NASSAU COUNTY CLEAN FUELS ASSESSMENT

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SUMMARY

Presently, there is a unique opportunity for fleets to upgrade with new, clean fuel vehicles.

Due to lingering effects of the Great Recession, most county agencies have deferred vehicle replacements. As a result of an agreement between Volkswagen and the U.S. Government settling claims that the automaker sold vehicles violating US EPA emission standards (VW Settlement), Florida is set to receive more than $166 million for emissions reduction projects. The Florida Department of Environmental Protection will allocate the funds under terms currently being developed.

Nassau County public fleet data was assessed to determine feasibility of transitioning to clean fuels. The stakeholders included in this analysis include[1]:

- City of Fernandina Beach
- Nassau County Board of County Commissioners
- Nassau County School District
- Nassau County Transit

The feasibility of transitioning fleets to propane (Autogas), compressed natural gas (CNG), electricity, biofuels and hydrogen was evaluated from operational and economic perspectives. The evaluation is based on fleet data from stakeholders, including fuel expenditure and use, vehicle miles travelled, vehicle age and quantities, vehicle replacement potential and fleet management facilities.

Each clean fuel – except hydrogen – is feasible assuming current conditions (i.e. the "base case"). Projects involving Autogas school buses, transit buses and a mix of Autogas vehicles; electric or plug-in electric hybrid vehicles; a mix of CNG vehicles; and biodiesel vehicles are economically feasible.

Variations in base case assumptions, including the quantity of vehicles / infrastructure included in the transition, available financial incentives, infrastructure delivery method and future fuel prices, can affect financial feasibility. Autogas Class 2 trucks, CNG school buses, Autogas class 1 trucks, electric transit buses and electric school buses may be feasible under some variations. Some projects feasible under the base case, including a mix of Autogas vehicles, a mix of CNG vehicles, and Autogas transit buses may not be economically feasible under some variations.

Finally, the location of fleet vehicles and fueling infrastructure can affect operational feasibility. Preliminary analysis and consultation with county fleet managers indicates that siting a single, centrally located CNG fast-fueling station is not feasible. At least two stations may be necessary. Without assuming any additional demand or incentives for CNG, this makes any transition to CNG challenging.

[1] Florida Public Utilities, Rayonier and Nassau County Sheriff were invited to participate in this study but did not provide data for analysis. Florida Public Utilities Government Affairs Manager, Romero Sicre, indicated over the course of this study at the Utility is willing to work with study participants to install CNG or Autogas infrastructure and is working with the City of Fernandina Beach to install EV charging stations.

FEASIBILITY ASSESSMENT

BASE CASE

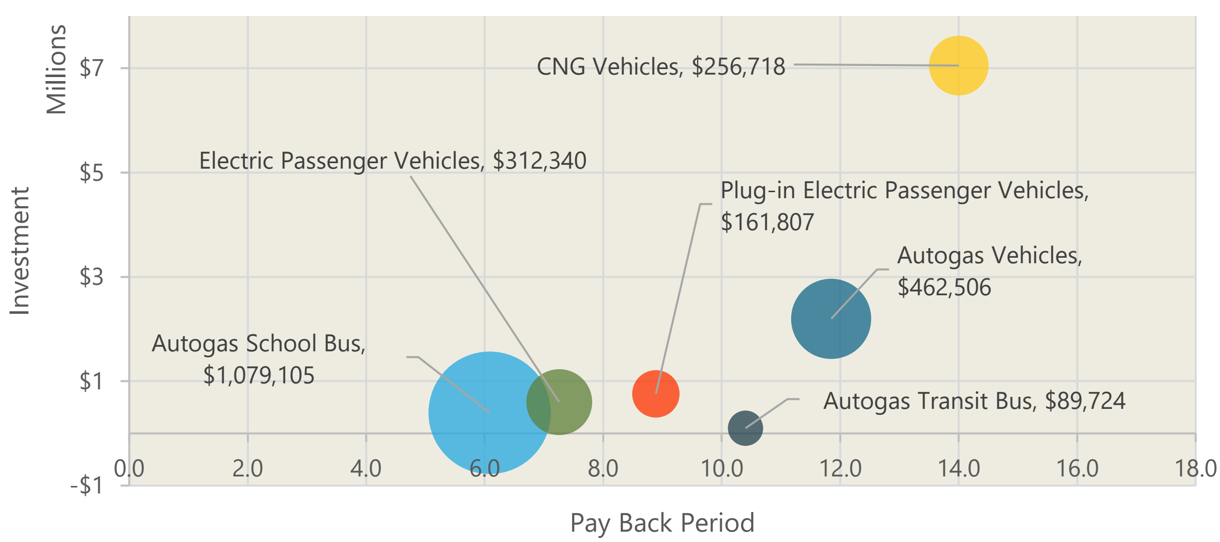
Assuming current conditions (i.e. the "base case"), the following clean fuels projects are feasible in order of economic benefit. Key assumptions used in the base case were reviewed with the study participants to validate these findings. A detail of the base case for each project is included in the Appendix.

- Autogas School Buses
- Autogas Vehicle Fleet
- Electric Passenger Vehicles
- Plug-in Hybrid Electric Passenger Vehicles
- CNG Vehicle Fleet
- Autogas Transit Buses

The base case is conservative – it assumes no incentives for vehicles or infrastructure will be available. It also assumes future oil prices will be neither very high nor very low[2]. It assumes that infrastructure will be designed, built, owned and operated by government, except for Autogas, where a public-private partnership is the most common delivery method.

Figure 1 compares these projects in terms of their investment (Y-axis), payback period (X-axis) and net present value (size of circles).[3] Projects in the lower left are "lower-hanging fruit" than those in the upper right. They require less investment and pay back faster. The larger the circle, the greater the profitability – or savings after accounting for investment.

FIGURE 1: FINANCIAL PERFORMANCE OF ECONOMICALLY FEASIBLE CLEAN FUELS PROJECTS UNDER BASE CASE ASSUMPTIONS



[2] The price of fuels under future oil prices is provided by the U.S. Energy Information Administration Annual Energy Outlook, 2018.

[3] Payback period is the amount of time in years required for a project to recoup all investment. Net present value is the difference between projects investments and project returns, adjusted for the fact that investments / returns today are more valuable than the same in the future.

VARIATIONS

Sixteen different scenarios were evaluated for each project to estimate sensitivity to changes in assumptions. In addition to the base case, an alternative case (e.g. less vehicles or more infrastructure), a high oil price future and a low oil price future were evaluated. For each of these, four different levels of upfront financial incentives / private capital for vehicles and infrastructure were tested. (4 cases × 4 variations = 16 scenarios).

In the past, incentives for vehicles and/or infrastructure have been provided by the Federal Government, State of Florida and the North Florida TPO, among others. Funds administered by the Florida Department of Environmental Protection via the VW Settlement will be available shortly. Private capital has also been successfully utilized in clean fuels projects in recent years. In such cases, infrastructure may be available at no or reduced upfront cost.

Table 1 summarizes the feasibility of each project, including the base case and the variations. In the Base Case column, green projects are feasible, red projects are not. In the Variations column, projects where all 16 scenarios are feasible are green, while projects with no feasible variations are red. Projects where some variations are feasible, while others are not are yellow. In those cases, care must be taken to understand how varying assumptions affect feasibility. Detail on each project, including results from all 16 scenarios, is included in the Appendix.

TABLE 1: FEASIBILITY OF CLEAN FUELS PROJECTS, BASE CASE AND VARIATIONS

Name	Base Case	Variations
Autogas School Bus	Feasible	Feasible
Autogas Fleet*	Feasible	May be Feasible
Electric Passenger Vehicles	Feasible	Feasible
CNG Fleet*	Feasible	May be Feasible
Plug-in Hybrid Electric Passenger Vehicles	Feasible	Feasible
Autogas Transit Bus	Feasible	May be Feasible
Autogas Class 2	Not Feasible	May be Feasible
CNG School Bus	Not Feasible	May be Feasible
Autogas Class 1	Not Feasible	Not Feasible
Electric Transit Bus	Not Feasible	May be Feasible
CNG Transit Bus	Not Feasible	Not Feasible
CNG Class 2	Not Feasible	Not Feasible
CNG Class 1	Not Feasible	Not Feasible
CNG Class 3	Not Feasible	Not Feasible
Electric School Bus	Not Feasible	May be Feasible

Key:
- Feasible (green)
- May be Feasible (yellow)
- Not Feasible (red)

**Fleet projects represent cooperative ventures among County governments that include a variety of vehicle transitions and shared fueling infrastructure.*

The table shows that in addition to the six feasible base case projects, Autogas Class 2[4] trucks, CNG school buses, Autogas Class 1 trucks, electric transit buses and electric school buses may be feasible under some variations. It also shows that, under some variations, Autogas fleet, CNG fleet, and Autogas transit buses (all feasible under the base case) may not be economically feasible. Autogas school buses, electric and plug-in electric passenger vehicles and Autogas school buses are feasible under all variations.

Feasible projects for each clean fuel are described in more detail below and in the Appendix.

Autogas[5]:

Nassau County Schools and Nassau Transit fleets may be good candidates for propane Autogas. It will be a financial challenge for Nassau County BCC or the City of Fernandina Beach to transition vehicles to Autogas without incentives for vehicles or sharing infrastructure with others in the County.

(red)	Class 1 Trucks:	Not economically feasible by themselves under any scenario.
(yellow)	Class 2 Trucks:	Feasible with restored State of Florida vehicle incentives (50 percent of incremental cost). Also feasible under all high oil price scenario cases, except traditional delivery and no incentives.
(green)	School Buses:	Feasible under all scenarios.
(yellow)	Transit Buses:	Feasible under most scenarios, except a low fuel price future scenario without vehicle incentives.
(yellow)	Fleet:	Transitions of a mix of class 1 and 2 trucks, transit and school bus fleets are economically feasible under most cases. Exceptions include a low fuel price future without incentives.

