Natural Gas Vehicle Feasibility Study 2014

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EXECUTIVE SUMMARY

Executive Summary

Natural gas is a domestically produced, abundant and clean burning fuel that is primarily used for home heating, industry and power generation in the United States. According to the US Energy Information Annual Energy Outlook, natural gas used for transportation equates to less than 1% of total natural gas consumed. This percentage is expected to increase in the coming years based on the reasonable price of natural gas fuel compared to the relatively high price of petroleum based fuels. The biggest challenge to natural gas use for transportation overall is fleets cannot convert their vehicles without a place to fuel, and fueling stations are a risk to build without proven demand. In order for natural gas vehicles to become as popular as their petroleum powered counterparts, fuel must be available and convenient.

The Brewer-Garrett Company was hired in June of 2013 to complete a study on the feasibility of building a compressed natural gas (CNG) fueling station and converting multiple fleets in the community that would benefit from such a station. A group of partners in Seneca County collaborated to be a part of the study, providing detailed information on their existing vehicles including past and future driving forecasts and planned replacements. This group consists is a mix of private companies, city and county government departments and local schools.

Section 1: Cost Benefit Analysis of CNG Infrastructure

The type of CNG infrastructure and where it can be placed can take many different forms. This section begins with mapping the location of each partner on one map to get a visual of placement possibilities. Then it describes the pros and cons of the two types of CNG fueling options, time-fill and fast-fill stations, and where installing each would make sense. The possibility of making the station open to the public is explored so average daily traffic will be taken into consideration.

Projected fueling units of each fleet are calculated in Section 2 of this report. The individual fueling volume is added together to project the total fuel volume for the station for the next five years. This five year demand is essential in determining the initial size of a station and a benchmark for its opportunity and success.

Section 2: Opportunity Analysis of Partner Fleet Conversion

Every vehicle in each participating partner fleet is analyzed for the benefits of fuel conversion to CNG. This section explains the conversion options available on the market today and strategies for converting fleets. It then defines assumptions used in conversion analysis in regards to projected rates of gasoline, diesel fuel and CNG. The cost of conversions will be different for every type of vehicle due to engineering a conversion package for each type of vehicle, total number of like packages purchased, and fuel capacity. Assumed conversion costs for this analysis were broken down into 5 categories to incorporate all types of over 400 vehicles in the study. An overview of emission benefits, performance differences and CNG vehicle safety are also included in this section.

The report contains an individual opportunity analysis for each partner. These detailed analyses are found immediately following Section Three and each partner can skip directly to their personalized report of their own fleet. The analysis takes into account miles driven in the past, fuel economy in miles per gallon (MPG), current regular routes traveled, the difference of current and projected fuel cost and projected conversion costs. Overall vehicle life and forecasted vehicle purchases are considered in the viability of conversion versus new vehicle purchases. The payback of each vehicle is determined on a high, medium and low cost difference between the price they pay for conventional fuel and the projected price of CNG. For partners with immediate opportunity, sample cash flows are created to show potential 10 year savings.

Section 3: Shared Natural Gas Purchasing Power

The larger the volume of throughput for the CNG station, the lower rate the utility will provide for the partners. This is a significant reason for the community to join together in this shared project. Natural Gas is purchased from utilities in units of a thousand cubic feet (MCF). When enough demand is created at the station (18,000 MCF), users will be sharing in the best possible rate available from the utility, which will mean lower prices per unit of CNG.

PARTNER LIST / MAP

Partner List

North Central Ohio Educational Service Center
928 West Market Street, Suite A
Tiffin, OH 44883

City of Tiffin
51 East Market Street
Tiffin, OH 44883

Seneca County
111 Madison Street
Tiffin, OH 44883

Tiffin City Schools
244 South Monroe Street
Tiffin, OH 44883

Seneca East Local Schools
13343 East US Hwy 224
Attica, OH 44807

Seneca County Agency Transportation (SCAT)
3140 S St Rt 100, Suite F
Tiffin, OH 44883

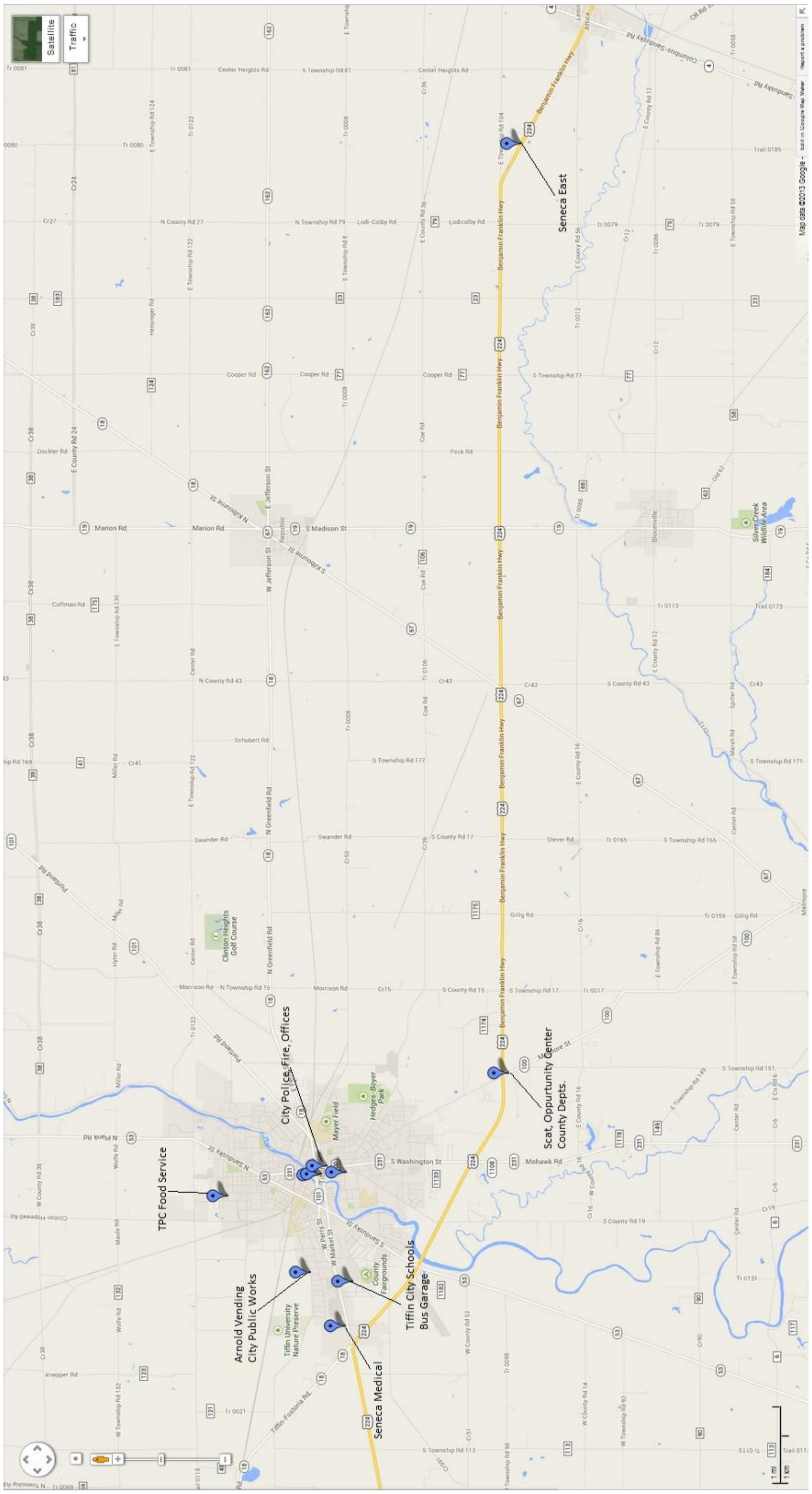
North Central Academy (NCA)
928 West Market Street, Suite B
Tiffin, OH 44883

Arnold Vending
646 Miami Street
Tiffin, OH 44883

Seneca Medical, Inc
85 Shaffer Park Drive
Tiffin, OH 44883

TPC Food Service
265 Sixth Avenue
Tiffin, OH 44883

Partner Map


Seneca East
City Police, Fire, Offices
TPC Food Service
Scat, Oppurtunity Center
County Depts.
Arnold Vending
City Public Works
Tiffin City Schools
Bus Garage
Seneca Medical

COST BENEFIT ANALYSIS
OF NG INFRASTRUCTURE

Section 1: Cost Benefit Analysis of CNG Infrastructure

1.1 Mapping of Partners and Natural Gas Lines

Natural gas infrastructure must be strategically located to serve all of the potential CNG fleets in the study. Convenience of fueling for vehicle operators helps to mitigate the stresses of changes to daily routines and fleet managers do not have to pay operators for additional time to drive extra miles to the pump. The partner map on page 5 shows where each partner is located. The main grouping of fleets is located in and around Tiffin, OH. Figure 1.1.1 draws out the strategic location of medium pressure natural gas lines located in Tiffin, OH. The selection of these highlighted areas for construction of CNG infrastructure is explained in Section 1.3.

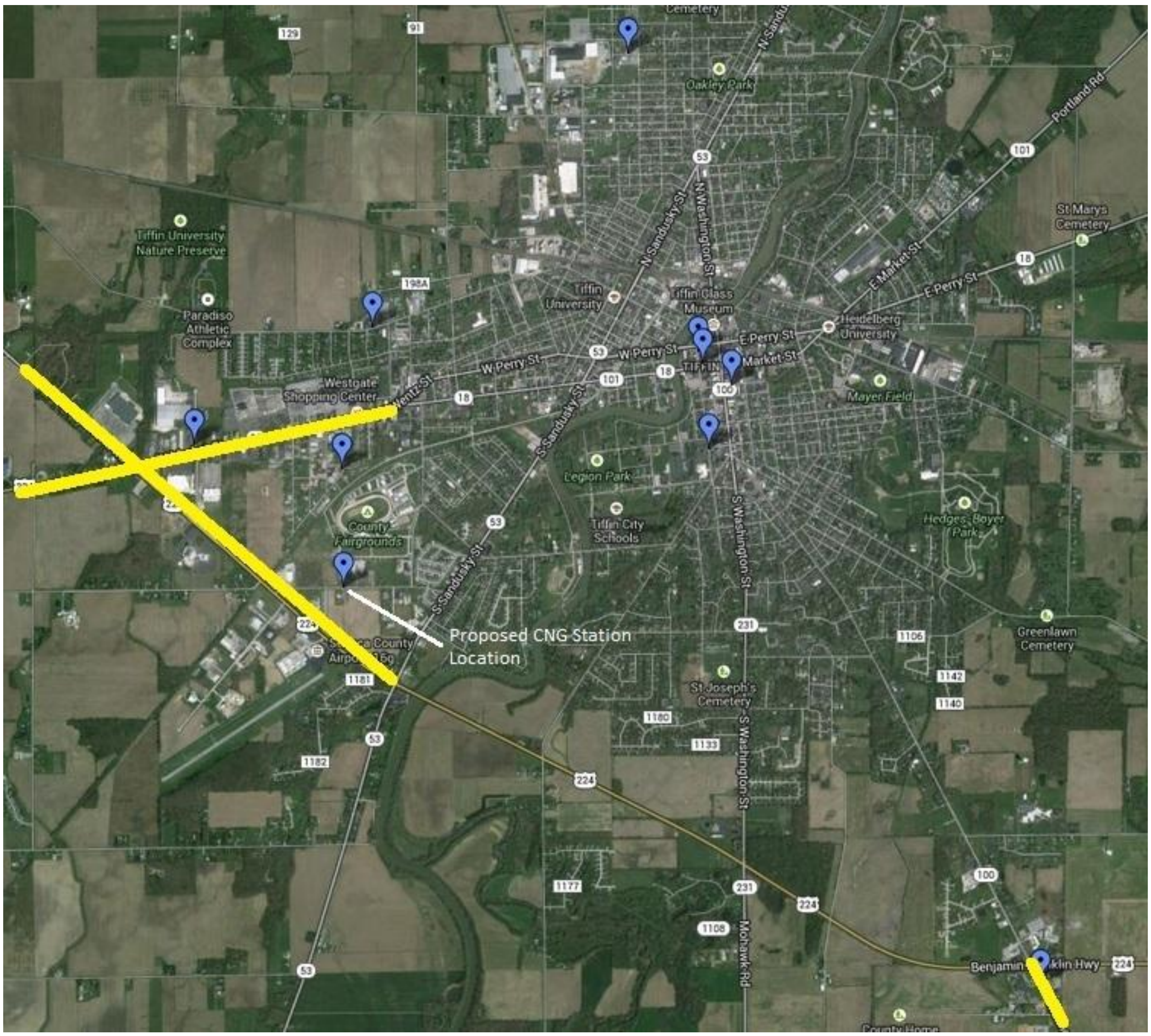


Figure 1.1.1 – Location of Medium Pressure Gas Lines in Tiffin, OH

Seneca East Local Schools parks their fleet of school buses at a garage in Attica, OH. Due to its distance away from the ideal location of a station in Tiffin, OH, separate CNG infrastructure would serve the bus fleet more effectively. Figure 1.1.2 maps the location of medium pressure natural gas lines near the bus garage. The yellow line is located very near the southeast corner of the bus garage property.

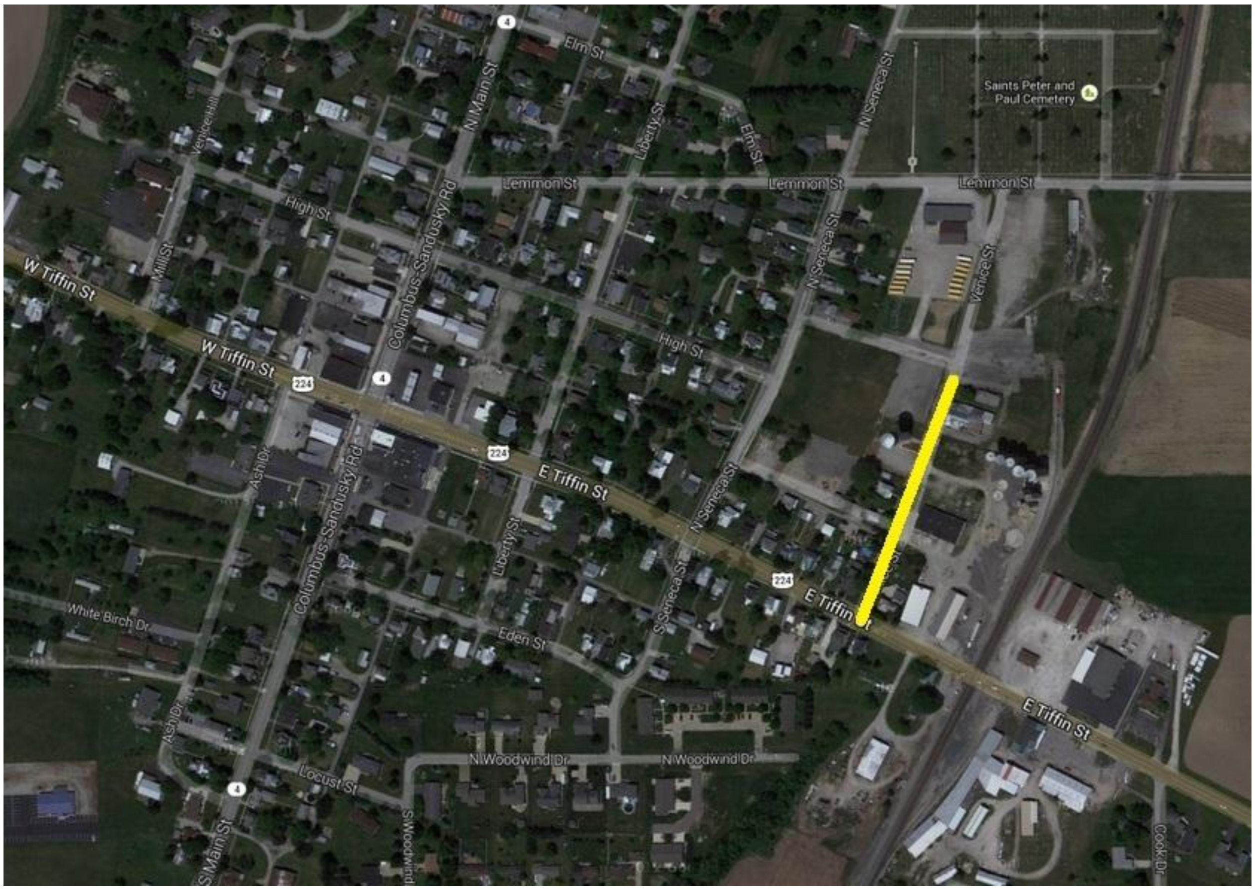


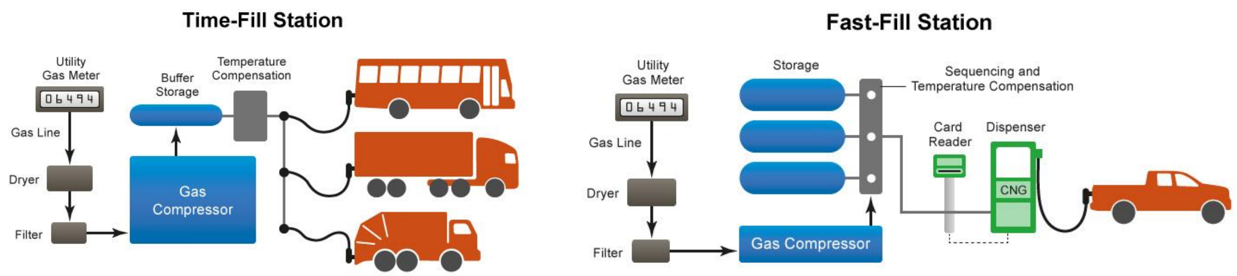
Figure 1.1.2 – Location of natural gas line by Seneca East bus garage

1.2 Fast-Fill vs. Time-Fill Stations

CNG fueling infrastructure options available:

Time-Fill Station

Time-fill stations can be characterized as fueling while a vehicle is parked. This setup is ideal for a fleet of vehicles that are parked overnight or for long periods of time outside at a home location. Natural gas is compressed and distributed to individual parking spaces through a series of poles and hoses. Time-fill stations require a lower capital investment than fast-fill stations but are limited by fueling capacity and time it takes to fill the fuel tank. An example of this scenario would be a school bus driver runs a daily route and at the end of the day connects a hose to the vehicle and by the morning has a full tank of CNG.



