough to allow for an appropriate temperature to be reached and maintained within the vehicle.
4.7.2 If the temperature is less than 10 degrees F, vehicle may idle for approximately 10 minutes, or until the vehicle has reached an acceptable and safe temperature.
4.7.3 If the temperature exceeds 80 degrees F, vehicle may idle long enough to cool passengers and ensure safe working conditions.
4.8 Shall use good judgment to implement anti-idling practices when operating a county vehicle.
4.9 Shall remain with the vehicle when engines must be left running for any reason.
4.10 Shall ensure that the tires of vehicles are properly inflated and tire pressure is checked at least monthly.

Pierce County Fleet Maintenance Staff:

4.11 Shall ensure fleet and all other vehicles are in proper operating condition and kept well maintained.

Pierce County Fleet Managers:

4.12 Shall keep abreast of pollutant reduction and fuel saving technologies and implement when practical. Pierce County Idle-Free Policy
4.13 Shall work to evaluate the most appropriate vehicle for the intended purpose prior to purchase (Right-sizing). Fleet efficiency is optimized when the most appropriate size and class of vehicle for the intended application is purchased and utilized.

Pierce County Departments and Supervisors:

4.14 Each supervisor will monitor for compliance and inform the vehicle operator of violation at the time of the infraction.
4.15 Each supervisor will coordinate with the Equipment Services Division or the Fleet Rental Division to assure employees receive appropriate vehicle operator training for compliance with this policy.
4.16 Each department using County-owned vehicles shall be responsible for monitoring and verifying compliance of their vehicles.

5.0 Policy Exemptions

This policy does not apply to the following vehicles, equipment or situations. Operators must use their own discretion in certain situations.

5.1 Emergency vehicles and equipment are exempted while engaged in activities such as Law Enforcement assistance or Public Works and Utilities operations.
5.2 Vehicles assisting in an emergency activity are exempt. A vehicle may idle to prevent a safety or health emergency.
5.3 A vehicle may idle to operate auxiliary equipment, as required for necessary business operations.
5.4 Vehicles may idle for the purpose of defogging, defrosting or de-icing windows. Idling must cease when fog, frost, or ice conditions have been eliminated.
5.6 Staff may idle vehicles/equipment for the purpose of getting warm and/or dry if indoor accommodations are not available at the work site.

5.7 During the winter season with below zero temperatures and/or blizzard conditions and during summer periods of extreme heat, extended idling periods may be necessary for the well being of the operator and passengers.
5.8 A vehicle may idle for maintenance, servicing, repairing, or diagnostic purposes if idling is required for such activity.
5.9 Where safety may be compromised by shutting down the engine, vehicles/equipment may idle at the discretion of the operator.
5.10 A vehicle may idle while forced to remain motionless because of traffic congestion, when required to yield the right of way to responding emergency vehicles, at an official traffic control device or signal, or at the direction of a law enforcement official.
5.11 A vehicle may idle as part of a state or federal inspection if required.
5.12 Operating an auxiliary power unit, generator set, or other mobile idle reduction technology as a means to heat, air condition, or provide electrical power as an alternative to idling the main engine is allowed and shall not be considered idling. Pierce County Idle-Free Policy

6.0 Consequences of Violations

Willful or blatant violation of this policy may result in disciplinary action.

7.0 Policy Evaluation

This policy should be regularly evaluated to ensure it is enabling and effectively moving Pierce County towards its sustainability goals.

Appendix G

From the Lee County, Florida Fleet Management Department[72]:

NUMBER FV - 025

FLEET MANAGEMENT
POLICY / PROCEDURE

SUBJECT: No Idling Policy

APPROVED: _____
MARILYN L. RAWLINGS, FLEET MANAGER

APPROVED: _____
PETER WINTON, ASSISTANT COUNTY MANAGER

DISTRIBUTION:
Fleet Management

PURPOSE:
The purpose of this policy is to establish a uniform No Idling Policy.

Lee County realizes that vehicles that idle contribute to ozone formation due to the presence of two key ingredients in internal combustion engine emissions: nitrous oxides (NOX) and volatile organic compounds (VOC's). Idling vehicles produce unnecessary pollution that contribute to climate changes, smog and health problems, cause premature engine wear and waste fuel, which increases costs to our taxpayers. In addition, an idling vehicle gets 0 miles per gallon.