Electricity[6]:

Electric passenger vehicles may be used by all County fleets. To maximize benefits, fleets must be willing to substitute electric vehicles (EVs) for larger passenger vehicles, including SUVs and non-pursuit police vehicles, where operationally feasible.

(green)	Passenger Vehicles:	Electric vehicles (EV) or plug-in hybrid electric vehicles (PHEV) are economically feasible under all variations.
(yellow)	School Buses:	Only feasible with very large incentives / reduction in incremental vehicle costs. Not feasible in a low oil price future.
(yellow)	Transit Buses:	Only feasible with large incentives / reduction in incremental vehicle costs with base case or high future oil prices. They are not feasible in a low oil price future.

[4] Vehicle type is based on the Federal Highway Administration system of vehicle classification, which organizes vehicles into eight classes based on gross vehicle weight ratings. "Passenger" (Class 1) includes cars, trucks and vans with a gross vehicle weight rating (GVWR) less than 6,000 pounds / 3 tons. "Light" (Class 2) includes trucks and vans with GVWR between 6,001 and 10,000 lbs / 5 tons. "Medium" (Class 3 – 6) includes trucks, vans, buses and specialty vehicles with GVWR between 10,001 lbs / 26,000 lbs / 13 tons. "Heavy" (Class 7 – 8) includes trucks, vans, buses and specialty vehicles with GVWR greater than 26,000 lbs.

[5] Passenger Vehicles and Class 3 Trucks are not technically feasible at present due to a lack of vehicle options. One exception is Autogas police vehicles, which may be feasible. Police vehicles were not identified in data provided by the City of Fernandina Beach. The Nassau County Sherriff did not submit data for this study.

[6] Class 1 – 3 trucks are not technically feasible at present due to a lack of vehicle options. This may change rapidly as innovation in this sector proceeds.

CNG[7]:

CNG projects require large numbers of vehicles for economic feasibility. The anchor of a cooperative ("fleet") CNG project would be the Nassau County Schools bus fleet. Nassau County BCC, the City of Fernandina Beach and Nassau Transit could not profitably develop a CNG project on their own. In addition, operational feasibility issues exist with identifying a single centrally located fueling station. Due to high infrastructure cost, more than one CNG station is not likely feasible without utilization by additional fleets.

(red)	Class 1 Trucks:	Not economically feasible by themselves under any scenario.
(red)	Class 2 Trucks:	Not economically feasible by themselves under any scenario.
(red)	Class 3 Trucks:	Not economically feasible by themselves under any scenario.
(yellow)	School Buses:	Feasible with vehicle incentives or with high future fuel prices. Not feasible where more than one fueling station is required or with low future fuel prices.
(red)	Transit Buses:	Not economically feasible by themselves under any scenario.
(yellow)	Fleet:	County governments may cooperatively transition a mix of class 1, 2 and 3 trucks, transit vehicles and school buses to CNG, except under a low oil price future, where no incentives are available. Not feasible with two stations except with financial incentives. Preliminary discussions with County fleet managers indicates that one fueling station will not be enough.

Biofuels:

Transition of any/all diesel fleet vehicles to biodiesel (B20) is technically feasible. Economic feasibility depends on obtaining B20 at a price equal to or less than the current diesel price from local distributors. Survey of local distributors indicates that this may be possible.

E85 may be feasible if enough flex-fuel vehicles (FFVs) are included in fleet to buy the fuel at volume. Economic feasibility depends on obtaining E85 at a price equal to or less than the current diesel price from local distributors. Survey of local distributors indicate that this may be possible. It is unknown how many FFVs are currently in County fleets.

Detailed evaluation of biofuels projects was not conducted because incremental cost for fuel, compatible vehicles or infrastructure is not significant.

Hydrogen

Hydrogen is not practical or economically feasible because infrastructure and vehicles are not available. There are no known plans to develop hydrogen infrastructure in North Florida. For these reasons, Hydrogen was not evaluated further.

[7] Passenger vehicles are not technically feasible due to a lack of vehicle options.

STAKEHOLDER SUMMARIES

Nassau County organizations differ in their potential to use clean fuels. This section summarizes the feasibility of using clean fuels for each stakeholder involved in this study.

City of Fernandina Beach

FIGURE 2: CLEAN FUELS FEASIBILITY FOR THE CITY OF FERNANDINA BEACH

- **Autogas:** The City may cost-effectively transition up to about 18 Class 2 trucks and two school buses to Autogas, including new fueling infrastructure at its current fleet facility, only if state vehicle incentives of 50 percent of incremental cost or equivalent are restored.
- **CNG:** The City may play a role (about 50 Class 1, Class 2 and three trucks and two school buses) in a cooperative project to transition County fleets to CNG. Project feasibility is limited by no convenient location for a shared CNG fueling station. CNG is not feasible without a cooperative project.
- **Electricity:** The City may cost-effectively transition about 15 passenger vehicles to EVs, including new fueling infrastructure, at its present fleet location. This may depend upon altering present fleet operational assumptions about the use of EVs.
- **Biofuels:** The City may cost-effectively utilize B20 in its diesel trucks. The number of diesel vehicles in the fleet has been estimated. E85 may be feasible if enough FFVs are included in its fleet to buy the fuel at volume. The actual number of diesel and FFVs in the fleet is unknown.
- **Hydrogen:** This fuel is not currently practical or economically feasible for the City.

Table 2 estimates total potential numbers of vehicles eligible for transition to clean fuels over the next five years by vehicle type, based on model year. Actual numbers may be less based on various factors, including fleet replacement budgets. Black-out areas are not applicable.

TABLE 2: ESTIMATED TOTAL POTENTIAL QUANTITY OF VEHICLE TRANSITIONS TO CLEAN FUELS BY TYPE AT THE CITY OF FERNANDINA BEACH OVER THE NEXT FIVE YEARS

Project	Autogas	CNG	Electric	Biofuels*	Hydrogen
School Bus	2	2	2	2	
Transit					
Class 1	27	27	15		
Class 2	18	18		6	
Class 3		6		6	

**Biofuels counts only include vehicles capable of using B20 since quantities of E85 Flex Fuel Vehicles are unknown.*

Nassau County Board of County Commissioners

FIGURE 3: CLEAN FUELS FEASIBILITY FOR NASSAU COUNTY BOARD OF COUNTY COMMISSIONERS

- **Autogas:** The County may cost-effectively transition up to about 19 Class 2 trucks to Autogas including new fueling infrastructure at its current fleet facility only if vehicle incentives are available and a P3 delivery method is utilized.
- **CNG:** The County may play a role, up to about 90 Class 1, 2 and 3 trucks, in a cooperative project to transition County fleets to CNG. Project feasibility is limited by no convenient central location for a shared CNG fueling station. CNG is not feasible without a cooperative effort.
- **Electricity:** The County may cost-effectively transition up to about 20 passenger vehicles to EVs, including new fueling infrastructure, at its present fleet location. This may depend upon altering present fleet operational assumptions about EV use.
- **Biofuels:** The County may cost-effectively utilize B20 in its 90 diesel trucks. E85 may be feasible if enough FFVs are included in its fleet to buy the fuel at volume. The actual number of FFVs in the fleet is unknown.
- **Hydrogen:** This fuel is not currently practical or economically feasible.

Table 3 estimates potential numbers of vehicles eligible for transition to clean fuels over the next five years by vehicle type, based on model year. Actual numbers may be less based on various factors, including fleet replacement budgets.

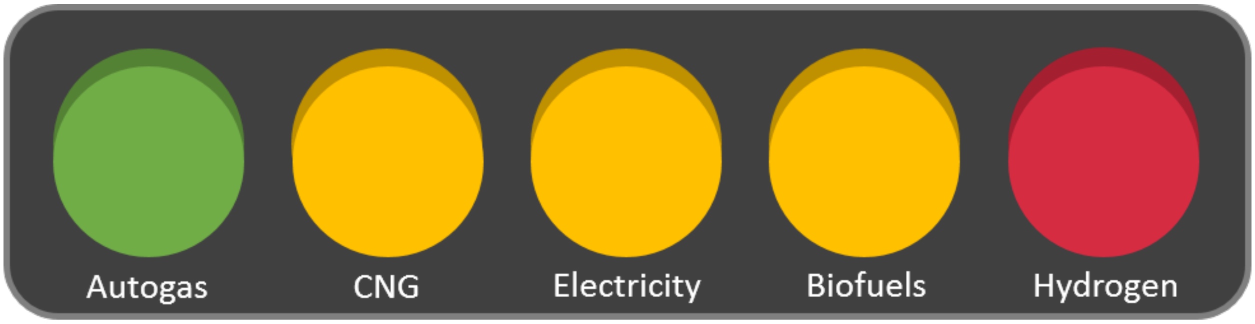
TABLE 3: ESTIMATED TOTAL POTENTIAL QUANTITY OF VEHICLE TRANSITIONS TO CLEAN FUELS BY TYPE AT THE NASSAU COUNTY BCC OVER THE NEXT FIVE YEARS

Project	Autogas	CNG	Electric	Biofuels*	Hydrogen
School Bus					
Transit					
Class 1	57	57	19		
Class 2	19	19		12	
Class 3		13		22	

**Biofuels counts only include vehicles capable of using B20 since quantities of E85 Flex Fuel Vehicles are unknown.*

Nassau Transit

FIGURE 4: CLEAN FUELS FEASIBILITY FOR NASSAU TRANSIT



- **Autogas:** Nassau Transit may cost-effectively transition up to about 11 transit buses, including new fueling infrastructure at its current fleet facility, regardless of available incentives or delivery method. This may not be feasible in a low future fuel price scenario. Class 2 trucks may also be transitioned if incentives are available.
- **CNG:** Nassau Transit may play a role (11 transit buses) in a cooperative project to transition County fleets to CNG. Project feasibility is limited by no convenient central location for a shared CNG fueling station. CNG is not feasible without a cooperative project.
- **Electricity:** At current prices, electric buses will only be feasible if large financial incentives greater than 65 percent of the incremental cost are available.
- **Biofuels:** B20 is not feasible in Nassau Transit buses, because they currently run on gasoline. E85 may be feasible if enough FFVs are included in its non-bus fleet to buy the fuel at volume. **Hydrogen:** This fuel is not practical or economically feasible at this time.