Source: US Department of Energy
http://www.afdc.energy.gov/fuels/natural_gas_cng_stations.html

Figure 1.2.1 – Visual Representation of Time-Fill and Fast-Fill Fueling Stations

Fast-Fill Station

A fast-fill fueling station dispenses CNG at a rate and overall experience similar to existing gasoline and diesel stations. Fast-fill stations are necessary when dealing with multiple fleets located in different locations and public access. Fast-fill stations require a larger initial capital investment but have the ability to spread costs over a larger pool of consumers by being available to be used by more people.

Combination-Fill Station

A combination-fill station combines a fast-fill station with time-fill availability in the same location. This setup is ideal for a large vehicle fleet that wants to invest in CNG infrastructure for its own fleet, and also wants to make it available to other users to recoup capital costs and develop community infrastructure. Another advantage of a combo-fill station is that a fleet can use the time-fill option when it has the time, but top off or fill at the fast-fill pumps when time is constrained.

1.3 Alternative Fueling Units Explained

Units of measure for traditional vehicle fuel in the United States are provided in gallons for gasoline and diesel. While the properties of liquids accurately allow for dealing with them in terms of volume, gases can occupy a different amount of space depending on the temperature and pressure. CNG used for vehicles is natural gas compressed to 3600 psi; therefore standardized terms are used to compare fuels based on how much energy is contained in the fuel and not the volume it occupies.

Gasoline Gallon Equivalent (GGE)

A GGE refers to the amount of energy in the volume of one gallon of gasoline.
1 GGE = 114,000 BTU

Diesel Gallon Equivalent (DGE)

A DGE refers to the amount of energy in the volume of one gallon of diesel fuel.
1 DGE = 129,500 BTU = 1.136 x GGE

Fuel Type	Unit of Measure	BTUs/Unit	Gallon Equivalent
Gasoline (regular)	gallon	114,100	1.00 gallon
Diesel #2	gallon	129,500	0.88 gallons
Biodiesel (B100)	gallon	118,300	0.96 gallons
Biodiesel (B20)	gallon	127,250	0.90 gallons
Compressed Natural Gas (CNG)	cubic foot	900	126.67 cu. ft.
Liquid Natural Gas (LNG)	gallon	75,000	1.52 gallons
Propane (LPG)	gallon	84,300	1.35 gallons
Ethanol (E100)	gallon	76,100	1.50 gallons
Ethanol (E85)	gallon	81,800	1.39 gallons
Methanol (M100)	gallon	56,800	2.01 gallons
Methanol (M85)	gallon	65,400	1.74 gallons
Electricity	kilowatt hour (Kwh)	3,400	33.56 Kwhs

Source: alternativefuels.about.com

Table 1.3.1 – Alternative Fuel Energy Equivalents

1.4 Strategic Placement of Fueling Stations

The first step in locating ideal sites for fueling infrastructure starts by analyzing the partner map on page 5. The main grouping of fleets is located within 4 miles of each other in the City of Tiffin. This map shows how one fast-fill station could support all of the fleets in the Tiffin area. To locate a possible fast-fill station in Tiffin, OH two main factors need to be addressed: the location of existing natural gas lines and the best location based on fleet traffic.

Installing new gas lines can represent a large capital investment, therefore placing a station near existing gas lines has the potential for a quicker install time and less initial cost. In order to get the natural gas into onboard CNG storage at 3600 psi, compressors are staged and store the gas at a higher pressure to handle instantaneous fueling demand. Therefore, the higher the pressure of the incoming CNG, the more efficient and quickly the station can compress the gas for use. Medium pressure natural gas lines are found throughout the city and near strategic areas for a fast-fill fueling station (high pressure is not available in the area). According to the Tiffin Loop Road Feasibility Study in 2002, the area with the highest Average Daily Traffic, especially for high volume users such as trucks is along US 224 between the intersections of SR 18 and SR 100. Medium gas pressure natural gas lines are highlighted in Figure 1.1.1 along this route.

An ideal parcel of vacant land has been located near medium pressure gas lines on CR 54 near US 224. The lot is 4.7 acres and already cleared and ready for construction. It can be developed large enough for larger vehicles to navigate, accommodate fueling traffic, and leave room for capacity expansion as popularity grows.

Seneca East High School is located roughly 15 miles from the center of the main grouping of fleets with its bus garage located 2 miles east, which is farther away from Tiffin. Their potential converted school bus fleet could not be solely supported by a fast-fill station located in Tiffin. Seneca East's school bus fleet runs regular routes in accordance with the school schedule, and returns to the bus garage when not driving and at the end of the day. Due to its fleets' route pattern, and because they park outside in the same location every day, Seneca East has an opportunity to install its own time-fill station located at the exterior of the bus maintenance garage. A medium pressure gas line is located near the property shown in figure 1.1.3. The yellow line represents the medium pressure line running up Venice Street waiting to be taken to the bus property. By fueling as the bus is parked, the fueling time is reduced for operators and they benefit with a cleaner fueling experience.

1.5 Quantity of Fueling Units

In order to design the size of the station needed by the partners in the study, the projected fueling needs of each entity must be determined. In the tabs of this report, all of the vehicle fleets are analyzed by miles driven, age, and payback potential. Table 1.4.1 combines the projected needs of the partner fleets for a 5 year period.

Year	Projected CNG Use (GGE)							
	Seneca Medical	TPC	Arnold Vending	SCAT	Public	Sub Total	School Buses	Total
1	46,800	32,750	28,350	35,000	21,000	163,900	19,322	183,222
2	54,600	36,025	37,800	42,000	22,050	192,475	25,762	218,237
3	58,500	39,300	47,250	49,000	23,153	217,203	32,202	249,405
4	66,300	42,575	47,250	52,500	24,310	232,935	38,642	271,577
5	70,200	45,850	47,250	52,500	25,526	241,326	45,082	286,408
Total	296,400	196,500	207,900	231,000	116,038	1,047,838	161,010	1,208,848

Table 1.4.1 – Potential CNG Use

The fast-fill fueling station in Tiffin, OH will also be open to the public. In sizing the station, CNG pumped by entities who are not partners in this study are taken into consideration. Fueling sales from the City of Dublin station in Columbus, OH were analyzed for the added fueling their station has experienced. These numbers were adjusted for the population difference of Dublin and Tiffin and are shown for a 5 year period. The initial CNG use in year one was escalated 5% per year to project for 10 years.

School buses also have to be considered in the sizing of the fast-fill station. Although school buses consume a large amount of fuel, the available CNG school buses are sold a very high premium. The price difference for a like-to-like CNG school bus is approximately $40,000 more than its diesel counterpart. Despite the high initial cost, CNG school buses have the potential to pay back over their life cycle, but in most cases they break even. The school bus market is advancing rapidly, and with engine manufacturers coming out with more appropriate sized engines than current larger duty forced into the buses now, the premium could be reduced to a cost that will generate significant savings. Also, funding is available through grants for CNG school buses. Even with their high cost, buses will be sought after by schools with accessible fueling infrastructure.

1.6 Design Considerations of the CNG Fueling Station

The 5 year forecast of CNG use in Table 1.4.1 is used to determine the initial sizing options of the fast-fill fueling infrastructure. Stations should be built with future expansion in mind as CNG demand in the area has the potential to grow. The key is to build the station large enough to handle initial oncoming load, while keeping it small enough to keep the capital investment at an affordable level. The projected CNG demand for the station in year 1 is 183,000 GGE, while after 5 years it grows to 286,000 GGE. This 5 year forecast should be the target size of the station and the ideal station capacity for this study ranges between 250,000 to 300,000 GGE/year.

This new station will be the only place to fuel a CNG vehicle in a 20 mile radius. Therefore, redundancy is a major issue for the building of the station. Redundancy is achieved by designing the station with multiple pieces of equipment so that if a compressor fails, vehicles will still be able to be fueled. Although building redundant equipment raises the initial cost of the station, the reliability will be a selling point to fleets in the area who are weighing conversions of their fleets to CNG.

The physical footprint of the CNG station must also be taken into consideration. The largest vehicles in the study that have a favorable payback are tractors with trailers. The station must be large enough to handle multiple tractors at a time plus space for overflow should all the installed dispensers be occupied at the same time so as not to disturb traffic patterns. There also needs to be enough room for these large vehicles to maneuver at the station.

OPPORTUNITY ANALYSIS
PARTNER FLEET CONVERSION

Section 2: Opportunity Analysis of Partner Fleet Conversion

2.1 Types of CNG Vehicles

Dedicated

A dedicated CNG vehicle is powered only by CNG. CNG is the only fuel stored on the vehicle and the engine system can only burn CNG.

Bi-Fuel

A bi-fuel vehicle is an "OR" vehicle. CNG and gasoline are stored on the vehicle in separate fuel systems. The switch of the fuels can be automatic or manual. For example, when CNG is present, the vehicle will default to burning it for maximum savings. If the CNG tank is emptied while driving, it automatically and seamlessly switches to burning gasoline. The switch can also be made with a manual switch by the vehicle operator.

Dual Fuel

Dual Fuel vehicles can be thought of as "AND" vehicles. Because diesel engines use compression for combustion, they cannot be converted to burn exclusively natural gas which needs a spark plug to cause ignition. Therefore, these vehicles inject roughly a 50-50 split of CNG and diesel for power, but in some cases a higher ratio of CNG to diesel fuel can be achieved (60-40, 70-30, etc…). Dual Fuel vehicles cannot run on CNG alone, but if the CNG tank is empty, they will operate solely on diesel.

Each fleet operator must decide if converting vehicles to CNG is right for them. If it is, the next step is to develop a conversion strategy. One way to convert a fleet is to completely replace all petroleum powered vehicles with dedicated CNG powered vehicles. This method will see the largest annual savings immediately, but costs the most up front to implement. Additionally, there is always the risk of the vehicle running out of fuel in a remote location far from any CNG stations. Furthermore, by purchasing all new vehicles, the displaced vehicles must be sold or discarded and fleet managers might not recoup their residual value.

For some fleets, a hybrid conversion strategy works best. An example would be to convert existing vehicles using bi-fuel or duel fuel conversions where the payback is shorter than the remaining vehicle life. Older vehicles not initially converted are replaced with new CNG powered models as they retire.

2.2 Existing Fuel Rates

In this analysis, current fuel rates are taken at the rate provided by each partner. For reference, the average retail fuel prices for the past 13 years are displayed in Figure 2.2.1 according to the Alternative Fuels Data Center. Keep in mind that the fuel prices are in cost per GGE, so energy wise, diesel fuel and gasoline are almost equal in price.

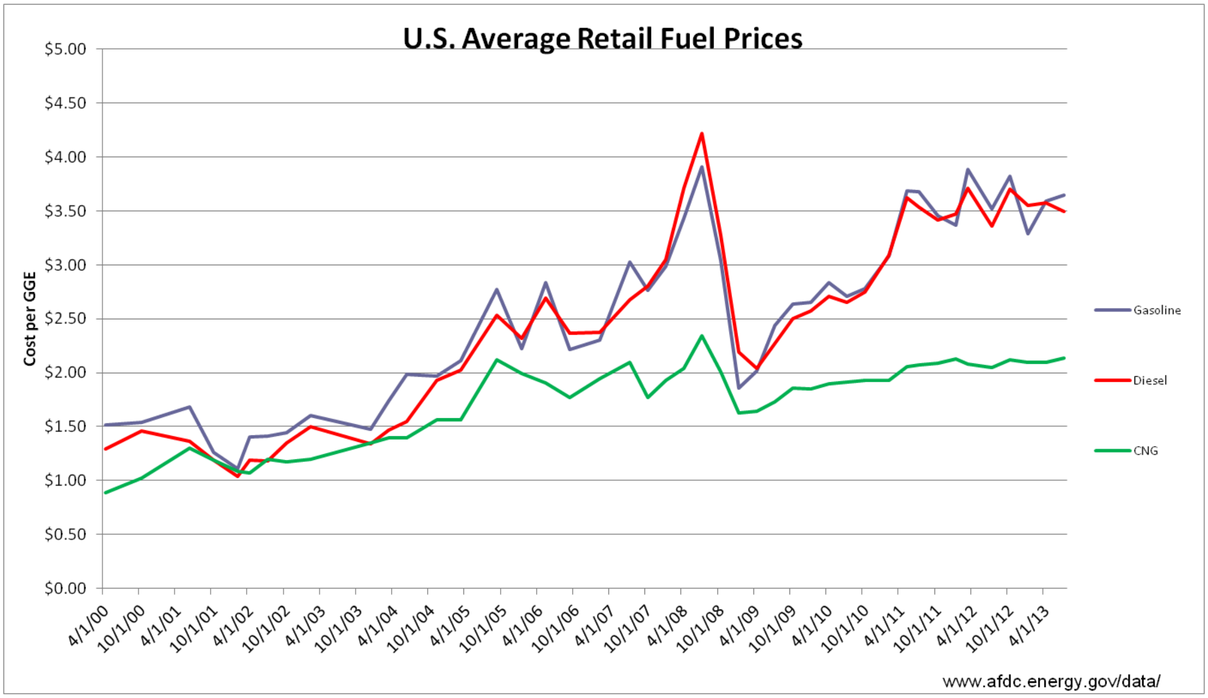


Figure 2.2.1 – Past and Current Retail Fuel Prices

Just looking at Figure 2.2.1, it is easy to see the allure of using natural gas as a vehicle fuel. Ever since late 2003, CNG has been the more affordable fuel for vehicles. As this gap has spread, CNG technology has progressed and more stations are being constructed throughout the country.

Federal excise taxes are imposed on liquid fuels such as gasoline and diesel. Public entities are exempt from paying such taxes. The public entities pay approximately $.50 less per gallon of fuel than the private entities as illustrated in the individual opportunity analyses.

2.3 Projected Fuel Rates

The projected price paid for CNG by the partners in this study depends on many variables. The main components in the price of CNG are natural gas, electrical compression, operations and maintenance, and a capital amortization component to pay off the initial investment. An example of what a fuel rate could look like is displayed in Table 2.3.1.

CNG Cost Component	per GGE
Natural Gas Cost	$0.75
Electric Compression	$0.15
Operations and Maintenance	$0.40
Capital Amortization	$0.50
Total CNG Cost	$1.80

Table 2.3.1 – Example Price of a Cost of CNG per GGE

Depending on how the station is engineered, built and funded the costs in Table 2.3.1 could change. The analysis in this report takes CNG rates on a low, medium and high case. Savings calculated are based on the difference of the current rate of fuel and three projected rates for CNG. Figure 2.3.2 shows the fuel price projections from the Annual Energy Outlook 2014 Early Release. This graph effectively shows that the price disparity of petroleum fuels and CNG will remain pronounced for the foreseeable future.