It is every Employee's responsibility to minimize Fleet's operating costs while reducing harmful effects to the environment.

PROCEDURE:
a) **Department/ Division Directors and area supervisors shall make certain that all employees and volunteers within their jurisdiction are instructed regarding this No Idling Policy.**
b) **With the exception of a warm-up period, not to exceed five (5) minutes at the beginning of the work shift, the policy of the County is that no vehicle will be left idling. Exceptions are listed in the Paragraph entitled "Exceptions to Policy".**
c) **Where applicable, electronic fuel controls will be set to shut down automatically after five (5) minutes of idle time.**
d) **The engines of unattended or unoccupied vehicles are to be turned off.**

RESPONSIBILITY AND AUTHORITY:
The Division of Fleet Management shall be responsible for the overall coordination and administration of this Policy in accordance with the direction of County Administration. The enforcement of this policy is assigned to Department Directors.

S:\FRONT OFFICE\POLICY-PROCEDURE\FV 025 No Idling Policy and Procedure.DOC 1

[72] http://www.leegov.com/gov/dept/Fleet/Documents/DocumentsandForms/FV%20025.pdf

DEFINITIONS:

Employee- Paid and unpaid employees of Lee County Government including County staff, volunteers and contracted staff.

Vehicle- Any licensed/unlicensed motor vehicle or equipment (on-road/off-road) owned, leased, or fueled by Lee County.

EXCEPTIONS TO POLICY:

a) **Public Safety vehicles, such as Fire trucks, EMS, Sheriff and Police vehicles, while engaged in operational activities.**
b) **Vehicles that are required to idle to power ancillary equipment mounted on the vehicle without risking damage to the battery, i.e. warning devices, hoists, lift gates, hydraulic equipment or lights.**
c) **Vehicles equipped with temperature sensitive equipment, i.e. Animal Control vehicles.**
d) **The primary propulsion engine of a motor vehicle providing a power source necessary for mechanical operation, not including propulsion, and/or passenger compartment heating or air conditioning.**
e) **A motor vehicle forced to remain motionless because of traffic conditions over which the operator has no control.**
f) **The primary engine of a motor vehicle being operated for maintenance or diagnostic purposes.**

Revision Date: May 2010

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TERRY COLE
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TO: **FPPAEA**
FROM: **Terry Cole and Hillary Copeland**
DATE: **June 19, 2008**
RE: **Passage of Diesel Idling Rule 62-285.420 by ERC**

Today the Environmental Regulation Commission ("ERC") unanimously passed Rule 62-285.420, Florida Administrative Code, entitled "Heavy-Duty Vehicle Idling Reduction." This rule prohibits on-road, heavy-duty diesel engine powered vehicles from idling for more than 5 consecutive minutes, with several exemptions. Heavy-duty diesel engine powered vehicle means a vehicle with a gross vehicle weight rating equal to or greater than 8,500 pounds, used to transport passengers or freight, that is used on roads for a commercial, governmental, or public purpose. There are a number of exemptions granted by the rule, covering situations where idling may be necessary.

The rule applies to owners or operators of the vehicles, not to property owners. The maximum penalty for a violation is $1,000. However, the Department of Environmental Protection ("DEP") stressed that compliance assistance, through education and outreach, is the preferred method of enforcing the rule.

The ERC accepted two amendments to the rule proposed by DEP. The first amendment clarified that cargo refrigeration units and waste collection vehicles, during normal collection operations, are exempt from the idling prohibition. This exemption only applies to companies that either own or operate these types of vehicles. The second amendment established the rule's effective date as December 15, 2008.

The rule passed with limited comments from the public. A representative of the Florida Trucking Association stated that the Association accepted the rule, as amended, and she noted that DEP had worked closely with the group during formation of the rule. A representative of Florida Operations Network voiced a few concerns with the rule as it applies to mass transit, but ultimately accepted the rule. Finally, a representative of the Southern Alliance for Clean Energy proposed many stringent changes to the rule, including extending the rule to apply to off-road vehicles. The ERC did not adopt any of these proposed changes.

Several new Commissioners were introduced. They noted this was the first of a number of rules that would be coming before them to address CO2 emissions and climate change. The new Chairperson, Don Ross, conducted the meeting very well.

If you have any questions regarding this, please let us know.