Table 5 below includes estimated potential numbers of vehicles eligible for transition to clean fuels over the next five years by vehicle type based on model year.

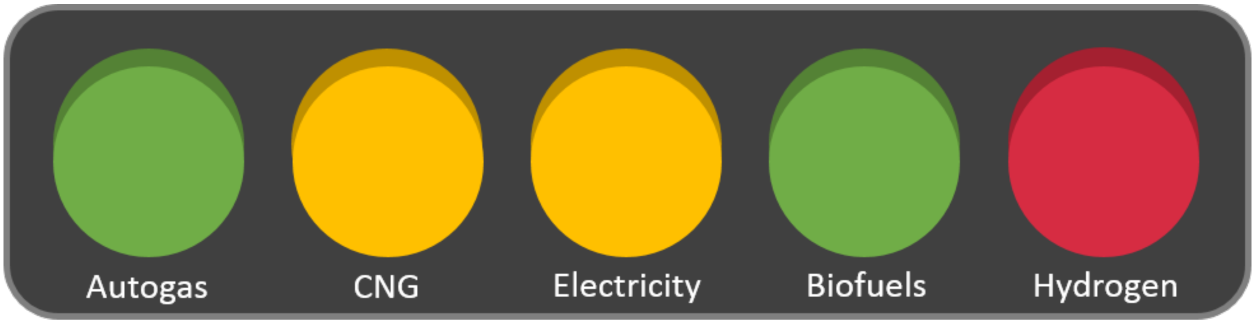
TABLE 4: ESTIMATED TOTAL POTENTIAL QUANTITY OF VEHICLE TRANSITIONS TO CLEAN FUELS BY TYPE AT NASSAU TRANSIT OVER THE NEXT FIVE YEARS

Project	Autogas	CNG	Electric	Biofuels*	Hydrogen
School Bus					
Transit	11	11	11	11	
Class 1					
Class 2					
Class 3					

**Biofuels counts only include vehicles capable of using B20 since quantities of E85 FFVs are unknown.*

Nassau County Schools

FIGURE 5: CLEAN FUELS FEASIBILITY FOR NASSAU COUNTY SCHOOLS



- **Autogas:** Nassau County Schools may cost effectively transition up to about 60 school buses (including new fueling infrastructure at its current fleet facility) regardless of available incentives, delivery method or future oil prices. Class 2 trucks may also be transitioned under these circumstances if incentives are available.
- **CNG:** By transitioning up to about 60 school buses, Nassau County Schools could become the anchor of a cooperative County CNG project. Transition of Class 1 – 3 trucks may also be feasible under these circumstances. Project feasibility is limited by the challenge of identifying a shared CNG fueling station location. Preliminary analysis suggests a shared central location is not feasible. Nassau County Schools may find it feasible to develop a project on its own, particularly if a time-fuel station is built. A time-fuel station fuels vehicles over a matter of hours, typically overnight, via multiple fueling bays.
- **Electricity:** Nassau County Schools may cost-effectively transition up to 18 passenger vehicles to EVs, including new fueling infrastructure, at its fleet location. At current prices, electric buses will only be feasible if large financial incentives more than 80 percent of incremental cost are available.
- **Biofuels:** Nassau County Schools may cost-effectively utilize B20 in school buses. E85 may be feasible if enough FFVs are included in its non-bus fleet to buy the fuel at volume. The actual number of FFVs in the fleet is not known.
- **Hydrogen:** This fuel is not currently practical or economically feasible.

Table 4 estimates potential numbers of vehicles eligible for transition to clean fuels over the next five years by vehicle type, based on model year. Actual numbers may be less based on various factors, including fleet replacement budgets.

TABLE 5: ESTIMATED TOTAL POTENTIAL QUANTITY OF VEHICLE TRANSITIONS TO CLEAN FUELS BY TYPE AT NASSAU COUNTY SCHOOLS OVER THE NEXT FIVE YEARS

Project	Autogas	CNG	Electric	Biofuels*	Hydrogen
School Bus	60	60	60	113	
Transit					
Class 1	35	35	18		
Class 2	18	18		134	
Class 3				1	

**Biofuels counts only include vehicles capable of using B20 since quantities of E85 FFVs are unknown.*

CLEAN FUELS INFRASTRUCTURE

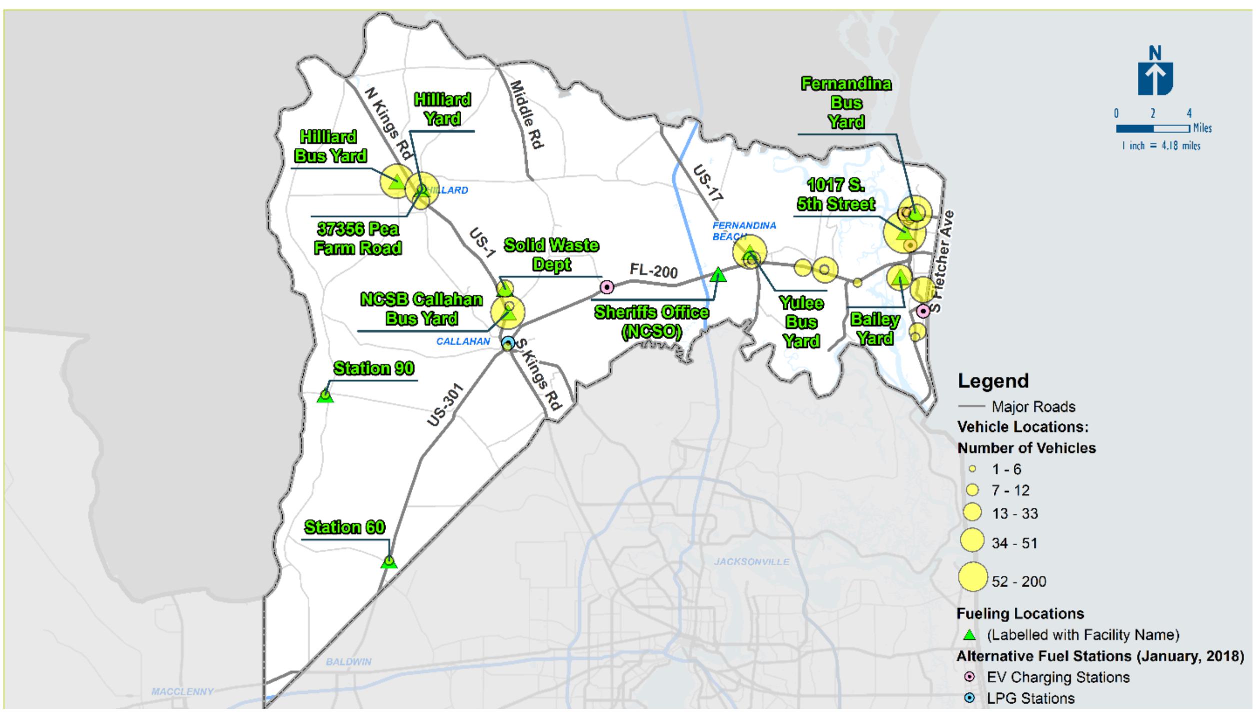
Transition to clean fuel vehicles will require new fueling infrastructure since adequate infrastructure does not now exist in Nassau County. New infrastructure requirements vary by fuel. For CNG and electricity, it is important to consider location. For other fuels this is less important.

- **Autogas:** Typically, Autogas infrastructure can be located where fleet vehicles are currently stored.
- **Electricity:** Infrastructure can be located where fleet vehicles are stored. Some municipalities plan to serve a portion of their electric fleets by providing public infrastructure, which promotes adoption. Municipal fleets may also use publicly-accessible infrastructure provided by others.
- **CNG:** Due to high cost and the likelihood that it must be shared with other stakeholders, the location of compressed natural gas infrastructure must be carefully considered. Allowing public access to infrastructure may improve the economic feasibility of a project and generate royalties.
- **Biofuels:** Biofuels are compatible with existing gasoline or diesel infrastructure, although maintenance practices differ.
- **Hydrogen:** Hydrogen infrastructure is unavailable and/or cost prohibitive at this time.

Current Clean Fuels Locations

Currently, Nassau County has no publicly accessible Autogas, CNG, Biofuel or Hydrogen fueling stations. EV charging infrastructure is limited. Infrastructure outside the County is too far away to utilize regularly. Figure 6 shows existing clean fuels stations, the location of County fleets and an estimated number of vehicles per location.

FIGURE 6: LOCATION OF EXISTING CLEAN FUEL INFRASTRUCTURE AND COUNTY FLEETS



- Alternative fuel infrastructure in the County is currently limited to seven EV charging stations. All but one are located in the vicinity of Fernandina Beach / Amelia Island. These stations are not fully accessible to the public, and are for fleet use, Tesla use or by permission only.
- AA Bottled Gas Co., a propane distributor, operates a facility for refilling propane tanks. It is not outfitted to fuel vehicles. The closest Autogas fueling station is approximately 20 miles away from Yulee at a fueling station along Eastport Road near I-295 and Pulaski Road in Jacksonville.
- The closest CNG fueling facility is located approximately 20 miles away from Yulee at a fueling station located along Heckscher Drive in Jacksonville.
- The closest biofuels fueling facility is an E85 fueling station near the Jacksonville International Airport. There are no public biodiesel fueling facilities in the region.

Future Clean Fuels Locations

Autogas infrastructure may be affordably sited where fleet vehicles are stored. Biofuels may be compatible with existing fueling infrastructure. Location is not a major factor in the feasibility of Autogas or biofuel fleet transitions. Due to cost, it is a major factor for CNG. Siting of electric infrastructure is important to develop a regional network of EV charging stations.