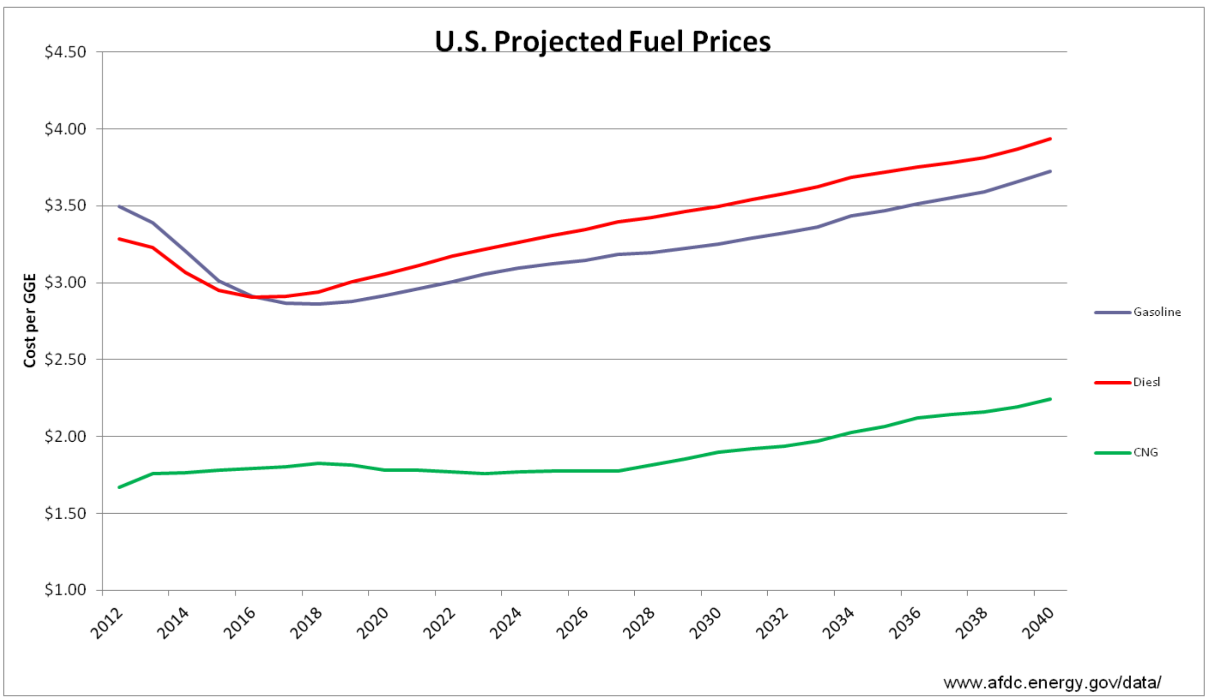


Figure 2.3.2 – Fuel Price Projections to 2040

2.4 Cost of Conversion

Payback for each conversion depends on two factors. One is the difference of the current fuel price paid and the new cost of CNG, and the other is how much money is paid for the vehicle conversions. With the long list of vehicles in this study, the CNG conversion cost was broken down into 5 different categories. They are listed below in Table 2.4.1.

Conversion type	Code	Cost
regular bi-fuel	A	$8,000
large bi-fuel	B	$10,000
regular dual-fuel	C	$12,000
large dual fuel	D	$20,000
school bus incremental	E	$40,000

Table 2.4.1

The code listed in the table corresponds to the projected type of conversion listed in the analysis tabs. These costs are simplified for this analysis and are meant to give an approximate idea of what to expect. When discussions begin to take place about converting vehicles, each vehicle or type of vehicle will get a custom conversion setup and cost.

The payback of the vehicle conversion must also take the residual value of the components into consideration. One of the largest portions of the conversion costs is the price of the CNG tanks themselves. Correct sizing of the tanks based on range is the first way to keep cost down, but the tank's value after the vehicle is retired must also be considered. CNG tanks are rated for 20 years of useful life. This rating cannot be extended, but in almost all cases the tanks in a conversion will outlast the life of the vehicle. Therefore, each vehicle conversion system will be modularly engineered to be able to remove the expensive part of the conversion and reuse it on the next vehicle that takes its place. For example, most vehicles in this study with heavy use are taken off the road or used as spares after 10 years on the high end. In this example, the tanks in the conversion can serve at least two (2) life cycles of vehicles.

2.5 CNG Emissions, Performance and Safety

Emissions

Natural gas (CH_4) is a low carbon fuel and burns cleaner than gasoline (C_8H_{18}) and diesel ($C_{16}H_{34}$). According to the California Air Resources Board (CARB) using natural gas as a vehicle fuel can reduce greenhouse gas emissions by 20-30%.

Performance

CNG vehicle performance is similar to their gasoline counterparts in normal driving conditions. One thing to keep in mind is that CNG tanks are pressurized, so where gasoline vehicles perform the same until empty, CNG vehicles gradually drop in power as the pressure reduces.

The only passenger CNG vehicle sold on the market, the 2012 Honda CNG, is a dedicated vehicle with fuel efficiency of 27 city/38 highway. Compare that with a similar gasoline powered 2012 Honda Civic of 28 city/39 highway fuel efficiency. In this case, fuel economy is barely affected, but the CNG version has less power.

As for school buses, the Bluebird CNG powered bus has 250-280 HP while the equivalent diesel version comes in at 200-280. The equivalent HP is due to the CNG engine being larger to create the same amount of power. This fact, along with the slightly heavier CNG tanks over diesel tanks reduces the overall fuel economy of the CNG powered buses from 5-15%.

Dual fuel vehicles actually experience a significant increase in power over diesel only versions. Fuel economy in this setup is unchanged or slightly better.

Safety

Natural gas vehicles are very similar to gasoline and diesel vehicles. The majority of the vehicle remains unchanged other than the fuel distribution system. The tanks are extremely durable and have strict standards for tank safety. Tanks are US Department of Transportation approved with expiration dates to assure tank integrity over time. Regular visual inspections must be performed, and since they are so rugged, damage to the tank will be noticeable by a trained inspector.

Properties of the natural gas itself make it safer than gasoline or diesel. CNG is lighter than air and dissipates into the atmosphere if a leak occurs, where liquid fuel pools on the ground as a fire hazard. In order for natural gas to ignite, the correct proportion of gas in the air must be present, between 5 and 15%, and with natural gas dissipation, this concentration does not happen for long. The ignition temperature is relatively high for natural gas, almost double that of the ignition temperature for gasoline.

Re-fueling a CNG tank is a much cleaner experience than fueling with a liquid fuel. Because it is lighter than air, on the off chance some gas does escape during fueling, it dissipates into the air instead of spraying out of the tank or getting on hands and clothes.

SHARED NATURAL GAS
PURCHASING POWER

Section 3: Shared Natural Gas Purchasing Power

Building one fast-fill fueling station to serve multiple partner needs creates a better position in negotiating with the natural gas company, and in turn achieves a better CNG rate for everyone. Deposits are paid for the installation of natural gas pipeline infrastructure expansion to the gas utility. When the utility recognizes large oncoming use, this deposit is typically waived.

The rate paid to the utility is also dependent on volume of commodity use. For a natural gas use of over 18,000 MCF per year with at least 50% of the use coming in the summer (profile of a public CNG station), the account qualifies for a special LGS rate. This shared natural gas use could mean a reduction of $.10 to $.20 per GGE paid at the pump.

Table 3.1 shows the amount of natural gas used per year based on how much fuel is pumped. The target amount fuel use at the station to qualify for the LGS rate is 161,871 GGE.

GGE/year	MCF/year
100,000	11,120
125,000	13,900
150,000	16,680
161,871	18,000
175,000	19,460
200,000	22,240

Table 3.1 – Natural Gas Use In Terms of Fuel Pumped

TAB 1: CITY OF TIFFIN

City of Tiffin CNG Opportunity Analysis

Police Department

Scheduled Replacement: 2 new cruisers per year

The City of Tiffin Police Department has a fleet of 14 vehicles. Eight of these vehicles drive regular patrols and cover a significant amount of miles per year. The Police Department buys gasoline and diesel tax free, therefore they pay a relatively low rate for fuel. Vehicles are changed out at a rate of approximately 2 cruisers per year and ideally at 90,000 miles or 3 to 4 years. The payback of a conversion under these conditions is break even at best because of the continual replacement of vehicles at low miles. There are other issues hurting the opportunity including a reduction in trunk space for the CNG tanks, which is where officers store their gear. Also, the officers indicated they base vehicle purchasing decisions on results of tests conducted by the Michigan State Police Vehicle Evaluations. As of now, they have not conducted tests on natural gas vehicles. The other six vehicles do not drive enough miles to be candidates for conversions.

Conclusion: It is not recommended that the Tiffin Police Department convert their existing vehicles to run on CNG. However, options such as using interceptors, an SUV type police vehicle with more trunk space, or a reduction of gear could make CNG powered vehicles viable to Tiffin Police in the future, contingent on positive feedback from the Michigan State Police Vehicle Evaluation.

Tiffin Fire Rescue

Scheduled Replacement: 1 new engine in 3 years
1 new command vehicle in 2 years

Tiffin Fire Rescue maintains a fleet of 12 vehicles located in multiple locations. Overall, none of the vehicles in the fleet drive enough miles per year to justify the conversion to natural gas. The fire department receives fuel tax free making their rate relatively low. Also, the chief indicated that reliability is seen as the top priority for the fire fleets vehicles. Although the natural gas conversions are reliable, adding another point of complexity to the fuel system is not desired.

Conclusion: It is not recommended that Tiffin Fire Rescue should convert their vehicles to CNG at this time.

City of Tiffin Public Works

5 year Scheduled Replacements: New sweeper, dump truck, backhoe, jet truck and pickup

The City of Tiffin Public Works maintains a fleet of 21 vehicles. They range from medium to heavy duty and mainly travel in the city limits of Tiffin, OH. Some are seasonal vehicles such as the tractor and backhoe. Although some of the vehicles are used every day, they do not get driven a significant amount of miles. The information provided did not include the odometer readings of all vehicles, but during the interview it was clear that the light use of these vehicles does not fit the profile of successful conversion candidates.

Conclusion: It is not recommended that the City of Tiffin Public Works should convert their existing vehicles to CNG at this time. Sweeper trucks are generally a good prospect for a CNG and the replacement in the 5 year forecast should be evaluated as a new purchase.

City of Tiffin Public Works

Year	Make	Model	Odometer (miles)	Main Fuel Type	Flex Fuel?	Return to Same Place at Night?	Estimated Fuel Economy (MPG)
1993	Ford	Cargo 7000		Diesel	no	yes	
2004	INT	Dump Tk		Diesel	no	yes	
2009	INT	Dump Tk		Diesel	no	yes	
2009	Ford	F250		Gasoline	no	yes	
2010	Ford	F250		Gasoline	no	yes	
2002	Ford	F150	110,000	Gasoline	no	yes	
2002	INT			Diesel	no	yes	
2008	Ford	F350		Diesel	no	yes	
2008	Ford	F350		Diesel	no	yes	
1997	Ford	F250		Gasoline	no	yes	
1998	INT	Dump Tk		Diesel	no	yes	
2000	INT	Dump Tk		Diesel	no	yes	
1998	Ford	Backho		Diesel	no	yes	
2001	Dodge	F250	90,000	Gasoline	no	yes	
2001	Ford	F350		Diesel	no	yes	
2002	Ford	F450		Diesel	no	yes	
2002	Dodge	Dakota		Gasoline	no	yes	
2007	INT	Bucket Truck		Diesel	no	yes	
1995	Ford	Distributor		Diesel	no	yes	
2010	444K Loader	Deere		Diesel	no	yes	
2004	JD	Tractor 5420		Diesel	no	yes	

Tiffin Fire Rescue

Days Per Year
250

Cost per	Low	Medium	High
GGE	$1.70	$1.90	$2.20
DGE	$1.92	$2.15	$2.49

Existing Fuel Cost	
Gasoline	$3.00
Diesel	$3.50

Year	Make	Model	Odometer (miles)	Main Fuel Type	Flex Fuel?	Return to Same Place at Night?	Estimated Fuel Economy (MPG)	Years	MPY	GPY	DGE/GGE per day	Savings Low Case	SPB	Savings Med Case	SPB	Savings High Case	SPB	Conversion Type	Cost
1972	Peter Pirsch	80CT	57670	Diesel	no	yes	1.44	41	1,407	977	2.0	$637	31.38	$521	38.36	$347	57.59	D	20000
1981	L.T.I.	CFLC-3064	25479	Diesel	no	yes	1.6	32	796	498	1.0	$325	61.59	$266	75.30	$177	113.05	D	20000
1992	Grumman	Fire Cat	55537	Diesel	no	yes	3.19	21	2,645	829	1.7	$541	36.97	$442	45.20	$295	67.86	D	20000
2001	Seagrave	TB50CM	65109	Diesel	no	yes	3.26	12	5,426	1,664	3.3	$1,086	18.42	$888	22.51	$592	33.80	D	20000
2001	Ford	E-450	54006	Diesel	no	yes	3.3	12	4,501	1,364	2.7	$890	22.47	$728	27.48	$485	41.25	D	20000
2002	Seagrave	LR06CM	23279	Diesel	no	yes	2.33	11	2,116	908	1.8	$593	33.74	$485	41.26	$323	61.94	D	20000
2002	Ford	E-450	53243	Diesel	no	yes	9.4	11	4,840	515	1.0	$336	59.52	$275	72.77	$183	109.26	D	20000
2004	Ford	F-250	9653	Gasoline	no	yes	7.1	9	1,073	151	0.6	$184	43.59	$152	52.69	$104	76.75	A	8000
2005	Seagrave	TB50DA	32849	Diesel	no	yes	3.06	8	4,106	1,342	2.7	$876	22.84	$716	27.93	$477	41.93	D	20000
2005	Ford	Explorer	52041	Gasoline	no	yes	18	8	6,505	361	1.4	$439	18.22	$363	22.03	$249	32.08	A	8000
2006	Ford	Crown Vic	35498	Gasoline	no	yes	12	7	5,071	423	1.7	$513	15.58	$425	18.84	$292	27.44	A	8000
2008	GMC	TC4V042	44491	Diesel	no	yes	6.2	5	8,898	1,435	2.9	$937	21.36	$766	26.11	$510	39.20	D	20000

Tiffin Police Department

Days Per Year
250

Cost per	Low	Medium	High
GGE	$1.70	$1.90	$2.20
DGE	$1.92	$2.15	$2.49

Existing Fuel Cost	
Gasoline	$3.00
Diesel	$3.50

Year	Make	Model	Odometer (miles)	Main Fuel Type	Flex Fuel?	Return to Same Place at Night?	Estimated Fuel Economy (MPG)	Years	MPY	GPY	DGE/GGE per day	Savings Low Case	SPB	Savings Med Case	SPB	Savings High Case	SPB	Conversion Type	Cost
1991	Ford	Econline van	71,974	Diesel	no	yes	10	22	3,272	327	0.7	$213	46.84	$175	57.27	$116	85.98	B	10000
2002	Chevy	Impala	44378	Gasoline	no	no	19	11	4,034	212	0.8	$258	38.76	$213	46.86	$147	68.25	B	10000
2003	Ford	Taurus	74,446	Gasoline	no	no	19	10	7,445	392	1.6	$476	21.01	$394	25.39	$270	36.99	B	10000
2003	Ford	Taurus	81,061	Gasoline	no	no	19	10	8,106	427	1.7	$518	19.29	$429	23.32	$294	33.97	B	10000
2003	Ford	F150	68,564	Gasoline	no	yes	14	10	6,856	490	2.0	$595	16.81	$492	20.32	$338	29.59	B	10000
2008	Ford	Crown Vic	163,459	Gasoline	no	yes	18	5	32,692	1,816	7.3	$2,207	4.53	$1,825	5.48	$1,253	7.98	B	10000
2010	Ford	Crown Vic	91,156	Gasoline	no	yes	18	3	30,385	1,688	6.8	$2,051	4.88	$1,697	5.89	$1,165	8.59	B	10000
2010	Ford	Crown Vic	83,717	Gasoline	no	yes	18	3	27,906	1,550	6.2	$1,884	5.31	$1,558	6.42	$1,070	9.35	B	10000
2011	Ford	Crown Vic	44,091	Gasoline	no	yes	18	2	22,046	1,225	4.9	$1,488	6.72	$1,231	8.12	$845	11.83	B	10000
2011	Ford	Crown Vic	40,316	Gasoline	no	yes	18	2	20,158	1,120	4.5	$1,361	7.35	$1,125	8.89	$773	12.94	B	10000
2012	Dodge	Charger	40,314	Gasoline	no	yes	18	1	40,314	2,240	9.0	$2,721	3.67	$2,251	4.44	$1,545	6.47	B	10000
2012	Dodge	Charger	33,102	Gasoline	no	yes	18	1	33,102	1,839	7.4	$2,234	4.48	$1,848	5.41	$1,269	7.88	B	10000
2013	Dodge	Charger	13,367	Gasoline	no	yes	18	1	13,367	743	3.0	$902	11.08	$746	13.40	$512	19.52	B	10000
2013	Dodge	Charger	9,028	Gasoline	no	yes	18	1	9,028	502	2.0	$609	16.41	$504	19.84	$346	28.90	B	10000

TAB 2: SENECA COUNTY

Seneca County CNG Opportunity Analysis

Seneca County Sheriff Department

Scheduled Replacements: 2 cars per year

The Seneca County Sheriff Department faces many of the same challenges for CNG fuel conversion as the Tiffin Police Department. The sheriff explained that the trunks of the cruisers are used almost as a locker for the officers. They are always packed with equipment. Plus, as all of the public entities, the relatively low gasoline prices paid due to being tax exempt makes for a longer payback. Some vehicles do drive a significant amount of miles, but CNG is not a good solution for the Sheriff department.