Electricity

Fleets that transition to EVs can affordably fuel them with private infrastructure. However, a nationwide effort is underway to develop a network of EV charging stations to support projected growth in EV use. As of February 2018, there were 71 EVs registered in Nassau County, mostly in its eastern portion. Registrations are expected to grow by at least 30 percent annually.

Locally, the North Florida TPO has led the effort to develop a public EV charging network. In 2016, the North Florida TPO installed 25 public charging stations in Duval County. It is currently implementing plans to install a similar amount of stations on public land in Clay, Nassau and St. Johns Counties. Two stations may be installed in Nassau County as part of this effort: one at the James S. Page Governmental Complex along SR-200 between Yulee and Amelia Island; the other at 140 Ash Street in downtown Fernandina Beach. These stations could be used to support fleet transitions to EVs at the Nassau County BCC and City of Fernandina Beach. Additional public stations may be viable elsewhere in the County, particularly if anchored by County fleet vehicles.

CNG

The location of new infrastructure is crucial for transitions to CNG. This assessment concludes that a single, central CNG fueling location is not feasible. If a single, central location cannot be found, transitions to AFVs for study participants other than Nassau County Schools may not be feasible without significant incentives or involving of additional fleets, including private fleets.

The cost of new fast-fuel CNG infrastructure requires significant fuel demand to justify investment[8]. In Nassau County, sufficient demand likely requires a cooperative transition, anchored by Nassau County Schools. Such a transition is based on convenient access to infrastructure.

8 Fast-fuel infrastructure fuels vehicles at a similar rate to gas or diesel pumps.

FIGURE 7: CURRENT FLEET FUELING LOCATIONS AND ASSOCIATED FUEL USE INTENSITY

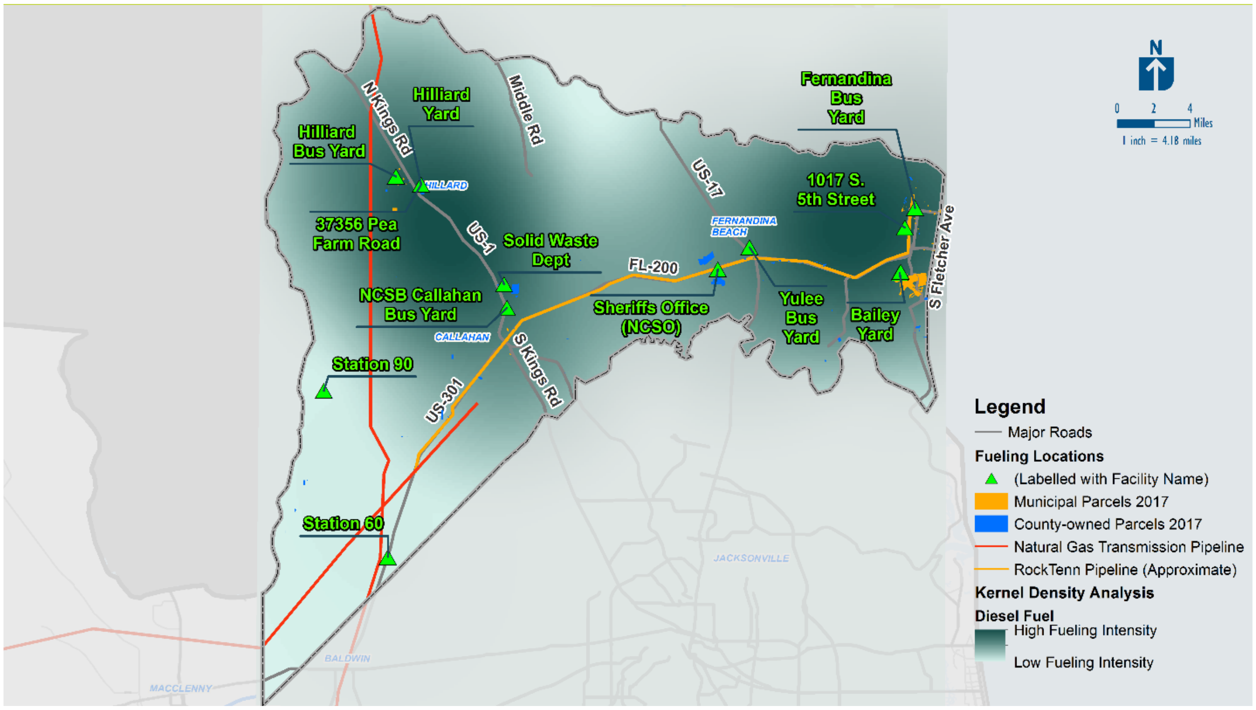


Figure 7 shows the location of current County fleet fueling locations. It also shows fueling intensity and the locations of fleet vehicles. The dark green areas represent high concentrations of fueling activity, while light green areas show low concentrations of fueling activity. The figure also shows county- or municipally-owned land parcels that could potentially be sites for fueling infrastructure. A natural gas transmission pipeline runs from the southwestern portion of the County (red line). The RockTen Pipeline is a spur from one of these that parallels US-301, FL-200 and A1A to the City of Fernandina Beach (orange line).

The figure suggests two "nodes" of significant fueling among the County's fleets. One is centered between Hilliard and Callahan, the other between Fernandina Beach and Yulee. The most likely location for a single, central CNG fueling station would be along FL-200 between US-1 and US-17. Given current and planned development, the area around FL-200 and I-95 might be an ideal location. The County owns land on either side of FL-200 just east of I-95. However, this location is about 20 miles from fleet vehicles in Hilliard and 15 miles from fleet vehicles in Fernandina Beach.

These findings were reviewed with the study participants during a May 29, 2018 meeting. Participants' consensus was that this location would be an inconvenient fueling location. Further, participants agreed that a single, central location would not be feasible. Focusing solely on Nassau County Schools, it is unlikely that a single location could serve its fleet, since vehicles are housed and fueled across the County. Thus, while Nassau County Schools could find it economically feasible to develop a fast-fuel CNG station on its own with vehicle incentives, it is probably not feasible from an operational perspective.

BASELINE

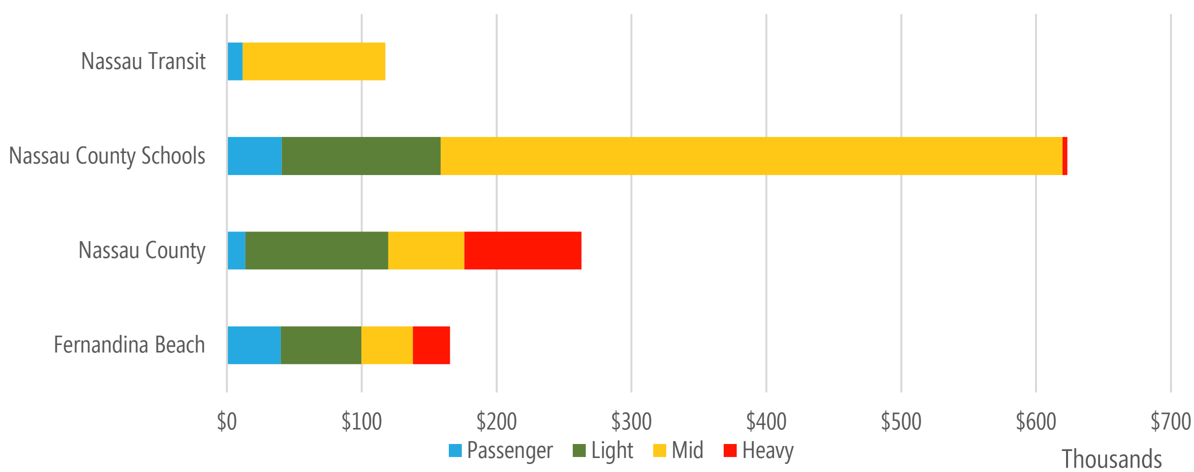
Analyzing fleet data forms the basis of this feasibility assessment. This section characterizes the study participants' fleets, including fuel expenditure, fuel use, vehicle miles travelled, fleet vintage, vehicle numbers, vehicle replacement potential, and fleet facilities. Below is a summary of key characteristics:

- » Study participants spent about $1.2 million per year on gasoline and diesel fuel per year.
- » More than 500 vehicles are in operation among the organizations. The majority are light and medium duty trucks.
- » Generally, fleets are old, with 2009 the average model year and more than half the vehicles aged eight or more years. This indicates potential for significant vehicle replacement.
- » Fleet facilities are located throughout the County, with at least 11 fueling locations operated by participants.

FUEL EXPENDITURE

Study participants spend about $1.2 million dollars for on-road vehicle fuel per year, based on data from the year 2017. For each study participant, expenditure is further broken down by vehicle type[9] (Figure 8). Participants spent about $143,000 for off-road vehicle / equipment fuel, about 12 percent of total expenditure.