Conclusion: It is not recommended that the Seneca County Sheriff convert their fleet to CNG at this time.

Seneca County Engineer

Scheduled Replacements: unknown

The Seneca County Engineer has a fleet of 43 vehicles. The average age of the fleet is over 12 years old. From this, it is assumed that most of the vehicles do not cover a lot of miles per year.

Conclusion: It is not recommended that the Seneca County Engineer convert their fleet to CNG at this time based on the information provided.

Seneca County Department of Disabilities (DD)

Scheduled Replacements: 3 buses and 3 transit vans in the next 5 years

The Seneca County Department of Disabilities has a fleet of 8 transit vans and 12 school buses that service 16 daily routes. What sets the DD apart from most other schools is that they transport students from the entire county and they operate year round. With this increased usage, some of these vehicles are candidates for conversion. Vehicles are replaced with the schedule of 250,000 miles or 12 years.

The cost of CNG school buses currently carries a $40,000 premium over a like for like diesel bus and at that price, the vehicle will pay off by the end of life. CNG school bus technology is advancing as the industry grows. New engines are being developed especially for school buses that will bring down the premiums in the future. This development is happening rapidly, and as the premium decreases the overall savings for the school increases. Financial incentives are also available to schools for the purchase of new CNG school buses.

Conclusion: Seneca County DD should convert its bus fleet to CNG with financial incentives. The CNG buses should be placed on the longest daily routes to maximize savings. As the cost of CNG buses decreases, Seneca County DD should replace retiring buses with CNG powered versions. Also, converting existing transit vans and purchasing new CNG vans should be considered.

Other County Departments

This category covers the county departments that are not covered in the departments above. This includes: Clerk of Courts, Crosswaeh, Dog Warden, EMA, EMS, Job and Family Services, Juvenile Court, Maintenance, Soil and Water, Veteran Services, and the Youth Center. This fleet contains 72 vehicles. Out of all of these vehicles, only a few of them might break even before they are replaced, and none are ideal candidates for conversion based on economics. As the popularity of CNG grows and the price of conversions and new CNG vehicles decreases, it might make sense to replace some with a CNG vehicle, but at this point, these are not good candidates for conversion.

Conclusion: It is not recommended that these County Departments convert their vehicles to CNG at this time based on economics, but added benefits of decreased emissions and supporting the community CNG station could play a role in evaluating feasibility.

County Sheriff Department

Year	Make	Model	Odometer (miles)	Main Fuel Type	Flex Fuel?	Return to Same Place at Night?	Estimated Fuel Economy (MPG)
1999	Chevrolet	Express Van					
2001	Ford	Econoline					
2002	Ford	Explorer					
2003	Ford	Crown Vic					
2003	Ford	Crown Vic					
2003	Ford	Crown Vic					
2003	Dodge	Durango					
2004	Ford	Crown Vic					
2004	Ford	Crown Vic					
2005	Ford	Crown Vic	129500	Gasoline	no	yes	
2005	Ford	Crown Vic	185049	Gasoline	no	yes	19
2005	Ford	Crown Vic	136326	Gasoline	no	yes	18
2006	Ford	Crown Vic					
2006	Buick	Rendezvous					
2006	GMC	Savanna					
2007	Ford	Crown Vic					
2007	Ford	Crown Vic	151925	Gasoline		yes	
2007	Ford	Crown Vic	149710	unleaded	no	yes	18
2007	Ford	Crown Vic	127527	unleaded	no	yes	18
2007	Dodge	Caravan					
2009	Ford	Crown Vic	89390	unleaded	yes	yes	19
2010	Ford	Crown Vic	84957	unleaded	yes	yes	23
2010	Ford	Crown Vic					
2011	Ford	Crown Vic					
2011	Ford	Crown Vic					
2011	Ford	Crown Vic					
2012	Dodge	Charger					
2012	Dodge	Charger					
2012	Ford	E350					
2013	Ford	Explorer					

County Engineer

Days Per Year
250

Cost per	Low	Medium	High
GGE	$1.70	$1.90	$2.20
DGE	$1.92	$2.15	$2.49

Existing Fuel Cost	
Gasoline	$3.29
Diesel	$3.60

Year	Make	Model	Odometer (miles)	Main Fuel Type	Flex Fuel?	Return to Same Place at Night?	Estimated Fuel Economy (MPG)	Years	MPY	GPY	DGE/GGE per day	Savings Low Case	SPB	Savings Med Case	SPB	Savings High Case	SPB	Conversion Type	Cost
1987	International		185632	Diesel	no	yes	12	26	7,140	595	1.2	$417	48.02	$346	57.83	$240	83.41	D	20000
1990	International		169615	Diesel	no	yes	12	23	7,375	615	1.2	$430	46.49	$357	55.99	$248	80.75	D	20000
1990	International		198659	Diesel	no	yes	12	23	8,637	720	1.4	$504	39.69	$418	47.81	$290	68.95	D	20000
1991	International		169676	Diesel	no	yes	12	22	7,713	643	1.3	$450	44.45	$374	53.54	$259	77.22	D	20000
1991	International		152621	Diesel	no	yes	12	22	6,937	578	1.2	$405	49.42	$336	59.52	$233	85.84	D	20000
1992	International		76529	Diesel	no	yes	12	21	3,644	304	0.6	$213	94.08	$177	113.31	$122	163.42	D	20000
1992	International		188989	Diesel	no	yes	12	21	8,999	750	1.5	$525	38.09	$436	45.88	$302	66.17	D	20000
1993	GMC		220865	Gasoline	no	yes	12	20	11,043	920	3.7	$1,385	7.22	$1,192	8.39	$902	11.09	B	10000
1995	International		57597	Diesel	no	yes	12	18	3,200	267	0.5	$187	107.14	$155	129.04	$107	186.11	D	20000
1995	International		183010	Diesel	no	yes	12	18	10,167	847	1.7	$593	33.72	$492	40.61	$341	58.57	D	20000
1995	International		185241	Diesel	no	yes	12	18	10,291	858	1.7	$600	33.31	$498	40.12	$346	57.87	D	20000
1995	International		338489	Diesel	no	yes	12	18	18,805	1,567	3.1	$1,097	18.23	$911	21.96	$632	31.67	D	20000
1995	International		210113	Diesel	no	yes	12	18	11,673	973	1.9	$681	29.37	$565	35.37	$392	51.02	D	20000
1996	Ford		120529	Gasoline	no	yes	12	17	7,090	591	2.4	$889	11.25	$765	13.07	$579	17.27	B	10000
1997	Jeep			Gasoline	no	yes	12	16	0	0	0.0	$0	0.00	$0	0.00	$0	0.00	B	10000
1999	Ford		151549	Gasoline	no	yes	12	14	10,825	902	3.6	$1,358	7.37	$1,168	8.56	$884	11.31	B	10000
1999	International		134364	Diesel	no	yes	12	14	9,597	800	1.6	$560	35.72	$465	43.02	$322	62.05	D	20000
1999	International		26201	Diesel	no	yes	12	14	1,872	156	0.3	$109	183.19	$91	220.63	$63	318.21	D	20000
2000	Chevrolet		128492	Diesel	no	yes	12	13	9,884	824	1.6	$577	34.69	$479	41.78	$332	60.25	D	20000
2000	GMC		124226	Gasoline	no	yes	12	13	9,556	796	3.2	$1,198	8.34	$1,031	9.70	$780	12.81	B	10000
2001	International		133307	Diesel	no	yes	12	12	11,109	926	1.9	$648	30.86	$538	37.17	$373	53.61	D	20000
2001	International		184447	Diesel	no	yes	12	12	15,371	1,281	2.6	$897	22.30	$744	26.86	$516	38.74	D	20000
2001	International		198215	Diesel	no	yes	12	12	16,518	1,376	2.8	$964	20.76	$800	25.00	$555	36.05	D	20000
2002	Ford		113309	Diesel	no	yes	12	11	10,301	858	1.7	$601	33.28	$499	40.09	$346	57.81	D	20000
2002	International		126980	Diesel	no	yes	12	11	11,544	962	1.9	$673	29.70	$559	35.77	$388	51.59	D	20000
2002	International		172113	Diesel	no	yes	12	11	15,647	1,304	2.6	$913	21.91	$758	26.39	$525	38.06	D	20000
2003	Ford			Diesel	no	yes	12	10	0	0	0.0	$0	0.00	$0	#DIV/0!	$0	0.00	D	20000
2003	Ford			Gasoline	no	yes	12	10	0	0	0.0	$0	0.00	$0	#DIV/0!	$0	0.00	B	10000
2004	Ford		119227	Diesel	no	yes	12	9	13,247	1,104	2.2	$773	25.88	$642	31.17	$445	44.95	D	20000
2005	Ford		97327	Gasoline	no	yes	12	8	12,166	1,014	4.1	$1,526	5.24	$1,313	6.09	$994	8.05	A	8000
2005	Ford		112730	Diesel	no	yes	12	8	14,091	1,174	2.3	$822	24.33	$683	29.30	$473	42.26	D	20000
2005	International		98447	Diesel	no	yes	12	8	12,306	1,025	2.1	$718	27.86	$596	33.55	$413	48.39	D	20000
2005	International		71094	Diesel	no	yes	12	8	8,887	741	1.5	$518	38.58	$430	46.46	$298	67.01	D	20000
2007	International		81770	Diesel	no	yes	12	6	13,628	1,136	2.3	$795	25.16	$660	30.30	$458	43.70	D	20000
2007	International		72804	Diesel	no	yes	12	6	12,134	1,011	2.0	$708	28.25	$588	34.03	$408	49.08	D	20000
2009	International		31803	Diesel	no	yes	12	4	7,951	663	1.3	$464	43.12	$385	51.93	$267	74.90	D	20000
2009	International		36736	Diesel	no	yes	12	4	9,184	765	1.5	$536	37.33	$445	44.96	$308	64.84	D	20000
2011	Ford		38481	Gasoline	no	yes	12	2	19,241	1,603	6.4	$2,413	4.14	$2,076	4.82	$1,571	6.36	B	10000
2011	Ford		16747	Gasoline	no	yes	12	2	8,374	698	2.8	$1,050	9.52	$904	11.07	$684	14.62	B	10000
2013	International		2050	Diesel	no	yes	12	1	2,050	171	0.3	$120	167.24	$99	201.42	$69	290.50	D	20000
2013	International		1742	Diesel	no	yes	12	1	1,742	145	0.3	$102	196.80	$84	237.04	$59	341.87	D	20000

Year	Make	Model	Odometer (miles)	Main Fuel Type	Flex Fuel?	Return to Same Place at Night?	Estimated Fuel Economy (MPG)	Years	MPY	GPY	DGE/GGE per day	Savings Low Case	SPB	Savings Med Case	SPB	Savings High Case	SPB	Conversion Type	Cost
2013	Ford	F150	1832	Gasoline	no	yes	12	1	1,832	153	0.6	$230	43.52	$198	50.58	$150	66.84	B	10000
2013	Ford	F350	52	Gasoline	no	yes	12	1	52	4	0.0	$7	1533.35	$6	1782.00	$4	2354.79	B	10000

County Department of Disabilities

Days Per Year
250

Cost per	Low	Medium	High
GGE	$1.70	$1.90	$2.20
DGE	$1.92	$2.15	$2.49

Existing Fuel Cost	
Gasoline	$3.29
Diesel	$3.60

Year	Make	Model	Odometer (miles)	Main Fuel Type	Flex Fuel?	Return to Same Place at Night?	Estimated Fuel Economy (MPG)	Years	MPY	GPY	DGE/GGE per day	Savings Low Case	SPB	Savings Med Case	SPB	Savings High Case	SPB	Conversion Type	Cost
2005	Blue Bird	School Bus	177525	Diesel	No	yes	8	8	22,191	2,774	11.1	$4,383	9.13	$3,724	10.74	$2,735	14.63	E	40000
2005	International	Truck	133627	Diesel	No	yes	8	8	16,703	2,088	8.4	$3,299	12.12	$2,803	14.27	$2,059	19.43	E	40000
2006	Ford	Eldorado	207141	Diesel	No	yes	14	7	29,592	2,114	4.2	$1,480	8.11	$1,229	9.77	$852	14.09	C	12000
2006	International	School Bus	143335	Diesel	No	yes	8	7	20,476	2,560	10.2	$4,044	9.89	$3,436	11.64	$2,524	15.85	E	40000
2006	International	School Bus	194477	Diesel	No	yes	8	7	27,782	3,473	13.9	$5,487	7.29	$4,662	8.58	$3,424	11.68	E	40000
2006	Ford	Cutaway Van	152038	Gas	No	yes	14	7	21,720	1,551	6.2	$2,335	4.28	$2,009	4.98	$1,520	6.58	B	10000
2007	International	School Bus	112529	Diesel	No	yes	8	6	18,755	2,344	9.4	$3,704	10.80	$3,147	12.71	$2,312	17.30	E	40000
2008	International	School Bus	125716	Diesel	No	yes	8	5	25,143	3,143	12.6	$4,966	8.05	$4,219	9.48	$3,099	12.91	E	40000
2008	International	School Bus	120517	Diesel	No	yes	8	5	24,103	3,013	12.1	$4,761	8.40	$4,045	9.89	$2,971	13.46	E	40000
2008	Dodge	Grand Caravar	26819	Gas	No	yes	21	5	5,364	255	1.0	$384	26.01	$331	30.23	$250	39.95	B	10000
2008	Dodge	Grand Caravar	31209	Gas	No	yes	21	5	6,242	297	1.2	$447	22.35	$385	25.98	$291	34.33	B	10000
2009	International	School Bus	112529	Diesel	No	yes	8	4	28,132	3,517	14.1	$5,556	7.20	$4,721	8.47	$3,467	11.54	E	40000
2009	International	School Bus	112529	Diesel	No	yes	8	4	28,132	3,517	14.1	$5,556	7.20	$4,721	8.47	$3,467	11.54	E	40000
2010	Ford	Transit	12375	Gas	No	yes	24	3	4,125	172	0.7	$259	38.66	$223	44.93	$168	59.37	B	10000
2010	Dodge	Town & Count	9160	Gas	No	yes	21	3	3,053	145	0.6	$219	45.70	$188	53.11	$142	70.18	B	10000
2011	International	School Bus	59997	Diesel	No	yes	8	2	29,999	3,750	15.0	$5,925	6.75	$5,034	7.95	$3,697	10.82	E	40000
2012	International	School Bus	39747	Diesel	No	yes	8	1	39,747	4,968	19.9	$7,850	5.10	$6,670	6.00	$4,899	8.17	E	40000
2012	International	School Bus	39107	Diesel	No	yes	8	1	39,107	4,888	19.6	$7,724	5.18	$6,562	6.10	$4,820	8.30	E	40000
2012	Ford	Goshen 16 Pas	18240	Diesel	No	yes	14	1	18,240	1,303	2.6	$912	13.16	$757	15.85	$525	22.85	C	12000
2012	Ford	Goshen 16 Pas	24273	Diesel	No	yes	14	1	24,273	1,734	3.5	$1,214	9.89	$1,008	11.91	$699	17.17	C	12000