FIGURE 8: ROAD EXPENDITURE (DOLLARS) BY VEHICLE TYPE*

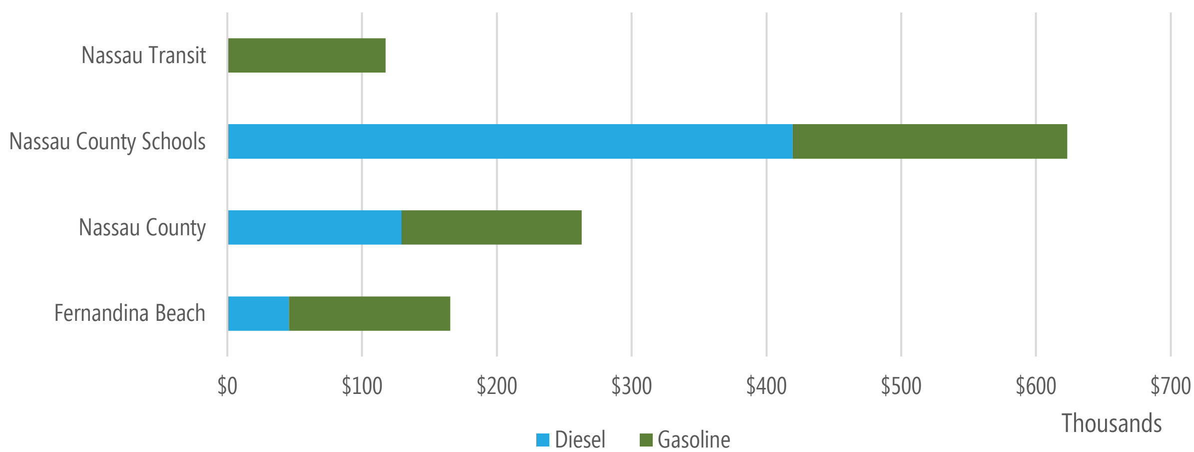


**Expenditure by vehicle class is estimated for the City of Fernandina Beach and Nassau County Schools, since only fleet-wide expenditure totals were provided.*

[9] Vehicle type is based on the Federal Highway Administration system of vehicle classification, which organizes vehicles into eight classes based on gross vehicle weight ratings. "Passenger" (Class 1) includes cars, trucks and vans with a gross vehicle weight rating (GVWR) less than 6,000 pounds / 3 tons. "Light" (Class 2) includes trucks and vans with GVWR between 6,001 and 10,000 lbs / 5 tons. "Medium" (Class 3 – 6) includes trucks, vans, buses and specialty vehicles with GVWR between 10,001 lbs / 26,000 lbs / 13 tons. "Heavy" (Class 7 – 8) includes trucks, vans, buses and specialty vehicles with GVWR greater than 26,000 lbs.

About 50 percent of expenditures are for diesel fuel, 50 percent for gasoline, though the balance between the two fuels varies considerably among agencies (Figure 9). For instance, Nassau Transit uses gasoline almost exclusively. Off-road fuel use is greater than 85 percent diesel.

FIGURE 9: ROAD FUEL EXPENDITURE (DOLLARS) BY FUEL TYPE*

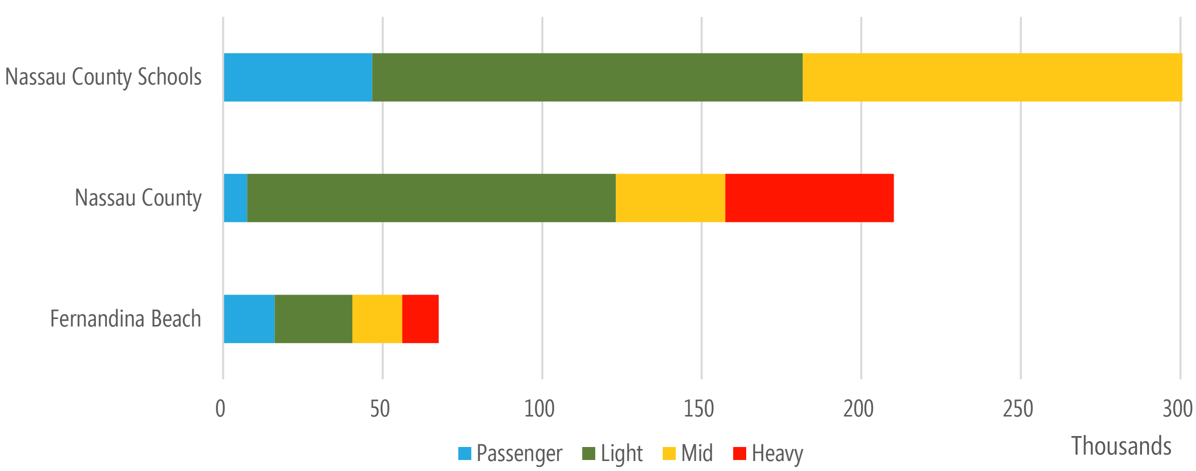


**Fuel type for City of Fernandina Beach and Nassau County Schools was estimated based on vehicle class*

FUEL USE

Study participants used about 824,000 gallons of fuel. Fuel use correlates strongly with fuel expenditure and vice versa, as indicated by Figure 10 and Figure 11. These figures graph on-road fuel use by vehicle type and by fuel type, respectively. About 11 percent of total fuel use is for off-road vehicles.

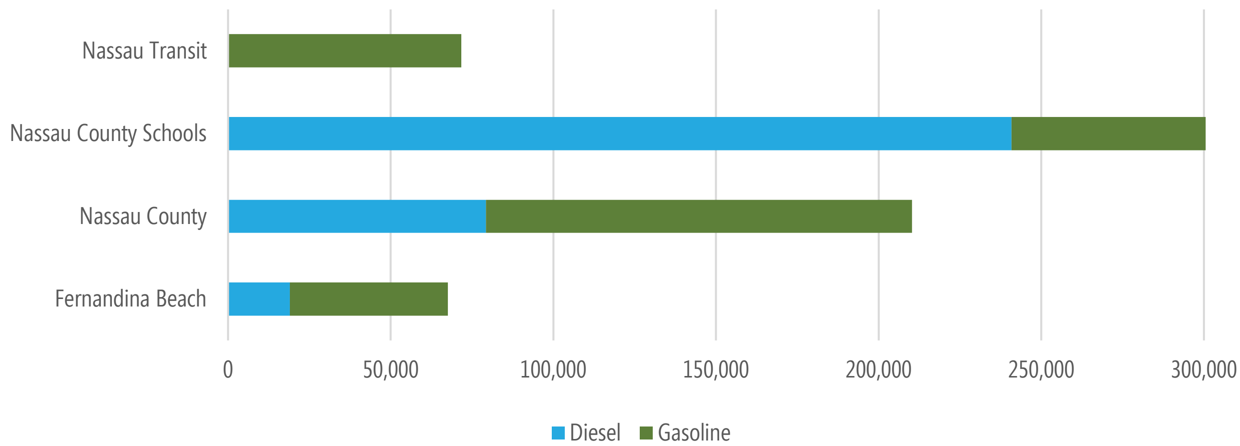
FIGURE 10: ROAD FUEL USE (GALLONS) BY VEHICLE TYPE



**Fuel use by vehicle class is estimated for the City of Fernandina Beach and Nassau County Schools, since only fleet-wide fuel use totals were provided.*

Study participants used about 485,000 gallons of gasoline and 339,000 gallons of diesel.

FIGURE 11: ROAD FUEL USE (GALLONS) BY FUEL TYPE



**Fuel use by fuel type is estimated for the City of Fernandina Beach and Nassau County Schools, since only fleet-wide fuel use totals were provided.*

Average fuel use by vehicle class varies substantially by organization, reflecting differing organizational requirements for fleet vehicles and / or data quality issues. Values are shown in Table 6. Average values for each organization's fuel use by vehicle type were used as inputs in the clean fuels feasibility projects.

TABLE 6: AVERAGE ROAD FUEL USE BY VEHICLE TYPE (GALLONS PER YEAR)

Organization	Passenger	Light	Medium	Heavy
Fernandina Beach	476	476	627	949
Nassau County	344	1,392	1,371	1,704
Nassau County Schools	2,595	2,595	2,169	2,094
Nassau Transit	1,804	-	3,392	-
Average	996	1,477	1,995	1,507

The fuel economy of participants' fleets is uncertain, since estimates are based on data provided by organizations or extrapolated from estimates of fuel use and VMT. These estimated values tend to be lower than national averages for vehicle classes. Except for school buses and transit buses, the values shown in Table 7 were not used in analysis. Instead, higher national averages published by the U.S. Department of Transportation Bureau of Transportation Statistics for the average vehicle model year were used in clean fuels projects business cases. Average fuel economy for school buses and transit buses was estimated at 7.6 and 9.3 miles per gallon, respectively.

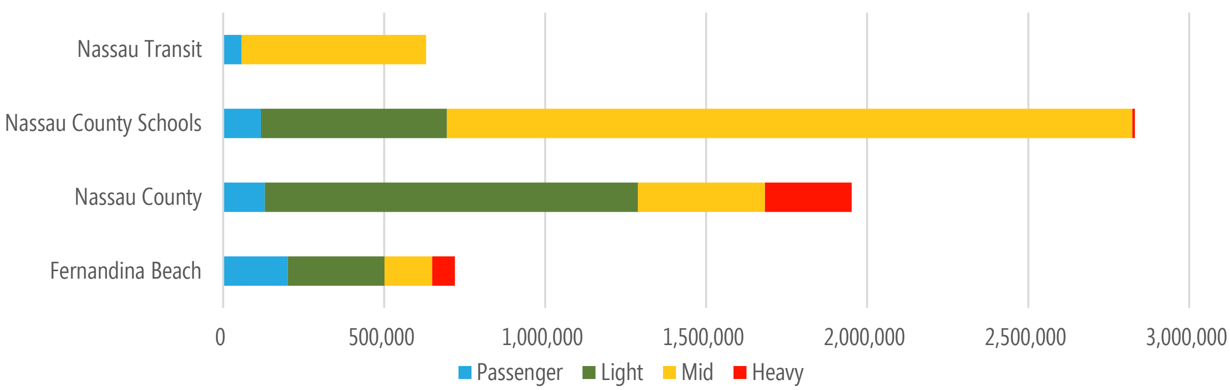
TABLE 7: AVERAGE FUEL ECONOMY (MILES PER GALLONS) BY FUEL AND VEHICLE TYPE

Organization	Passenger	Light	Medium	Heavy
Fernandina Beach	12.4	12.4	10.4	6.2
Nassau County	21.1	14.8	16.3	6.7
Nassau County Schools	2.5	4.3	7.4	3.7
Nassau Transit	8.2	-	9.3	-
Average	12.2	10.8	8.8	6.5