Other County Departments

Days Per Year
250

Cost per	Low	Medium	High
GGE	$1.70	$1.90	$2.20
DGE	$1.92	$2.15	$2.49

Existing Fuel Cost	
Gasoline	$3.29
Diesel	$3.60

Year	Make	Model	Odometer (miles)	Main Fuel Type	Flex Fuel?	Return to Same Place at Night?	Estimated Fuel Economy (MPG)	Years	MPY	GPY	DGE/GGE per day	Savings Low Case	SPB	Savings Med Case	SPB	Savings High Case	SPB	Conversion Type	Cost
1994	Ford	Ambulance	44,000	Diesel	no	yes	8	19	2,316	289	0.6	$203	98.69	$168	118.87	$117	171.44	D	20000
1995	Ford	Ambulance	48,000	Diesel	no	yes	8	18	2,667	333	0.7	$233	85.71	$194	103.23	$134	148.88	D	20000
1996	Ford	Ambulance	42,000	Diesel	no	yes	8	17	2,471	309	0.6	$216	92.51	$179	111.42	$124	160.70	D	20000
1997	Ford	Ambulance	83,000	Diesel	no	yes	10	16	5,188	519	1.0	$363	55.07	$302	66.33	$209	95.67	D	20000
1999	Ford	Ambulance	36,000	Diesel	no	yes	10	14	2,571	257	0.5	$180	111.10	$149	133.82	$104	193.00	D	20000
2001	MCCOY MILLER	Ambulance	34,000	Diesel	no	yes	8	12	2,833	354	0.7	$248	80.67	$206	97.16	$143	140.12	D	20000
2005	Ford	Ambulance	30,000	Diesel	no	yes	8	8	3,750	469	0.9	$328	60.95	$272	73.41	$189	105.87	D	20000
2005	Ford	Ambulance	25,000	Diesel	no	yes	8	8	3,125	391	0.8	$273	73.14	$227	88.09	$157	127.05	D	20000
2008	Horton	Ambulance	14,000	Diesel	no	yes	14	5	2,800	200	0.4	$140	142.85	$116	172.05	$81	248.14	D	20000
2008	Horton	Ambulance	30,000	Diesel	no	yes	14	5	6,000	429	0.9	$300	66.66	$249	80.29	$173	115.80	D	20000
1986	Ford	F350	92499	Gasoline	no	no	20	27	3,426	171	0.7	$258	46.55	$222	54.10	$168	71.48	C	12000
1988	Chevrolet		150397	Gasoline	no	no	20	25	6,016	301	1.2	$453	22.09	$390	25.67	$295	33.92	B	10000
1990	Chevrolet		175630	Gasoline	no	no	20	23	7,636	382	1.5	$575	17.40	$494	20.23	$374	26.73	B	10000
1992	Chevrolet	VAN	90841	Gasoline	no	no	20	21	4,326	216	0.9	$326	24.58	$280	28.56	$212	37.74	A	8000
1995	GMC	1500	101256	Gasoline	no	yes	20	18	5,625	281	1.1	$423	18.90	$364	21.96	$276	29.02	A	8000
1995	Dodge	Caravan	123301	Gasoline	no	yes	20	18	6,850	343	1.4	$515	15.52	$444	18.04	$336	23.83	A	8000
1995	Ford	F150	810758	Gasoline	no	no	20	18	45,042	2,252	9.0	$3,389	2.36	$2,916	2.74	$2,207	3.62	A	8000
1995	GMC	Sierra 2500	119091	Gasoline	no	yes	20	18	6,616	331	1.3	$498	16.07	$428	18.67	$324	24.68	A	8000
1997	Dodge	Caravan	160,000	Gasoline	no	yes	16	16	10,000	625	2.5	$941	8.50	$809	9.88	$613	13.06	A	8000
1997	Dodge	Caravan		Gasoline	no	no	20	16	0	0	0.0	$0	0.00	$0	0.00	$0	0.00	A	8000
1997	Dodge	Caravan		Gasoline	no	no	20	16	0	0	0.0	$0	0.00	$0	0.00	$0	0.00	A	8000
1997	Mercury	Villager	66869	Gasoline	no	yes	20	16	4,179	209	0.8	$314	25.44	$271	29.56	$205	39.07	A	8000
2000	Dodge	Dakota	150000	Gasoline	no	yes	14	13	11,538	824	3.3	$1,240	6.45	$1,067	7.50	$808	9.90	A	8000
2000	Pontiac	Grand Am	125107	Gasoline	no	no	20	13	9,624	481	1.9	$724	11.05	$623	12.84	$472	16.97	A	8000
2000	Dodge	Grand	114434	Gasoline	no	yes	21	13	8,803	419	1.7	$631	12.68	$543	14.74	$411	19.47	A	8000
2000	GMC	Savanna	91710	Gasoline	no	yes	14	13	7,055	504	2.0	$758	10.55	$653	12.26	$494	16.20	A	8000
2000	GMC	Savanna	90828	Gasoline	no	yes	14	13	6,987	499	2.0	$751	10.65	$646	12.38	$489	16.36	A	8000
2000	GMC	Savanna	100300	Gasoline	no	yes	14	13	7,715	551	2.2	$829	9.65	$714	11.21	$540	14.81	A	8000
2000	GMC	Savanna	105582	Gasoline	no	yes	14	13	8,122	580	2.3	$873	9.16	$751	10.65	$569	14.07	A	8000
2000	GMC	Sierra K250	105000	Gasoline	no	yes	12	13	8,077	673	2.7	$1,013	7.90	$872	9.18	$660	12.13	A	8000
2000	Ford	Windstar	199036	Gasoline	no	yes	20	13	15,310	766	3.1	$1,152	6.94	$991	8.07	$750	10.66	A	8000
2002	Dodge	Dakota	87511	Gasoline	no	yes	8	11	7,956	994	4.0	$1,497	6.68	$1,288	7.77	$975	10.26	B	10000
2003	Dodge	Caravan	74,108	Gasoline	yes	yes	23	10	7,411	322	1.3	$485	16.50	$417	19.17	$316	25.34	A	8000
2003	Ford	Windstar	111430	Gasoline	no	yes	20	10	11,143	557	2.2	$839	9.54	$722	11.09	$546	14.65	A	8000
2004	Nissan	350Z	69852	Gasoline	no	yes	18	9	7,761	431	1.7	$649	12.33	$558	14.33	$423	18.93	A	8000
2004	GMC	Savanna	183761	Gasoline	no	no	20	9	20,418	1,021	4.1	$1,536	5.21	$1,322	6.05	$1,000	8.00	A	8000
2004	Chevrolet	Venture	106496	Gasoline	no	yes	20	9	11,833	592	2.4	$890	8.98	$766	10.44	$580	13.80	A	8000
2005	Ford	Freestar	86,728	Gasoline	no	yes	20	8	10,841	542	2.2	$816	9.81	$702	11.40	$531	15.06	A	8000
2005	Ford	Freestar	82,821	Gasoline	no	yes	20	8	10,353	518	2.1	$779	10.27	$670	11.93	$507	15.77	A	8000
2005	Chevrolet	Malibu	111,488	Gasoline	no	yes	24	8	13,936	581	2.3	$874	9.15	$752	10.64	$569	14.06	A	8000
2005	Dodge	Stratus	86585	Gasoline	no	yes	18	8	10,823	601	2.4	$905	8.84	$779	10.27	$589	13.58	A	8000

Year	Make	Model	Odometer (miles)	Main Fuel Type	Flex Fuel?	Return to Same Place at Night?	Estimated Fuel Economy (MPG)	Years	MPY	GPY	DGE/GGE per day	Savings Low Case	SPB	Savings Med Case	SPB	Savings High Case	SPB	Conversion Type	Cost
2005	Ford	Taurus	127732	Gasoline	no	no	20	8	15,967	798	3.2	$1,201	6.66	$1,034	7.74	$782	10.23	A	8000
2006	Arctic Cat	650	5057	Gasoline	no	yes	8	7	722	90	0.4	$136	73.58	$117	85.51	$88	113.00	B	10000
2006	Dodge	Charger	54,983	Gasoline	no	yes	22	7	7,855	357	1.4	$537	14.89	$462	17.30	$350	22.86	A	8000
2006	Ford	Expedition	125,000	Gasoline	no	yes	14	7	17,857	1,276	5.1	$1,920	4.17	$1,652	4.84	$1,250	6.40	A	8000
2006	Ford	F150	77539	Gasoline	no	yes	16	7	11,077	692	2.8	$1,042	7.68	$897	8.92	$678	11.79	A	8000
2006	Ford	F150	77091	Gasoline	no	yes	16	7	11,013	688	2.8	$1,036	7.72	$891	8.98	$675	11.86	A	8000
2007	Ford	F150	68664	Gasoline	no	yes	8	6	11,444	1,431	5.7	$2,153	4.64	$1,852	5.40	$1,402	7.13	B	10000
2007	Chevrolet	Uplander	23240	Gasoline	no	no	20	6	3,873	194	0.8	$291	27.45	$251	31.90	$190	42.15	A	8000
2008	Dodge	Avenger	94,627	Gasoline	no	yes	26	5	18,925	728	2.9	$1,095	7.30	$943	8.49	$713	11.21	A	8000
2008	Chevrolet	Cobalt	26182	Gasoline	no	yes	20	5	5,236	262	1.0	$394	20.30	$339	23.59	$257	31.18	A	8000
2008	Ford	Edge	65716	Gasoline	no	yes	22	5	13,143	597	2.4	$899	8.90	$774	10.34	$585	13.66	A	8000
2008	Ford	F150	36662	Gasoline	no	yes	8	5	7,332	917	3.7	$1,379	7.25	$1,187	8.43	$898	11.13	B	10000
2008	Ford	F150	52918	Gasoline	no	yes	8	5	10,584	1,323	5.3	$1,991	5.02	$1,713	5.84	$1,296	7.71	B	10000
2008	Ford	F250 Super Du	25490	Gasoline	no	yes	8	5	5,098	637	2.5	$959	10.43	$825	12.12	$625	16.01	B	10000
2008	Ford	Fusion	37988	Gasoline	no	yes	20	5	7,598	380	1.5	$572	13.99	$492	16.26	$372	21.49	A	8000
2008	Jeep	Liberty	55,000	Gasoline	no	yes	21	5	11,000	524	2.1	$788	10.15	$678	11.79	$513	15.58	A	8000
2008	Chevrolet	Uplander	70499	Gasoline	no	yes	20.5	5	14,100	688	2.8	$1,035	7.73	$891	8.98	$674	11.87	A	8000
2009	Ford	Fusion	36,308	Gasoline	yes	yes	30	4	9,077	303	1.2	$455	17.57	$392	20.42	$297	26.98	A	8000
2009	GMC	Savanna	84942	Gasoline	no	yes	12	4	21,236	1,770	7.1	$2,663	3.00	$2,292	3.49	$1,734	4.61	A	8000
2010	Ford	Ranger	20685	Gasoline	no	yes	14	3	6,895	493	2.0	$741	10.79	$638	12.54	$483	16.58	A	8000
2011	Dodge	Caliber	25,863	Gasoline	no	yes	28	2	12,932	462	1.8	$695	11.51	$598	13.38	$453	17.68	A	8000
2012	Ford	Focus	28,428	Gasoline	no	yes	30	1	28,428	948	3.8	$1,426	5.61	$1,227	6.52	$929	8.61	A	8000
2012	Ford	Fusion	17382	Gasoline	no	yes	26	1	17,382	669	2.7	$1,006	7.95	$866	9.24	$655	12.21	A	8000
2012	Ford	Turtletop	9203	Gasoline	yes	yes	10	1	9,203	920	3.7	$1,385	7.22	$1,192	8.39	$902	11.09	B	10000
2013	Dodge	Avenger	2,189	Gasoline	no	yes	26	1	2,189	84	0.3	$127	63.14	$109	73.37	$83	96.96	A	8000
2013	Ford	Fusion	1956	Gasoline	no	yes	26	1	1,956	75	0.3	$113	70.66	$97	82.12	$74	108.51	A	8000
2013	Dodge	Grand	1000	Gasoline	yes	yes	25	1	1,000	40	0.2	$60	132.89	$52	154.44	$39	204.08	A	8000
2013	Dodge	Grand Caravar	1837	Gasoline	yes	yes	20	1	1,837	92	0.4	$138	57.87	$119	67.26	$90	88.88	A	8000
2013	Dodge	Grand Caravar	1445	Gasoline	yes	yes	20	1	1,445	72	0.3	$109	73.57	$94	85.50	$71	112.99	A	8000
2013	Chevrolet	Taho	25	Gasoline	yes	yes	18	1	25	1	0.0	$2	3827.24	$2	4447.88	$1	5877.55	A	8000
2013	Ford	Taurus	1762	Gasoline	yes	yes	23	1	1,762	77	0.3	$115	69.39	$99	80.64	$75	106.56	A	8000

TAB 3: TIFFIN CITY SCHOOLS

Tiffin City Schools CNG Opportunity Analysis

Scheduled Replacements: 10 new buses in the next 5 years (2 per year)

Tiffin City Schools has a large fleet of 25 school buses and 12 non-school buses. Of the 25 school buses, 18 run daily routes during the school year and seven are kept as backups. The routes vary in distance, but on average they drive 15,000 miles per year. With school bus fuel economy at an estimated 8 miles per gallon, there are significant savings to be had. The problem with purchasing CNG school buses is the initial capital cost. As of now, the incremental cost is approximately $40,000. That is relatively expensive compared to the savings, and the economics do not work out in most cases without the help of incentives. If Tiffin City Schools can secure grants for the initial cost of buses, they can save $2,000-$3,000 per year on fuel per route running bus.

CNG school bus technology is advancing as the industry grows. New engines are being developed especially for school buses that will bring down the premiums in the future. This development is happening rapidly and Tiffin City Schools should re-evaluate CNG powered buses for replacements on an annual basis.

There is not a significant money saving opportunity for converting the non school bus vehicles at this time. As the price of conversions become more affordable, some of these vehicles could be feasible to convert on a case by case basis.

Conclusion: Converting the bus fleet of Tiffin City Schools is recommended with financial incentives. When the school receives money for conversions the oldest route running buses should be converted first, and new buses would be dedicated CNG powered.

Tiffin City Schools

Days Per Year
250

Cost per	Low	Medium	High
GGE	$1.70	$1.90	$2.20
DGE	$1.92	$2.15	$2.49

Existing Fuel Cost	
Gasoline	$3.00
Diesel	$3.50

Year	Make	Model	Odometer (miles)	Main Fuel Type	Flex Fuel?	Return to Same Place at Night?	Estimated Fuel Economy (MPG)	Years	MPY	GPY	DGE/GGE per day	Savings Low Case	SPB	Savings Med Case	SPB	Savings High Case	SPB	Conversion Type	Cost
1992	FORD	Econoline	84646	Gasoline	no	yes	15	21	4,031	269	1.1	$326	30.63	$270	37.03	$185	53.93	B	10000
1993	international	thomas	252894	Diesel	no	yes	8	20	12,645	1,581	6.3	$2,339	17.10	$1,964	20.37	$1,400	28.56	E	40000
1994	international	wayne	144011	Diesel	no	yes	8	19	7,580	947	3.8	$1,402	28.52	$1,177	33.98	$839	47.65	E	40000
1995	international	wayne	133230	Diesel	no	yes	8	18	7,402	925	3.7	$1,369	29.21	$1,150	34.80	$820	48.80	E	40000
1995	FORD	F-800	80048	Diesel	no	yes	10	18	4,447	445	1.8	$658	60.77	$553	72.39	$394	101.52	E	40000
1996	international	carpenter	144598	Diesel	no	yes	8	17	8,506	1,063	4.3	$1,574	25.42	$1,321	30.28	$942	42.46	E	40000
1996	DODGE	Ram Van	65784	Gasoline	no	yes	14	17	3,870	276	1.1	$336	119.11	$278	144.00	$191	209.73	E	40000
1997	international	thomas	200398	Diesel	no	yes	8	16	12,525	1,566	6.3	$2,317	17.26	$1,945	20.56	$1,387	28.84	E	40000
1998	international	amtran	160581	Diesel	no	yes	8	15	10,705	1,338	5.4	$1,981	20.20	$1,663	24.06	$1,186	33.74	E	40000
1998	cummins	bluebird	194305	Diesel	no	yes	8	15	12,954	1,619	6.5	$2,397	16.69	$2,012	19.88	$1,435	27.88	E	40000
1998	cummins	thomas	138416	Diesel	no	yes	8	15	9,228	1,153	4.6	$1,707	23.43	$1,433	27.91	$1,022	39.14	E	40000
1999	international	bluebird	160277	Diesel	no	yes	8	14	11,448	1,431	5.7	$2,118	18.89	$1,778	22.50	$1,268	31.55	E	40000
2000	international	amtran	128935	Diesel	no	yes	8	13	9,918	1,240	5.0	$1,835	21.80	$1,540	25.97	$1,098	36.42	E	40000
2000	FORD	F-450	58311	Diesel	no	yes	10	13	4,485	449	0.9	$293	34.16	$239	41.77	$159	62.71	B	10000
2001	international	amtran	123104	Diesel	no	yes	8	12	10,259	1,282	5.1	$1,898	21.08	$1,593	25.11	$1,136	35.21	E	40000
2001	international	thomas	169630	Diesel	no	yes	8	12	14,136	1,767	7.1	$2,615	15.29	$2,195	18.22	$1,566	25.55	E	40000
2001	international	thomas	133298	Diesel	no	yes	8	12	11,108	1,389	5.6	$2,055	19.46	$1,725	23.19	$1,230	32.51	E	40000
2001	international	thomas	154342	Diesel	no	yes	8	12	12,862	1,608	6.4	$2,380	16.81	$1,998	20.02	$1,424	28.08	E	40000
2003	cummins	bluebird	155097	Diesel	no	yes	8	10	15,510	1,939	7.8	$2,869	13.94	$2,409	16.61	$1,718	23.29	E	40000
2003	cummins	bluebird	134896	Diesel	no	yes	8	10	13,490	1,686	6.7	$2,496	16.03	$2,095	19.09	$1,494	26.77	E	40000
2003	cummins	bluebird	205984	Diesel	no	yes	8	10	20,598	2,575	10.3	$3,811	10.50	$3,199	12.50	$2,281	17.53	E	40000
2006	cummins	thomas	83033	Diesel	no	yes	8	7	11,862	1,483	5.9	$2,195	18.23	$1,842	21.71	$1,314	30.45	E	40000
2006	cummins	thomas	164275	Diesel	no	yes	8	7	23,468	2,933	11.7	$4,342	9.21	$3,645	10.97	$2,599	15.39	E	40000
2006	cummins	thomas	141124	Diesel	no	yes	8	7	20,161	2,520	10.1	$3,730	10.72	$3,131	12.78	$2,233	17.91	E	40000
2007	dodge	ram 2500	34818	Gasoline	no	yes	10	6	5,803	580	2.3	$705	14.18	$583	17.15	$400	24.97	B	10000
2008	cummins	bluebird	60047	Diesel	no	yes	8	5	12,009	1,501	6.0	$2,222	18.00	$1,865	21.45	$1,330	30.07	E	40000
2009	international	int'l	48369	Diesel	no	yes	8	4	12,092	1,512	6.0	$2,237	17.88	$1,878	21.30	$1,339	29.87	E	40000
2009	ford	f-150	32190	Gasoline	no	yes	14	4	8,048	575	2.3	$698	14.32	$578	17.31	$397	25.21	B	10000
2010	GMC	Savanna	12096	Gasoline	yes	yes	14	3	4,032	288	1.2	$350	22.86	$289	27.64	$199	40.26	A	8000
2010	GMC	Canyon	19024	Gasoline	yes	yes	20	3	6,341	317	1.3	$385	20.77	$319	25.11	$219	36.57	A	8000
2010	JEEP	Commandor	56277	Gasoline	no	yes	16	3	18,759	1,172	4.7	$1,425	5.62	$1,178	6.79	$809	9.89	A	8000
2011	cummins	thomas	34265	Diesel	no	yes	8	2	17,133	2,142	8.6	$3,170	12.62	$2,661	15.03	$1,897	21.08	E	40000
2011	cummins	thomas	46681	Diesel	no	yes	8	2	23,341	2,918	11.7	$4,318	9.26	$3,625	11.03	$2,585	15.47	E	40000
2013	chevy	bluebird	8649	Gasoline	no	yes	12	1	8,649	721	2.9	$876	11.42	$724	13.81	$497	20.11	B	10000
2013	ford	f-250	2237	Gasoline	yes	yes	10	1	2,237	224	0.9	$272	36.79	$225	44.48	$154	64.79	B	10000
2014	cummins	bluebird	1376	Diesel	no	yes	8	1	1,376	172	0.7	$255	157.12	$214	187.18	$152	262.48	E	40000

TAB 4: SENECA EAST LOCAL SCHOOLS

Seneca East Local Schools CNG Opportunity Analysis

Scheduled Replacements: 6-10 new school buses in the next 5 years

Seneca East Local Schools has a fleet of 20 vehicles. 13 to 14 of these school buses drive daily routes and the remaining buses are kept as backups. These route running buses drive an average of 17,000 miles. Seneca East is a tax exempt school and pays a relatively low price for vehicle fuel at $3.47 per gallon of diesel. With an estimated fuel economy of a bus at 8 miles per gallon, a CNG powered bus would save a significant amount of money over a diesel bus, between $2,000 and $3,000, but there are some obstacles to conversion.

One obstacle is that the Seneca East bus garage is located far enough away from Tiffin to not take advantage of a shared fast-fill fueling CNG station. Therefore, Seneca East would have to build its own fueling infrastructure to service its bus fleet.

Another obstacle is the CNG incremental cost over a standard diesel bus. Current cost of a CNG bus is about a $40,000 premium. At this rate, the cost of conversion would not break even for the school to pay for themselves. When incentives become available for new buses and infrastructure, CNG powered buses will save the district money.

CNG School bus technology is advancing as the industry grows. New engines are being developed, especially for school buses, which will bring down the premiums in the future. This development is happening rapidly and Seneca East's planned replacement buses should leave the option open for CNG.

Conclusion: In order to support CNG buses, Seneca East must build its own time-fill fueling station. It is recommended that Seneca East Local Schools convert its fleet to CNG and build a time-fill station. If Seneca East can procure fueling infrastructure, CNG replacement buses should be evaluated for purchase.

Seneca East Local School District

Days Per Year
250

Cost per	Low	Medium	High
GGE	$1.70	$1.90	$2.20
DGE	$1.92	$2.15	$2.49

Existing Fuel Cost	
Gasoline	$3.08
Diesel	$3.47

Year	Make	Model	Odometer (miles)	Main Fuel Type	Flex Fuel?	Return to Same Place at Night?	Estimated Fuel Economy (MPG)	Years	MPY	GPY	DGE/GGE per day	Savings Low Case	SPB	Savings Med Case	SPB	Savings High Case	SPB	Conversion Type	Cost
1997	BLUE BIRD	NCS	142,360	Diesel	no	yes	7.5	16	8,898	1,186	4.7	$1,720	23.25	$1,438	27.81	$1,016	39.39	E	40000
1997	BLUE BIRD	SA8	135,988	Diesel	no	yes	7.5	16	8,499	1,133	4.5	$1,643	24.34	$1,374	29.11	$970	41.23	E	40000
1997	BLUE BIRD	NCSA	151,881	Diesel	no	yes	7.5	16	9,493	1,266	5.1	$1,835	21.79	$1,535	26.07	$1,083	36.92	E	40000
1997	INTERNATIONA	300	95,833	Diesel	no	yes	7.5	16	5,990	799	3.2	$1,158	34.54	$968	41.31	$684	58.51	E	40000
1998	INTERNATIONA	380	127,477	Diesel	no	yes	7.5	15	8,498	1,133	4.5	$1,643	24.34	$1,374	29.11	$970	41.24	E	40000
1998	INTERNATIONA	380	140,738	Diesel	no	yes	7.5	15	9,383	1,251	5.0	$1,814	22.05	$1,517	26.37	$1,071	37.35	E	40000
1998	BLUE BIRD	B7T (GMC)	180,187	Diesel	no	yes	7.5	15	12,012	1,602	6.4	$2,323	17.22	$1,942	20.60	$1,371	29.18	E	40000
2001	FREIGHTLINER	FS6	166,070	Diesel	no	yes	8	12	13,839	1,730	6.9	$2,509	15.95	$2,097	19.07	$1,481	27.01	E	40000
2002	FREIGHTLINER	FS6	212,193	Diesel	no	yes	8	11	19,290	2,411	9.6	$3,497	11.44	$2,924	13.68	$2,064	19.38	E	40000
2003	FREIGHTLINER	FS6	225,923	Diesel	no	yes	7	10	22,592	3,227	12.9	$4,680	8.55	$3,913	10.22	$2,763	14.48	E	40000
2009	BLUE BIRD	A3	54,377	Diesel	no	yes	7.4	4	13,594	1,837	7.3	$2,664	15.02	$2,227	17.96	$1,573	25.44	E	40000
2010	THOMAS	FE TRANSIT	53,163	Diesel	no	yes	8	3	17,721	2,215	8.9	$3,212	12.45	$2,686	14.89	$1,896	21.10	E	40000
2010	THOMAS	FE TRANSIT	48,542	Diesel	no	yes	8	3	16,181	2,023	8.1	$2,933	13.64	$2,452	16.31	$1,731	23.10	E	40000
2010	THOMAS	CE CONVENTI(	56,869	Diesel	no	yes	8	3	18,956	2,370	9.5	$3,436	11.64	$2,873	13.92	$2,028	19.72	E	40000
2010	ICL	CE SB	55,854	Diesel	no	yes	8	3	18,618	2,327	9.3	$3,375	11.85	$2,822	14.18	$1,992	20.08	E	40000
2010	ICL	CE SB	49,237	Diesel	no	yes	8	3	16,412	2,052	8.2	$2,975	13.45	$2,487	16.08	$1,756	22.78	E	40000
2010	BLUE BIRD	D3F	37,325	Diesel	no	yes	8	3	12,442	1,555	6.2	$2,255	17.74	$1,886	21.21	$1,331	30.05	E	40000
2012	THOMAS	1408S	23,500	Diesel	no	yes	7.9	1	23,500	2,975	11.9	$4,314	9.27	$3,607	11.09	$2,546	15.71	E	40000
2012	THOMAS	1408S	26,991	Diesel	no	yes	7.1	1	26,991	3,802	15.2	$5,513	7.26	$4,609	8.68	$3,254	12.29	E	40000
2014	ICBUS	INTEGRATED (	919	Diesel	no	yes	8	1	919	115	0.5	$167	240.13	$139	287.19	$98	406.78	E	40000

Tab 5: Seneca County Agency Transportation (SCAT)

Seneca County Agency Transportation (SCAT) Opportunity Analysis

Scheduled Replacements: 2-3 new transit vans per year

SCAT has a fleet of 26 transit vehicles, with 20 of them based in Tiffin. These vehicles currently fuel at the Seneca County Engineer location. The regular route running vans drive 25,000 to 30,000 miles per year. SCAT is tax exempt and pays a relatively low rate for fuel, \$3.08 per gallon of gasoline. The fuel economy for these vehicles is roughly 8 MPG. The vehicles are replaced at approximately 200,000 miles.

Even though SCAT pays a low rate for fuel, the vehicles are large consumers of gasoline and good candidates for conversion. The paybacks for the vans that are 2010 and newer are favorable and should be considered for conversion. As SCAT purchases new vehicles for replacement, they should also be converted to CNG.

The conversion of a transit van consists of a bi-fuel setup with the CNG tanks mounted under the vehicle. The bi-fuel setup allows the vehicle to be powered by CNG when it is present, and gasoline should the CNG run out.

The SCAT fleet parks inside at their location near SR 100. Therefore, installing time-fill fueling infrastructure is not a viable option.

Conclusion: SCAT in Tiffin has up to 10 vehicles in their fleet that are candidates for conversion and can support a fleet of up to 15 CNG vehicles as they replace older gasoline vehicles with CNG powered models.

Average Annual Greenhouse Gas Emission Reduction

148.1 Metric Tons of CO_2

= greenhouse gas emissions of 30.9 passenger vehicles for 1 year
= CO_2 emissions from 20.4 homes' electricity use for 1 year
=carbon sequestered by 121 acres of U.S. forests in 1 year

Year	Vehicles	GGE Used	Annual Savings	Cost	Cash Flow
1	10	35,000	$37,500	$100,000	-$62,500
2	12	42,000	$45,000	$20,000	-$37,500
3	14	49,000	$52,500	$20,000	-$5,000
4	15	52,500	$56,250	$0	$51,250
5	15	52,500	$56,250	$10,000	$97,500
6	15	52,500	$56,250	$10,000	$143,750
7	15	52,500	$56,250	$10,000	$190,000
8	15	52,500	$56,250	$10,000	$236,250
9	15	52,500	$56,250	$10,000	$282,500
10	15	52,500	$56,250	$10,000	$328,750
Total			$528,750	$200,000	

Seneca County Agency Transportation (SCAT)

Days Per Year
250

Cost per	Low	Medium	High
GGE	$1.70	$1.90	$2.20
DGE	$1.92	$2.15	$2.49

Existing Fuel Cost	
Gasoline	$3.08
Diesel	$0.00

Year	Make	Model	Odometer (miles)	Main Fuel Type	Flex Fuel?	Return to Same Place at Night?	Estimated Fuel Economy (MPG)	Years	MPY	GPY	DGE/GGE per day	Savings Low Case	SPB	Savings Med Case	SPB	Savings High Case	SPB	Conversion Type	Cost
2005	Ford	SW	133,602	Gasoline	no	yes	16.6	8	16,700	1,006	4.0	$1,303	7.68	$1,092	9.16	$775	12.91	B	10000
2005	Buick	4dr sedan	168,705	Gasoline	no	yes	25.4	8	21,088	830	3.3	$1,075	7.44	$901	8.88	$639	12.51	A	8000
2005	Ford	F350	204,661	Gasoline	no	yes	10.9	8	25,583	2,347	9.4	$3,039	3.29	$2,547	3.93	$1,807	5.53	B	10000
2006	Ford	E350	148,525	Gasoline	no	yes	9.1	7	21,218	2,332	9.3	$3,019	3.31	$2,530	3.95	$1,795	5.57	B	10000
2006	Ford	F350	165,809	Gasoline	no	yes	8.2	7	23,687	2,889	11.6	$3,741	2.67	$3,134	3.19	$2,224	4.50	B	10000
2006	Ford	F350	174,728	Gasoline	no	yes	9.8	7	24,961	2,547	10.2	$3,298	3.03	$2,764	3.62	$1,961	5.10	B	10000
2007	Dodge	Caravan	135,890	Gasoline	no	yes	18.9	6	22,648	1,198	4.8	$1,552	5.16	$1,300	6.15	$923	8.67	A	8000
2008	Dodge	Caravan	117,281	Gasoline	no	yes	17.3	5	23,456	1,356	5.4	$1,756	4.56	$1,471	5.44	$1,044	7.66	A	8000
2008	Ford	Bus	114,460	Gasoline	no	yes	7.7	5	22,892	2,973	11.9	$3,850	2.60	$3,226	3.10	$2,289	4.37	B	10000
2008	Ford	F350	157,370	Gasoline	no	yes	9.9	5	31,474	3,179	12.7	$4,117	2.43	$3,449	2.90	$2,448	4.09	B	10000
2008	Ford	Bus	139,528	Gasoline	no	yes	7.6	5	27,906	3,672	14.7	$4,755	2.10	$3,984	2.51	$2,827	3.54	B	10000
2008	Ford	Bus	92,390	Gasoline	no	yes	8.1	5	18,478	2,281	9.1	$2,954	3.39	$2,475	4.04	$1,757	5.69	B	10000
2009	Ford	E350	115,066	Gasoline	no	yes	8.9	4	28,767	3,232	12.9	$4,186	2.39	$3,507	2.85	$2,489	4.02	B	10000
2009	Ford	Bus	102,565	Gasoline	no	yes	9	4	25,641	2,849	11.4	$3,689	2.71	$3,091	3.23	$2,194	4.56	B	10000
2010	Dodge	Caravan	87,160	Gasoline	no	yes	18.1	3	29,053	1,605	6.4	$2,079	3.85	$1,742	4.59	$1,236	6.47	A	8000
2010	Dodge	Caravan	76,123	Gasoline	no	yes	18.2	3	25,374	1,394	5.6	$1,805	4.43	$1,513	5.29	$1,074	7.45	A	8000
2010	Ford	F350	78,623	Gasoline	no	yes	8.6	3	26,208	3,047	12.2	$3,946	2.53	$3,306	3.02	$2,347	4.26	B	10000
2010	Dodge	Van	45,844	Gasoline	no	yes	18.1	3	15,281	844	3.4	$1,093	9.15	$916	10.92	$650	15.38	B	10000
2011	Ford	F350	41,109	Gasoline	no	yes	8.2	2	20,555	2,507	10.0	$3,246	3.08	$2,720	3.68	$1,930	5.18	B	10000
2011	Ford	Bus	68,859	Gasoline	no	yes	8.4	2	34,430	4,099	16.4	$5,308	1.88	$4,447	2.25	$3,156	3.17	B	10000
2011	Ford	Bus	65,306	Gasoline	no	yes	9	2	32,653	3,628	14.5	$4,698	2.13	$3,937	2.54	$2,794	3.58	B	10000
2011	Ford	Supreme	37,209	Gasoline	no	yes	9	2	18,605	2,067	8.3	$2,677	3.74	$2,243	4.46	$1,592	6.28	B	10000
2011	Ford	Supreme	45,947	Gasoline	no	yes	8.5	2	22,974	2,703	10.8	$3,500	2.86	$2,932	3.41	$2,081	4.81	B	10000
2011	Ford	Econoline	34,324	Gasoline	no	yes	11	2	17,162	1,560	6.2	$2,020	4.95	$1,693	5.91	$1,201	8.32	B	10000
2013	Ford	Bus	250	Gasoline	no	yes	9	1	250	28	0.1	$36	277.99	$30	331.80	$21	467.53	B	10000
2013	Ford	Bus	250	Gasoline	no	yes	9	1	250	28	0.1	$36	277.99	$30	331.80	$21	467.53	B	10000
2013	Ford	Bus	250	Gasoline	no	yes	9	1	250	28	0.1	$36	277.99	$30	331.80	$21	467.53	B	10000

Tab 6: Arnold Vending

Arnold Vending Opportunity Analysis

Scheduled Replacements: 5-6 vehicles per year

The vehicle fleet of Arnold Vending consists mainly of Ford cargo vans. Regular route runners typically drive between 20,000 to 30,000 miles per year. Arnold Vending pays about $3.50 per gallon of gasoline and the vehicles vary from 8 to 24 MPG in fuel economy. The vehicles are retired when they reach approximately 240,000 miles of service.