VEHICLE MILES TRAVELLED

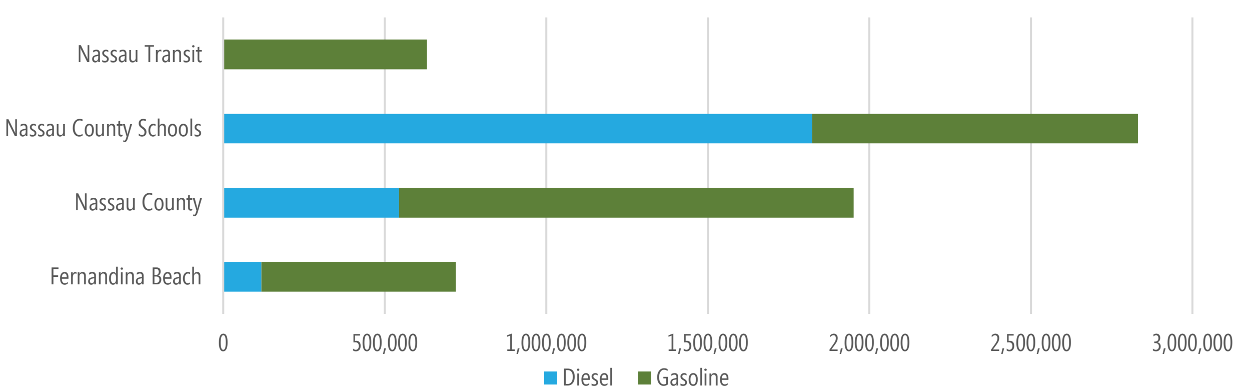
Figure 12 and Figure 13 graphs estimated annual vehicle miles travelled (VMT) by vehicle type and fuel type for each organization, based on data received for the years 2013 – 2015. In some cases, VMT was estimated using methods indicated in the figures below.

FIGURE 12: ANNUAL VEHICLE MILES (MILLIONS) BY VEHICLE TYPE*



**VMT by vehicle class is estimated for the City of Fernandina Beach and Nassau County Schools, since only fleet-wide totals and bus fleet totals were provided, respectively.*

FIGURE 13: ANNUAL VEHICLE MILES (MILLIONS) BY FUEL TYPE*



**VMT by vehicle class is estimated for the City of Fernandina Beach and Nassau County Schools, since only fleet-wide totals and bus fleet totals were provided, respectively.*

Each organization's average VMT by vehicle type and fuel type is shown in Table 8. The average of these values was used in the clean fuels feasibility projects.

TABLE 8: ANNUAL AVERAGE VEHICLE MILES (MILLIONS) BY FUEL AND VEHICLE TYPE

	Gasoline			Diesel		
Organization	Pass.	Light	Med.	Light	Med.	Heavy
Fernandina Beach	5,900	5,900	5,900		5,900	5,900
Nassau County	6,183	14,563	15,829	4,098	20,578	8,965
Nassau County Schools	6,529	11,093	15,712		15,919	7,674
Nassau Transit	14,168		30,181			
Average	6,554	11,144	17,416	4,098	15,774	8,080

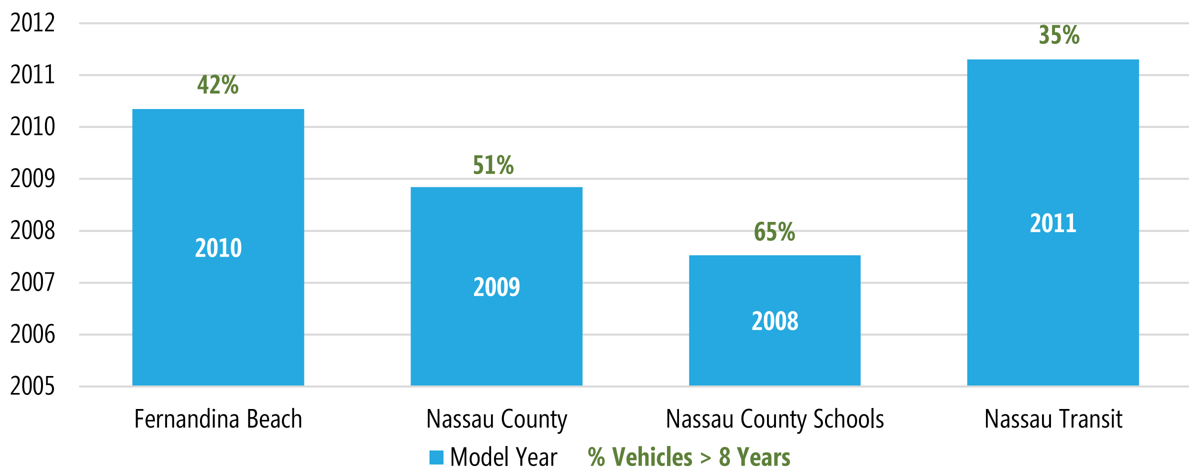
FLEET VINTAGE

The average model year among study participants is 2009, with over half the vehicles eight years old (i.e. model year 2010 or older). Vehicles in the City of Fernandina Beach and Nassau Transit fleets are slightly newer than this average.

During interviews, most representatives of County organizations indicated that the vintage of their fleet is older than in the past due to the lingering effects of the Great Recession, which have led to deferred investment in vehicle replacements. This suggests that some organizations are in a unique position to shift to clean fuels when and if conditions justify returning to historic replacement rate.

Figure 14 graphs the average model year of vehicles with the percentage of vehicles eight years or older.

FIGURE 14: FLEET AVERAGE MOEL YEAR WITH PERCENTAGE OF VEHICLES EIGHT YEARS OR OLDER



VEHICLE COUNTS

Among the four organizations, there are approximately 541 vehicles, with 16 percent in the Passenger Vehicle category, 36 percent in the Light Truck category, 39 percent in the Medium Truck category and 9 percent in the Heavy Truck category.

Figure 15 illustrates the proportion of vehicle types by organization, with quantities shown.

FIGURE 15: ROAD VEHICLES BY TYPE

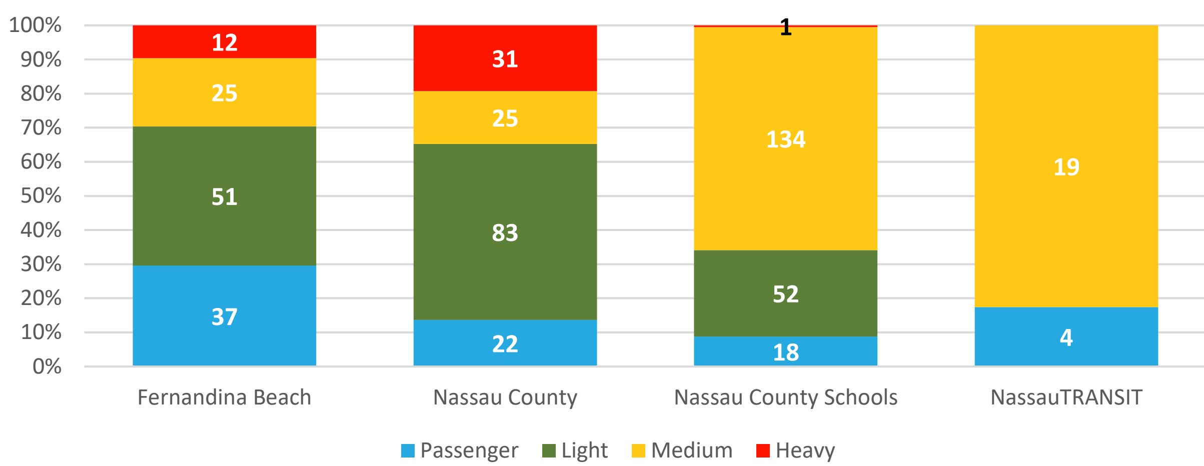


Table 9 indicates the number of vehicles operated by each organization by fuel and vehicle type.

TABLE 9: ROAD VEHICLES BY ORGANIZATION BY FUEL AND VEHICLE TYPE

	Gasoline				Diesel				
Organization	Pass.	Light	Med.	Sum	Light	Med.	Heavy	Sum	Total
Fernandina Beach	34	51	17	102	-	8	12	20	125
Nassau County	22	81	8	111	2	17	31	50	161
Nassau County Schools	18	52	20	90	-	114	1	115	205
Nassau Transit	4	-	19	23	-	-	-	-	23
Total	78	184	64	326	2	139	44	185	514

The City of Fernandina Beach and Nassau County operated about 140 non-road vehicles or pieces of equipment that use fuel. This includes three electric-powered passenger vehicles designed for neighborhood-scale travel operated by the City of Fernandina Beach.

VEHICLE REPLACEMENT POTENTIAL

Potential vehicle replacements over the next five to six years were identified via data analysis and meetings with representatives of each organization. The results of this qualitative assessment are summarized in Table 10.

The table shows potential replacements of conventionally fueled vehicles with Autogas, electric, CNG or biofuels for each organization.

TABLE 10: POTENTIAL REPLACEMENTS BY ORGANIZATION

Fuel	Vehicle Type	Fernandina Beach	Nassau County	Nassau County Schools	Nassau Transit
Electric	Passenger / Light	15	19	18	-
	Medium	-	-	-	-
	Heavy	-	-	-	-
	School Bus	2	-	60	-
	Transit Bus	-	-	-	11
Autogas	Passenger / Light	27	57	35	-
	Medium	18	19	18	-
	Heavy	-	-	-	-
	School Bus	2	-	60	-
	Transit Bus	-	-	-	11
Biodiesel	Passenger / Light	-	-	-	-
	Medium	6	12	134	-
	Heavy	6	22	1	-
	School Bus	2	-	113	-
	Transit Bus	-	-	-	11
Natural Gas	Passenger / Light	27	57	35	-
	Medium	18	19	18	-
	Heavy	6	13	1	-
	School Bus	2	-	60	-
	Transit Bus	-	-	-	11

Except for values for Nassau Transit, which provided an estimate of vehicles to be replaced over the next several years, this potential represents estimates based on the model year and expected life of fleet vehicles. Actual procurement of vehicles in the future may be higher or lower than the quantities presented.