The vans are good candidates for conversions but do face some challenges. The main issue is finding enough space for the CNG tanks used in the conversion. Each van is equipped with a refrigerator unit used to transport goods. Together with the unrefrigerated product, it does not leave a lot of room in the back of the van. CNG tanks can be mounted underneath the van, but to have enough fuel capacity for their longer routes of around 175 miles, an extra tank may have to be mounted in the cargo area.

The vans park in the same place lined up in a row overnight, which would make installing a time-fill station on the property an option. Unfortunately, the recommended fueling for this system would require that the vehicles be outside. They park inside so they can be loaded with product while parked.

Using current rates and total driving miles of 200,000, the lifetime savings for a converted van would be about $25,000 for a dedicated or bi-fuel system. Therefore, the conversion package and size selected for each van will determine whether or not it makes sense to convert them or buy new vans as the vans retire. For example, a van with 100,000 remaining service miles will save $12,500 before it is taken off the road. A conversion that will cost $10,000 will pay back in its lifetime and save an extra 25% on fuel. On top of that, some of the installed parts will be able to be used in the next conversion, reducing the initial cost in the future.

Of Arnold Vending's 52 total vehicles, 18 are candidates for immediate conversion. As the older vehicles are retired from service and replaced, new CNG powered vans can take place of the old ones. With the high rate of replacements per year, the fleet alternative powered vans could grow to over 30 in 3 years.

Conclusion: Arnold Vending has an opportunity to save money by converting some of its vehicles to CNG now and working in new CNG powered vehicles as older vans are replaced.

Average Annual Greenhouse Gas Emission Reduction

133.2 Metric Tons of CO_2

= greenhouse gas emissions of 27.8 passenger vehicles for 1 year
= CO_2 emissions from 18.3 homes' electricity use for 1 year
=carbon sequestered by 109 acres of U.S. forests in 1 year

Year	Vehicles	GGE Used	Annual Savings	Cost	Cash Flow
1	18	28,350	$43,200	$180,000	-$136,800
2	24	37,800	$57,600	$60,000	-$139,200
3	30	47,250	$72,000	$60,000	-$127,200
4	30	47,250	$72,000	$0	-$55,200
5	30	47,250	$72,000	$0	$16,800
6	30	47,250	$72,000	$0	$88,800
7	30	47,250	$72,000	$20,000	$140,800
8	30	47,250	$72,000	$20,000	$192,800
9	30	47,250	$72,000	$20,000	$244,800
10	30	47,250	$72,000	$20,000	$296,800
Total			$676,800	$380,000	

Arnold Vending

Days Per Year
250

Cost per	Low	Medium	High
GGE	$1.70	$1.90	$2.20
DGE	$1.92	$2.15	$2.49

Existing Fuel Cost	
Gasoline	$3.50
Diesel	$0.00

Year	Make	Model	Odometer (miles)	Main Fuel Type	Flex Fuel?	Return to Same Place at Night?	Estimated Fuel Economy (MPG)	Years	MPY	GPY	DGE/GGE per day	Savings Low Case	SPB	Savings Med Case	SPB	Savings High Case	SPB	Conversion Type	Cost
1998	Ford	Super	220,000	*Gasoline*	*no*	*yes*	12	15	14,667	1,222	4.9	$2,096	4.77	$1,839	5.44	$1,454	6.88	B	10000
1999	Chevrolet	Step	88,000	*Gasoline*	*no*	*yes*	12	14	6,286	524	2.1	$898	11.13	$788	12.68	$623	16.04	B	10000
1999	Ford	Super	210,000	*Gasoline*	*no*	*yes*	16	14	15,000	938	3.8	$1,608	6.22	$1,411	7.09	$1,116	8.96	B	10000
1999	Ford	Cube	180,000	*Gasoline*	*no*	*yes*	16	14	12,857	804	3.2	$1,378	7.26	$1,209	8.27	$956	10.46	B	10000
1999	Ford	Super	150,000	*Gasoline*	*no*	*yes*	16	14	10,714	670	2.7	$1,148	8.71	$1,008	9.92	$797	12.55	B	10000
2000	Ford	Super	190,000	*Gasoline*	*no*	*yes*	16	13	14,615	913	3.7	$1,567	6.38	$1,375	7.27	$1,087	9.20	B	10000
2000	Ford	Cube	200,000	*Gasoline*	*no*	*yes*	16	13	15,385	962	3.8	$1,649	6.06	$1,447	6.91	$1,144	8.74	B	10000
2000	Ford	Super	185,000	*Gasoline*	*no*	*yes*	16	13	14,231	889	3.6	$1,525	6.56	$1,339	7.47	$1,058	9.45	B	10000
2001	Ford	Super	250,000	*Gasoline*	*no*	*yes*	16	12	20,833	1,302	5.2	$2,233	4.48	$1,960	5.10	$1,549	6.45	B	10000
2001	Ford	E150	160,000	*Gasoline*	*no*	*yes*	16	12	13,333	833	3.3	$1,429	7.00	$1,254	7.97	$992	10.08	B	10000
2002	Ford	E250 Cargo	160,000	*Gasoline*	*no*	*yes*	16	11	14,545	909	3.6	$1,559	6.41	$1,368	7.31	$1,082	9.24	B	10000
2002	Ford	E250 Cargo	185,000	*Gasoline*	*no*	*yes*	16	11	16,818	1,051	4.2	$1,803	5.55	$1,582	6.32	$1,251	7.99	B	10000
2002	Ford	E350 Cube	205,000	*Gasoline*	*no*	*yes*	8	11	18,636	2,330	9.3	$3,995	2.50	$3,506	2.85	$2,772	3.61	B	10000
2002	Ford	E150	160,000	*Gasoline*	no	*yes*	16	11	14,545	909	3.6	$1,559	6.41	$1,368	7.31	$1,082	9.24	B	10000
2003	Ford	Super	160,000	*Gasoline*	*no*	*yes*	16	10	16,000	1,000	4.0	$1,715	5.83	$1,505	6.64	$1,190	8.40	B	10000
2003	Ford	E250 Cargo	200,000	*Gasoline*	*no*	*yes*	16	10	20,000	1,250	5.0	$2,144	4.66	$1,881	5.32	$1,488	6.72	B	10000
2003	Ford	E250 Cargo	140,000	*Gasoline*	*no*	*yes*	16	10	14,000	875	3.5	$1,501	6.66	$1,317	7.59	$1,041	9.60	B	10000
2003	Ford	Windstar	165,000	*Gasoline*	*no*	*yes*	18	10	16,500	917	3.7	$1,572	5.09	$1,380	5.80	$1,091	7.33	A	8000
2003	Ford	Explorer	160,000	*Gasoline*	*no*	*yes*	14	10	16,000	1,143	4.6	$1,960	5.10	$1,720	5.81	$1,360	7.35	B	10000
2003	Ford Econoline	E250	160,000	*Gasoline*	*no*	*yes*	16	10	16,000	1,000	4.0	$1,715	5.83	$1,505	6.64	$1,190	8.40	B	10000
2003	Ford	E350	240,000	*Gasoline*	*no*	*yes*	8	10	24,000	3,000	12.0	$5,145	1.94	$4,515	2.21	$3,570	2.80	B	10000
2003	Ford	E250	140,000	*Gasoline*	*no*	*yes*	16	10	14,000	875	3.5	$1,501	6.66	$1,317	7.59	$1,041	9.60	B	10000
2003	Ford	E150	250,000	*Gasoline*	*no*	*yes*	16	10	25,000	1,563	6.3	$2,680	3.73	$2,352	4.25	$1,859	5.38	B	10000
2004	Ford	E350 Cube	160,000	*Gasoline*	*no*	*yes*	8	9	17,778	2,222	8.9	$3,811	2.62	$3,344	2.99	$2,644	3.78	B	10000
2004	Ford	E350 Cube	200,000	*Gasoline*	*no*	*yes*	8	9	22,222	2,778	11.1	$4,764	2.10	$4,181	2.39	$3,306	3.03	B	10000
2005	Ford	E250	220,000	*Gasoline*	*no*	*yes*	16	8	27,500	1,719	6.9	$2,948	3.39	$2,587	3.87	$2,045	4.89	B	10000
2005	Ford	E250	160,000	*Gasoline*	*no*	*yes*	16	8	20,000	1,250	5.0	$2,144	4.66	$1,881	5.32	$1,488	6.72	B	10000
2005	Ford	E250	170,000	*Gasoline*	*no*	*yes*	16	8	21,250	1,328	5.3	$2,278	4.39	$1,999	5.00	$1,580	6.33	B	10000
2005	Ford	E250	130,000	*Gasoline*	*no*	*yes*	16	8	16,250	1,016	4.1	$1,742	5.74	$1,529	6.54	$1,209	8.27	B	10000
2006	Ford	Freestar	180,000	*Gasoline*	*no*	*yes*	18	7	25,714	1,429	5.7	$2,450	4.08	$2,150	4.65	$1,700	5.88	B	10000
2006	Ford	E250	120,000	*Gasoline*	*no*	*yes*	16	7	17,143	1,071	4.3	$1,838	5.44	$1,613	6.20	$1,275	7.84	B	10000
2006	Ford	Feestar	220,000	*Gasoline*	*no*	*yes*	18	7	31,429	1,746	7.0	$2,994	3.34	$2,628	3.81	$2,078	4.81	B	10000
2006	Ford	Ranger	85,000	*Gasoline*	*no*	*yes*	26	7	12,143	467	1.9	$801	9.99	$703	11.38	$556	14.39	A	8000
2006	Ford	E250	90,000	*Gasoline*	*no*	*yes*	16	7	12,857	804	3.2	$1,378	7.26	$1,209	8.27	$956	10.46	B	10000
2006	Ford	E250	55,000	*Gasoline*	*no*	*yes*	16	7	7,857	491	2.0	$842	11.87	$739	13.53	$584	17.11	B	10000
2006	Ford	E250	45,000	*Gasoline*	*no*	*yes*	16	7	6,429	402	1.6	$689	14.51	$605	16.54	$478	20.92	B	10000
2008	Ford	E350	45,000	*Gasoline*	*no*	*yes*	8	5	9,000	1,125	4.5	$1,929	5.18	$1,693	5.91	$1,339	7.47	B	10000
2010	Ford	Transit	50,000	*Gasoline*		*yes*	24	3	16,667	694	2.8	$1,191	8.40	$1,045	9.57	$826	12.10	B	10000
2010	Ford	E250	50,000	*Gasoline*		*yes*	16	3	16,667	1,042	4.2	$1,786	5.60	$1,568	6.38	$1,240	8.07	B	10000
2010	Ford	Explorer	40,000	*Gasoline*		*yes*	18	3	13,333	741	3.0	$1,270	7.87	$1,115	8.97	$881	11.34	B	10000
2011	Ford	F550	95,000	*Gasoline*		*yes*	6.5	2	47,500	7,308	29.2	$12,533	0.80	$10,998	0.91	$8,696	1.15	B	10000

Year	Make	Model	Odometer (miles)	Main Fuel Type	Flex Fuel?	Return to Same Place at Night?	Estimated Fuel Economy (MPG)	Years	MPY	GPY	DGE/GGE per day	Savings Low Case	SPB	Savings Med Case	SPB	Savings High Case	SPB	Conversion Type	Cost
2011	Ford	E250	30,000	*Gasoline*		*yes*	16	2	15,000	938	3.8	$1,608	6.22	$1,411	7.09	$1,116	8.96	B	10000
2011	Ford	E250	30,000	*Gasoline*		*yes*	16	2	15,000	938	3.8	$1,608	6.22	$1,411	7.09	$1,116	8.96	B	10000
2011	Ford	E150	13,000	*Gasoline*		*yes*	16	2	6,500	406	1.6	$697	14.35	$611	16.36	$483	20.69	B	10000
2012	Ford	E250	18,000	*Gasoline*	*yes*	*yes*	16	1	18,000	1,125	4.5	$1,929	5.18	$1,693	5.91	$1,339	7.47	B	10000
2012	Ford	E250 Ext Cargo	22,000	*Gasoline*	*yes*	*yes*	16	1	22,000	1,375	5.5	$2,358	4.24	$2,069	4.83	$1,636	6.11	B	10000
2012	Ford	E250	15,000	*Gasoline*	*yes*	*yes*	16	1	15,000	938	3.8	$1,608	6.22	$1,411	7.09	$1,116	8.96	B	10000
2012	Ford	E250	12,000	*Gasoline*	*yes*	*yes*	16	1	12,000	750	3.0	$1,286	7.77	$1,129	8.86	$893	11.20	B	10000
2012	Ford	E250	14,000	*Gasoline*	*yes*	*yes*	16	1	14,000	875	3.5	$1,501	6.66	$1,317	7.59	$1,041	9.60	B	10000
2013	Ford	E350	8,000	*Gasoline*	*yes*	*yes*	8	1	8,000	1,000	4.0	$1,715	5.83	$1,505	6.64	$1,190	8.40	B	10000
2013	Ford	E150	5,500	*Gasoline*	*yes*	*yes*	16	1	5,500	344	1.4	$590	16.96	$517	19.33	$409	24.45	B	10000
2013	Ford	E150	500	*Gasoline*	*yes*	*yes*	17	1	500	29	0.1	$50	198.25	$44	225.91	$35	285.71	B	10000

TAB 7: SENECA MEDICAL, INC.

Seneca Medical, Inc. Opportunity Analysis

Scheduled Replacements: Replace up to 8 route running vehicles in the next 5 years

Seneca Medical's vehicle fleet consists of straight trucks and tractors based in multiple states. The main fleet is based out of the corporate headquarters located in Tiffin, OH. This fleet consists of 32 vehicles with 22 of them running regular routes that cover over 1.1 million miles per year. Each truck drives an average of 50,000 miles per year at these rates. The trucks are all powered by diesel fuel and are ideal candidates for CNG conversion. Seneca Medical pays $3.90 per gallon of diesel and has fueling tanks on site. The straight trucks average 8 MPG of fuel while the tractors fuel economy is around 6.5 MPG.

Conversions for these trucks will consist of a dual fuel setup. Straight trucks have more than enough room for the new CNG tanks between the wheels. Capacity of the tanks therefore will only be limited by the necessary amount of CNG needed for each truck's route. The tractors on the other hand do not have the luxury of unlimited room, and therefore will have to have a system designed to balance capacity and storage space on a truck by truck basis.

With a dual fuel conversion averaging 50% diesel and 50% CNG, a truck driving 50,000 miles each year will have a payback between 2 and 4 years, not counting the residual value of the conversion kit. With that type of payback, there are 12 available vehicles to convert now and the other 10 can be converted over the next 5 years as the older trucks are replaced.

A time-fill fueling station is not an option for Seneca Medical. The trucks park at docks spread around the building when they are not on delivery routes to get loaded /unloaded. Although they are parked outside, it would not be feasible to install the fueling infrastructure around the whole building.

Conclusion: Seneca Medical has an opportunity to save a substantial amount of money by converting its trucking fleet over to CNG. There are 12 vehicles available to convert now, while 10 others can be added over the next 5 years.