The sensitivity of the business cases for clean fuels projects to the number of vehicles procured was evaluated, with the values in Table 10 serving as an upper limit. These analyses generally indicated that the economic performance of clean fuels projects worsens as the number of vehicles involved decreases.

FLEET FACILITIES

Organizations house vehicles at 29 locations across the county. Fleets fuel vehicles at 11 locations that they own / operate. In some cases, more than one organization uses individual fueling locations. Figure 16 depicts these locations. They are also collected in Table 11. Locations of maintenance and fueling facilities are important considerations to evaluate potential new infrastructure locations and the feasibility of transitions to clean fuels.

FIGURE 16: LOCATION OF EXISTING CLEAN FUEL INFRASTRUCTURE AND COUNTY FLEETS

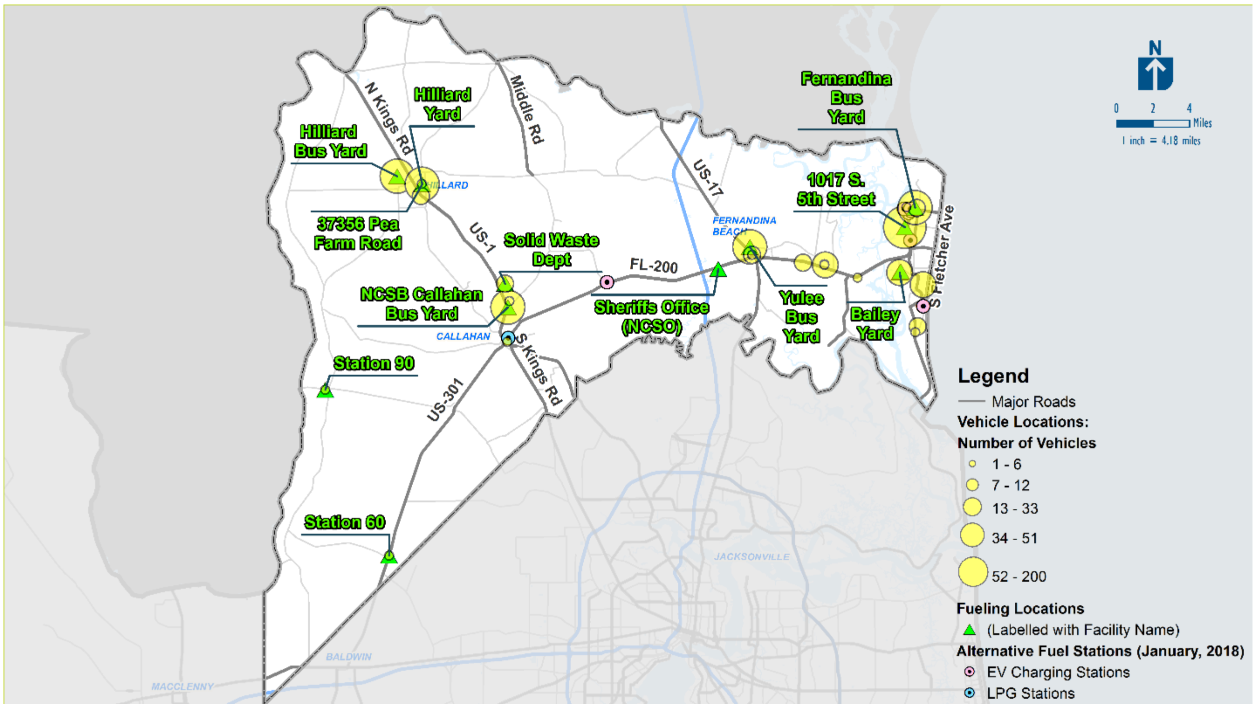


TABLE 11: FLEET FUELING LOCATIONS

Fleet Location	Fueling?	Organization	Address	City
Animal Control	No	Nassau County	86078 License Rd	Fernandina Beach
Bailey Yard	Yes	Nassau County	3164 Bailey Rd	Fernandina Beach
Extension Services Callahan	No	Nassau County	543350 US Hwy 1	Callahan
Extension Services Yulee	No	Nassau County	86028 Pages Dairy Rd	Yulee
Facilities Maintenance Yulee	No	Nassau County	96135 Nassau Pl	Yulee
Fernandina Library	No	Nassau County	25 N. 4th St	Fernandina Beach
Fire and Rescue Admin Bldg	No	Nassau County	96160 Nassau Pl	Yulee
Governmental Complex	No	Nassau County	96135 Nassau Pl	Yulee
Hilliard Yard	Yes	Nassau County	37357 Pea Farm Rd	Hilliard
Landfill Road	No	Nassau County	46027 Landfill Rd	Callahan
NAU Plant	No	Nassau County	5390 First Coast Hwy	Fernandina Beach
Public Service Building	No	Nassau County	96161 Nassau Pl	Yulee
Sheriff's Office	Yes	Nassau County	76001 Bobby Moore Circle	Yulee
Solid Waste Dept	Yes	Nassau County	46027 Landfill Rd	Callahan
Station 20	No	Nassau County	5518 First Coast Hwy	Fernandina Beach
Station 30	No	Nassau County	86028 Pages Dairy Rd	Yulee

TABLE 11, CONTINUED: FLEET FUELING LOCATIONS

Fleet Location	Fueling?	Organization	Address	City
Station 40	No	Nassau County	37230 Pea Farm Rd	Hilliard
Station 50	No	Nassau County	542310 US Hwy 1	Callahan
Station 60	Yes	Nassau County	8291 US Hwy 301	Bryceville
Station 70	No	Nassau County	96031 Pine Grove Rd	Fernandina Beach
Station 90	Yes	Nassau County	3195 SR2	Hilliard
Fernandina Beach	No	Nassau Transit	102 N 13th Street	Fernandina Beach
Hilliard	No	Nassau Transit	37002 Ingham Road	Hilliard
Fleet Maintenance Headquarters	Yes	City of Fernandina Beach	1017 South 5th Street	Fernandina Beach
Fernandina Beach Golf Club	No	City of Fernandina Beach	2800 Bill Melton Road	Fernandina Beach
Yulee Bus Yard	Yes	Nassau County Schools	86260 Goodbread Road	Yulee
Callahan Bus Yard	Yes	Nassau County Schools	45015 Musslewhite Road	Callahan
Fernandina Bus Yard	Yes	Nassau County Schools	1201 Atlantic Avenue	Fernandina Beach
Hilliard Bus Yard	Yes	Nassau County Schools	27637 Ohio Street	Hilliard

APPENDIX

FEASIBILITY ASSESSMENT DETAIL

This assessment evaluates the economic feasibility of 15 potential clean fuels projects. For each project, the potential economic performance under a base case and three additional cases was evaluated. The base case includes a specific number of vehicles based on estimated fleet replacement potential and moderate future fuel price increases. An alternative case examines how transitioning fewer vehicles or, in the case of the CNG projects, additional fueling infrastructure affects economic feasibility. Two additional cases examine how future fuel prices affect feasibility. High and low forecasted price increases are sourced from the U.S. Energy Administration (EIA) Annual Energy Outlook 2018 (AEO18).

For each case four variations are examined. The variations are the same for each case. They evaluate how financial incentives affect economic feasibility. Financial incentives for both infrastructure and vehicles are considered.

Autogas

Five Autogas projects were evaluated: a fleet of Autogas Class 1 / Light Trucks (less than 6,000 - 10,000 lbs), Class 2 / Medium Trucks (10,001 -26,000 lbs), transit buses and school buses; and each of these four vehicle transitions considered separately.

The project assumes the cost of an Autogas station is about $50,000. The number of stations varies by case. The assumed incremental cost of Class 1 and 2 trucks is $10,000, transit buses is $10,000 and school buses are $6,600, based on industry data. The estimated gasoline and diesel prices in the first year of the project are $2.30 and $2.69 per gaseous gallon equivalent (GGE), respectively. The estimated Autogas price in the first year of the project is $1.78 per GGE under a DBOM scenario and $1.88 per GG under a public-private partnership (P3) scenario. In the latter case, actual prices will be negotiated between the P3 provider and users.

Variations evaluate the effect of financial incentives and delivery method. Currently there are no incentives for Autogas vehicles or infrastructure. The State of Florida provided 50 percent of the incremental cost of vehicles until last year. Funding for this incentive program was not renewed in the most recent legislative session. However, vehicle incentives may be available for buses via VW settlement. The Autogas industry provides a P3 delivery method whereby infrastructure is provided at no upfront cost in exchange for a mult-year fuel purchase agreement that amortizes the infrastructure cost. An infrastructure incentive of 100 percent (equivalent to a no-upfront cost P3) and a vehicle incentive of 50 percent equivalent to lapsed State of Florida incentives were evaluated.

Fleet

This project evaluates transition of a fleet of vehicles (Class 1 and 2 trucks, transit and school buses). Results (Table 12) show that it is feasible under most scenarios. The exceptions are variations where future fuel prices are low and no financial incentives for vehicles are available.

Reducing the number of vehicles involved in the transition only marginally improves feasibility, since less fueling infrastructure may be required. The project performs much better with incentives on the scale of the State's recent program, but generally remains feasible without incentives. It also performs much better under a high future fuel price scenario. A low-price scenario puts the project at significant risk; incentives help mitigate this risk. The cases evaluated are as follows. Variations are the same for all cases.

- Base Case: 240 new Class 1 and 2 trucks, transit buses and school buses, based on the organizations' stated replacement potential. Nine fueling stations located at current fueling facilities.
  - Variation 1: DBOM delivery of new fueling infrastructure without any incentives.
  - Variation 2: P3 delivery of new fueling infrastructure without any incentives.
  - Variation 3: As Variation 1 with a 50 percent vehicle incentive.
  - Variation 4: As Variation 2, with a 50 percent vehicle incentive.
- 50 percent Fewer Vehicles: 120 new Class 1 and 2 trucks, transit buses and school buses. Four fueling stations located at current fueling facilities.
- Low Fuel Prices: 240 new Class 1 and 2 trucks, transit buses and school buses. Average annual price increases of 2.1, 2.0 and 2.4 percent for gasoline, diesel and Autogas, respectively.
- High Fuel Prices: 240 new Class 1 and 2 trucks, transit buses and school buses. Average annual price increases of 5.7, 5.9 and 4.6 percent for gasoline, diesel and Autogas, respectively.