Average Annual Greenhouse Gas Emission Reduction

210.6 Metric Tons of CO_2

= greenhouse gas emissions of 43.9 passenger vehicles for 1 year
= CO_2 emissions from 29 homes' electricity use for 1 year
=carbon sequestered by 173 acres of U.S. forests in 1 year

Year	Vehicles	GGE Used	Annual Savings	Cost	Cash Flow
1	12	46,800	$60,000	$192,000	-$132,000
2	14	54,600	$70,000	$32,000	-$94,000
3	15	58,500	$75,000	$16,000	-$35,000
4	17	66,300	$85,000	$32,000	$18,000
5	18	70,200	$90,000	$16,000	$92,000
6	19	74,100	$95,000	$32,000	$155,000
7	20	78,000	$100,000	$32,000	$223,000
8	21	81,900	$105,000	$32,000	$296,000
9	22	85,800	$110,000	$32,000	$374,000
10	22	85,800	$110,000	$16,000	$468,000
Total			$900,000	$432,000	

Seneca Medical, Inc.

Days Per Year
260

Cost per	Low	Medium	High
GGE	$1.70	$1.90	$2.20
DGE	$1.92	$2.15	$2.49

Existing Fuel Cost	
Gasoline	$3.65
Diesel	$3.90

Year	Make	Model	Odometer (miles)	Main Fuel Type	Flex Fuel?	Return to Same Place at Night?	Estimated Fuel Economy (MPG)	Years	MPY	GPY	DGE/GGE per day	Savings Low Case	SPB	Savings Med Case	SPB	Savings High Case	SPB	Conversion Type	Cost
1998	International	490	380,816	Diesel	no	yes	9.21	15	25,388	2,757	5.3	$2,323	5.17	$1,995	6.02	$1,504	7.98	C	12000
1998	Freightliner	F70	232,419	Diesel	no	yes	8.68	15	15,495	1,785	3.4	$1,504	7.98	$1,292	9.29	$974	12.32	C	12000
2000	Freightliner	F70	614,120	Diesel	no	yes	8.52	13	47,240	5,545	10.7	$4,672	2.57	$4,013	2.99	$3,025	3.97	C	12000
2000	Freightliner	F70	301,759	Diesel	no	yes	8.32	13	23,212	2,790	5.4	$2,351	5.10	$2,019	5.94	$1,522	7.88	C	12000
2000	International	490	332,665	Diesel	no	yes	8.28	13	25,590	3,091	5.9	$2,604	4.61	$2,237	5.37	$1,686	7.12	C	12000
2000	International	911	487,296	Diesel	no	yes	6.69	13	37,484	5,603	10.8	$4,721	4.24	$4,055	4.93	$3,056	6.54	D	20000
2000	GMC	Savana	143,200	Gasoline	no	yes	15	13	11,015	734	2.8	$1,370	5.84	$1,215	6.58	$984	8.13	A	8000
2002	International	430	445,318	Diesel	no	yes	8.28	11	40,483	4,889	9.4	$4,119	2.91	$3,539	3.39	$2,667	4.50	C	12000
2002	Freightliner	F70	259,676	Diesel	no	yes	9.18	11	23,607	2,572	4.9	$2,167	5.54	$1,861	6.45	$1,403	8.55	C	12000
2002	Freightliner	COL	552,883	Diesel	no	yes	7.16	11	50,262	7,020	13.5	$5,915	3.38	$5,080	3.94	$3,829	5.22	D	20000
2003	Freightliner	16M	236,247	Diesel	no	yes	9.85	10	23,625	2,398	4.6	$2,021	5.94	$1,736	6.91	$1,308	9.17	C	12000
2003	Freightliner	16M	497,332	Diesel	no	yes	8.05	10	49,733	6,178	11.9	$5,205	2.31	$4,471	2.68	$3,370	3.56	C	12000
2003	International	860	447,690	Diesel	no	yes	6.85	10	44,769	6,536	12.6	$5,507	3.63	$4,730	4.23	$3,565	5.61	D	20000
2003	Freightliner	COL	500,388	Diesel	no	yes	5.79	10	50,039	8,642	16.6	$7,282	2.75	$6,255	3.20	$4,714	4.24	D	20000
2003	Freightliner	COL	470,600	Diesel	no	yes	6.76	10	47,060	6,962	13.4	$5,865	3.41	$5,038	3.97	$3,798	5.27	D	20000
2004	Freightliner	16M	378,426	Diesel	no	yes	8.28	9	42,047	5,078	9.8	$4,279	2.80	$3,675	3.27	$2,770	4.33	C	12000
2004	Freightliner	16M	399,052	Diesel	no	yes	8.42	9	44,339	5,266	10.1	$4,437	2.70	$3,811	3.15	$2,873	4.18	C	12000
2005	International	430	580,784	Diesel	no	yes	9.03	8	72,598	8,040	15.5	$6,774	1.77	$5,819	2.06	$4,386	2.74	C	12000
2005	Peterbuilt	330	199,790	Diesel	no	yes	7.73	8	24,974	3,231	6.2	$2,722	4.41	$2,338	5.13	$1,762	6.81	C	12000
2005	Chevrolet	Uplander	88,500	Gasoline	no	yes	23	8	11,063	481	1.8	$897	8.92	$796	10.05	$645	12.41	A	8000
2006	International	430	487,698	Diesel	no	yes	8.8	7	69,671	7,917	15.2	$6,671	1.80	$5,730	2.09	$4,319	2.78	C	12000
2006	Freightliner	16M	510,195	Diesel	no	yes	6.77	7	72,885	10,766	20.7	$9,071	1.32	$7,792	1.54	$5,873	2.04	C	12000
2006	Freightliner	16M	349,188	Diesel	no	yes	7.25	7	49,884	6,881	13.2	$5,797	2.07	$4,980	2.41	$3,753	3.20	C	12000
2006	Freightliner	16M	157,631	Diesel	no	yes	8.44	7	22,519	2,668	5.1	$2,248	5.34	$1,931	6.21	$1,455	8.24	C	12000
2006	Freightliner	M2	117,260	Diesel	no	yes	8.77	7	16,751	1,910	3.7	$1,609	7.46	$1,382	8.68	$1,042	11.52	C	12000
2006	Freightliner	COL	208,663	Diesel	no	yes	6.53	7	29,809	4,565	8.8	$3,846	3.12	$3,304	3.63	$2,490	4.82	C	12000
2006	Freightliner	COL	225,203	Diesel	no	yes	7.08	7	32,172	4,544	8.7	$3,829	3.13	$3,289	3.65	$2,479	4.84	C	12000
2006	Chevrolet	Express	93,200	Gasoline	no	yes	15	7	13,314	888	3.4	$1,655	4.83	$1,469	5.45	$1,189	6.73	A	8000
2007	Freightliner	M2	203,372	Diesel	no	yes	9.05	6	33,895	3,745	7.2	$3,156	3.80	$2,711	4.43	$2,043	5.87	C	12000
2007	Freightliner	M2	411,207	Diesel	no	yes	8.51	6	68,535	8,053	15.5	$6,785	1.77	$5,828	2.06	$4,393	2.73	C	12000
2007	Freightliner	M2	161,706	Diesel	no	yes	9.01	6	26,951	2,991	5.8	$2,520	4.76	$2,165	5.54	$1,632	7.35	C	12000
2007	Freightliner	M2	107,876	Diesel	no	yes	8.45	6	17,979	2,128	4.1	$1,793	6.69	$1,540	7.79	$1,161	10.34	C	12000
2009	Freightliner	16M	325,862	Diesel	no	yes	7.35	4	81,466	11,084	21.3	$9,339	1.28	$8,022	1.50	$6,046	1.98	C	12000
2009	Hino	338	278,513	Diesel	no	yes	7.14	4	69,628	9,752	18.8	$8,216	1.46	$7,058	1.70	$5,320	2.26	C	12000
2009	Peterbuilt	330	183,595	Diesel	no	yes	8.81	4	45,899	5,210	10.0	$4,390	2.73	$3,771	3.18	$2,842	4.22	C	12000

TAB 8: TPC FOOD SERVICE

TPC Food Service Opportunity Analysis

Scheduled Replacements: 1 new truck per year

TPC Food Service's vehicle fleet consists of 23 vehicles, 14 straight trucks and 9 tractors. Every truck has a diesel refrigeration unit mounted on the front. 18 of the trucks run regular routes year round. Tuesday, Thursday and Friday are the busiest days while Monday and Wednesday tend to be lighter. TPC pays a rate of $4.02 per gallon of diesel. The tractors have about 6 MPG fuel economy while the straight trucks run at 8 MPG. Route running trucks drive about 40,000 miles per year.

With the large amount of miles that these trucks drive and the low fuel economy, TPC has an opportunity to save a significant amount of money by converting its fleet over to CNG. Comparing the CNG payback with the projected remaining life of each vehicle, TPC can convert 10 vehicles immediately and phase in the remaining 8 to CNG as the older vehicles retire over the next 5 years.

These vehicles will have a dual fuel conversion. The refrigerator units that run on diesel will not be affected and will continue to run as they do today. CNG tanks will be added and the trucks will use a 50-50 mixture of CNG to diesel for power.

Installing time-fill infrastructure for fueling is not an option for TPC. The vehicles park all around the building at loading docks and too far spread to be effective. Also, the turnaround time may vary for the trucks, making fast-fill stations desirable.

Conclusion: TPC Food Service can convert 10 of its route running trucks to dual fuel while phasing in the remaining route running trucks. The 8 remaining vehicles should be phased in as the existing diesel trucks are retired. After 5 years, TPC Food Service could have a fleet of 15 CNG powered vehicles.

Average Annual Greenhouse Gas Emission Reduction

141.5 Metric Tons of CO_2

= greenhouse gas emissions of 29.5 passenger vehicles for 1 year
= CO_2 emissions from 19.5 homes' electricity use for 1 year
=carbon sequestered by 116 acres of U.S. forests in 1 year

Year	Vehicles	GGE Used	Annual Savings	Cost	Cash Flow
1	10	32,750	$45,000	$160,000	-$115,000
2	11	36,025	$49,500	$16,000	-$81,500
3	12	39,300	$54,000	$16,000	-$43,500
4	13	42,575	$58,500	$16,000	-$1,000
5	14	45,850	$63,000	$16,000	$46,000
6	15	49,125	$67,500	$16,000	$97,500
7	16	52,400	$72,000	$24,000	$145,500
8	17	55,675	$76,500	$24,000	$198,000
9	18	58,950	$81,000	$24,000	$255,000
10	18	58,950	$81,000	$24,000	$312,000
Total			$648,000	$336,000	

TPC Food Service

Days Per Year
250

Cost per	Low	Medium	High
GGE	$1.70	$1.90	$2.20
DGE	$1.92	$2.15	$2.49

Existing Fuel Cost	
Gasoline	$3.71
Diesel	$4.02

Year	Make	Model	Odometer (miles)	Main Fuel Type	Flex Fuel?	Return to Same Place at Night?	Estimated Fuel Economy (MPG)	Years	MPY	GPY	DGE/GGE per day	Savings Low Case	SPB	Savings Med Case	SPB	Savings High Case	SPB	Conversion Type	Cost
1995	International	4900	433,554	Diesel	no	yes	8	18	24,086	3,011	6.0	$2,708	4.43	$2,351	5.11	$1,814	6.62	C	12000
1996	International	8200	140,756	Diesel	no	yes	6	17	8,280	1,380	2.8	$1,241	16.11	$1,077	18.56	$831	24.05	D	20000
1998	International	4900	428,335	Diesel	no	yes	8	15	28,556	3,569	7.1	$3,211	3.74	$2,787	4.31	$2,151	5.58	C	12000
1998	International	4700	488,016	Diesel	no	yes	8	15	32,534	4,067	8.1	$3,658	3.28	$3,175	3.78	$2,450	4.90	C	12000
1999	International	8100	137,780	Diesel	no	yes	6	14	9,841	1,640	3.3	$1,475	13.55	$1,281	15.62	$988	20.24	D	20000
2001	International	4700	54,328	Diesel	no	yes	8	12	4,527	566	1.1	$509	23.57	$442	27.16	$341	35.19	C	12000
2001	International	8100	43,124	Diesel	no	yes	6	12	3,594	599	1.2	$539	37.12	$468	42.77	$361	55.42	D	20000
2002	International	4300	250,852	Diesel	no	yes	8	11	22,805	2,851	5.7	$2,564	4.68	$2,226	5.39	$1,717	6.99	C	12000
2002	International	9100	801,096	Diesel	no	yes	6	11	72,827	12,138	24.3	$10,919	1.83	$9,476	2.11	$7,313	2.73	D	20000
2002	International	9100	734,675	Diesel	no	yes	6	11	66,789	11,131	22.3	$10,013	2.00	$8,691	2.30	$6,707	2.98	D	20000
2004	International	4300	191,181	Diesel	no	yes	8	9	21,242	2,655	5.3	$2,389	5.02	$2,073	5.79	$1,600	7.50	C	12000
2004	Freightliner	M2	310,282	Diesel	no	yes	8	9	34,476	4,309	8.6	$3,877	3.10	$3,365	3.57	$2,596	4.62	C	12000
2004	International	8600	406,716	Diesel	no	yes	6	9	45,191	7,532	15.1	$6,775	2.95	$5,880	3.40	$4,538	4.41	D	20000
2005	International	4400	322,655	Diesel	no	yes	8	8	40,332	5,041	10.1	$4,535	2.65	$3,936	3.05	$3,038	3.95	C	12000
2005	International	8600	618,767	Diesel	no	yes	6	8	77,346	12,891	25.8	$11,596	1.72	$10,064	1.99	$7,767	2.58	D	20000
2006	International	4400	305,997	Diesel	no	yes	8	7	43,714	5,464	10.9	$4,915	2.44	$4,266	2.81	$3,292	3.64	C	12000
2006	International	4300	220,030	Diesel	no	yes	8	7	31,433	3,929	7.9	$3,534	3.40	$3,068	3.91	$2,367	5.07	C	12000
2008	Freightliner	M2106	129,116	Diesel	no	yes	8	5	25,823	3,228	6.5	$2,904	4.13	$2,520	4.76	$1,945	6.17	C	12000
2008	Freightliner	M2106	163,090	Diesel	no	yes	8	5	32,618	4,077	8.2	$3,668	3.27	$3,183	3.77	$2,457	4.88	C	12000
2009	GMC	Savana	55,125	Gasoline	no	yes	15	4	13,781	919	3.7	$1,769	4.52	$1,576	5.08	$1,286	6.22	A	8000
2010	International	8600	195,497	Diesel	no	yes	8	3	65,166	8,146	16.3	$7,327	2.73	$6,360	3.14	$4,908	4.08	D	20000
2011	International	4300	39,193	Diesel	no	yes	8	2	19,597	2,450	4.9	$2,203	5.45	$1,912	6.27	$1,476	8.13	C	12000
2012	Freightliner	M2106	55,915	Diesel	no	yes	8	1	55,915	6,989	14.0	$6,287	1.91	$5,457	2.20	$4,211	2.85	C	12000
2012	Freightliner	M2106	42,133	Diesel	no	yes	8	1	42,133	5,267	10.5	$4,738	2.53	$4,112	2.92	$3,173	3.78	C	12000

CONCLUSION

Conclusion

There is a significant opportunity to introduce an alternative fuel to the community of Tiffin. It allows both the private and public sectors significant savings in transportation and operational cost. Availability of an alternative fueling option increases the competitiveness of the region promoting future job growth while at the same time supporting the existing community and businesses.

With the NCOESC collaborative funding the construction of fueling infrastructure, the burden of significant capital investment from the private sector has been eliminated. With reduced capital outlay and the reduction in fuel spend by 40-60%, private businesses will see a competitive advantage in their respective markets. The conversion from diesel/gasoline to CNG is environmentally friendly and can be used as added value when soliciting new business.

By reducing transportation fuel by 40-60% the public sector partner's show their constituents that they take cost reduction seriously, and are thinking “outside the box” to keep taxes at a minimum. Local government is reminding their constituents that there are technologies to reduce their carbon footprint, while being fiscally responsible.

Gasoline and diesel as the traditional fuel source for American automobiles has come under increasing pressure as a commodity. Geo-political events, especially in the Middle East, and the hedging of petroleum products on the international market, have made oil an unstable commodity for the last 20 years. One example of this is the average cost of diesel doubling from $2 in 2008 to $4 per gallon today. Fleet managers are always looking to reduce operating costs and alternative fuels have become a viable solution. Natural gas is reliable, domestic, safe, clean and sustainable. Most importantly, the stable and relatively low long term cost projections for natural gas prove CNG is a vehicle fuel of the future.