TABLE 12: AUTOGAS VEHICLE FLEET PROJECT COST-EFFECTIVENESS SUMMARY

Case / Variation	NPV	IRR	ROI	PP	Life
1. Base Case: 240 vehicles, 9 stations					
Variation 1: DBOM, 0% Incentive	$462,506	6%	23%	11.8	20.5
Variation 2: P3, 0% Incentive	$276,807	5%	11%	12.6	20.5
Variation 3: DBOM, 50% Incentive	$1,276,793	14%	80%	8.8	20.5
Variation 4: P3, 50% Incentive	$1,462,492	19%	146%	7.7	20.5
2. Fewer Vehicles: 120 vehicles, 4 stations					
Variation 1: DBOM, 0% Incentive	$247,279	7%	26%	11.7	20.5
Variation 2: P3, 0% Incentive	$179,612	5%	15%	12.2	20.5
Variation 3: DBOM, 50% Incentive	$656,837	14%	88%	8.6	20.5
Variation 4: P3, 50% Incentive	$724,504	20%	152%	7.6	20.5
3. Low Fuel Prices: 240 vehicles, 9 stations					
Variation 1: DBOM, 0% Incentive	$1,451,363	11%	73%	10.0	20.5
Variation 2: P3, 0% Incentive	$1,265,664	9%	49%	10.6	20.5
Variation 3: DBOM, 50% Incentive	$2,265,651	19%	142%	7.8	20.5
Variation 4: P3, 50% Incentive	$2,451,349	26%	245%	6.8	20.5
4. High Fuel Prices: 240 vehicles, 9 stations					
Variation 1: DBOM, 0% Incentive	($398,223)	0%	-20%	20.5	20.5
Variation 2: P3, 0% Incentive	($583,921)	-1%	-22%	20.5	20.5
Variation 3: DBOM, 50% Incentive	$416,065	7%	26%	10.5	20.5
Variation 4: P3, 50% Incentive	$601,764	12%	60%	9.3	20.5

Class 1 Trucks

This project evaluates transition of Class 1 / Light trucks to Autogas. Results (Table 13) show that it is not feasible under any scenario. These trucks are relatively fuel efficient. As a result, it takes too long for upfront investment in new Autogas vehicles to be repaid through fuel savings.

The cases evaluated are as follows. Variations are the same for all cases.

- Base Case: 115 new Class 1 trucks. Four fueling stations located at current fueling facilities.
  - Variation 1: DBOM delivery of new fueling infrastructure without any incentives.
  - Variation 2: P3 delivery of new fueling infrastructure without any incentives.
  - Variation 3: As Variation 1 with a 50 percent vehicle incentive.
  - Variation 4: As Variation 2, with a 50 percent vehicle incentive.
- Fewer Vehicles: 55 new Class 1 trucks. Two fueling stations located at current fueling facilities.
- Low Fuel Prices: 115 new Class 1 trucks. Average annual price increases of 2.1, 2.0 and 2.4 percent for gasoline, diesel and Autogas, respectively.
- High Fuel Prices: 115 new Class 1 trucks. Average annual price increases of 5.7, 5.9 and 4.6 percent for gasoline, diesel and Autogas, respectively.

TABLE 13: AUTOGAS CLASS 1 TRUCK PROJECT COST-EFFECTIVENESS SUMMARY

Case / Variation	NPV	IRR	ROI	PP	Life
1. Base Case: 115 vehicles, 4 stations					
Variation 1: DBOM, 0% Incentive	($678,011)	-11%	-65%	>20.5	13.5
Variation 2: P3, 0% Incentive	($850,146)	-12%	-65%	>20.5	13.5
Variation 3: DBOM, 50% Incentive	($326,474)	-5%	-42%	>20.5	13.5
Variation 4: P3, 50% Incentive	($154,339)	-2%	-29%	>20.5	13.5
2. Fewer Vehicles: 55 vehicles, 2 stations					
Variation 1: DBOM, 0% Incentive	($324,266)	-11%	-65%	>20.5	13.5
Variation 2: P3, 0% Incentive	($412,066)	-13%	-66%	>20.5	13.5
Variation 3: DBOM, 50% Incentive	($161,614)	-6%	-43%	>20.5	13.5
Variation 4: P3, 50% Incentive	($73,814)	-2%	-29%	>20.5	13.5
3. Low Fuel Prices: 115 vehicles, 4 stations					
Variation 1: DBOM, 0% Incentive	($594,265)	-9%	-57%	>20.5	13.5
Variation 2: P3, 0% Incentive	($766,400)	-10%	-59%	>20.5	13.5
Variation 3: DBOM, 50% Incentive	($242,727)	-3%	-31%	>20.5	13.5
Variation 4: P3, 50% Incentive	($70,592)	1%	-13%	12.7	13.5
4. High Fuel Prices: 115 vehicles, 4 stations					
Variation 1: DBOM, 0% Incentive	($774,719)	-14%	-74%	>20.5	13.5
Variation 2: P3, 0% Incentive	($946,854)	-15%	-73%	>20.5	13.5
Variation 3: DBOM, 50% Incentive	($423,182)	-9%	-55%	>20.5	13.5
Variation 4: P3, 50% Incentive	($251,047)	-6%	-48%	>20.5	13.5

Class 2 Trucks

This project evaluates transition of Class 2 / Medium trucks to Autogas. Results (Table 14) show that it is feasible only under certain scenarios.

The project is feasible only with vehicle incentives on the scale of the State's recent program, except under a high future fuel price scenario with a P3 delivery method. Reducing the number of vehicles involved in the transition does not appreciably change feasibility.

The cases evaluated are as follows. Variations are the same for all cases.

- Base Case: 55 new Class 2 trucks. Four fueling stations located at current fueling facilities.
  - Variation 1: DBOM delivery of new fueling infrastructure without any incentives.
  - Variation 2: P3 delivery of new fueling infrastructure without any incentives.
  - Variation 3: As Variation 1 with a 50 percent vehicle incentive.
  - Variation 4: As Variation 2, with a 50 percent vehicle incentive.
- Fewer Vehicles: 25 new Class 2 trucks. Two fueling stations located at current fueling facilities.
- Low Fuel Prices: 55 new Class 2 trucks. Average annual price increases of 2.1, 2.0 and 2.4 percent for gasoline, diesel and Autogas, respectively.
- High Fuel Prices: 55 new Class 2 trucks. Average annual price increases of 5.7, 5.9 and 4.6 percent for gasoline, diesel and Autogas, respectively.

TABLE 14: AUTOGAS CLASS 2 TRUCK PROJECT COST-EFFECTIVENESS SUMMARY

Case / Variation	NPV	IRR	ROI	PP	Life
1. Base Case: 55 vehicles, 4 stations					
Variation 1: DBOM, 0% Incentive	($28,312)	2%	-6%	11.3	13.5
Variation 2: P3, 0% Incentive	($213,917)	-3%	-28%	>20.5	13.5
Variation 3: DBOM, 50% Incentive	$36,535	5%	7%	9.8	13.5
Variation 4: P3, 50% Incentive	$222,140	19%	89%	7.1	13.5
2. Fewer Vehicles: 25 vehicles, 2 stations					
Variation 1: DBOM, 0% Incentive	($12,869)	2%	-6%	11.3	13.5
Variation 2: P3, 0% Incentive	($108,682)	-4%	-31%	>20.5	13.5
Variation 3: DBOM, 50% Incentive	$5,160	4%	2%	10.1	13.5
Variation 4: P3, 50% Incentive	$100,973	19%	89%	7.1	13.5
3. Low Fuel Prices: 55 vehicles, 4 stations					
Variation 1: DBOM, 0% Incentive	$91,213	7%	18%	9.5	13.5
Variation 2: P3, 0% Incentive	($94,392)	1%	-13%	12.0	13.5
Variation 3: DBOM, 50% Incentive	$156,060	9%	31%	8.6	13.5
Variation 4: P3, 50% Incentive	$341,665	25%	136%	6.4	13.5
4. High Fuel Prices: 55 vehicles, 4 stations					
Variation 1: DBOM, 0% Incentive	($137,294)	-3%	-27%	>20.5	13.5
Variation 2: P3, 0% Incentive	($322,899)	-8%	-43%	>20.5	13.5
Variation 3: DBOM, 50% Incentive	($72,447)	0%	-14%	>20.5	13.5
Variation 4: P3, 50% Incentive	$113,158	12%	45%	8.4	13.5

Transit Bus

This project evaluates transition to Autogas transit buses for Nassau Transit. Results (Table 15) show that it is feasible under most scenarios.

The project is feasible in all variations except a low fuel price future. In this variation, the project is only feasible with vehicle incentives and a P3 delivery method. Reducing the number of vehicles involved in the transition does not appreciably change feasibility.

The cases evaluated are as follows. Variations are the same for all cases.

- Base Case: 10 new transit buses. Two fueling stations located at current fueling facilities.
  - Variation 1: DBOM delivery new fueling infrastructure without any incentives.
  - Variation 2: P3 delivery of new fueling infrastructure without any incentives.
  - Variation 3: As Variation 1 with a 50 percent vehicle incentive.
  - Variation 4: As Variation 2, with a 50 percent vehicle incentive.
- Fewer Vehicles: 5 new transit buses. One fueling station located at a current fueling facility.
- Low Fuel Prices: 10 new transit buses. Average annual price increases of 2.1, 2.0 and 2.4 percent for gasoline, diesel and Autogas, respectively.
- High Fuel Prices: 10 new transit buses. Average annual price increases of 5.7, 5.9 and 4.6 percent for gasoline, diesel and Autogas, respectively.

TABLE 15: AUTOGAS TRANSIT BUS PROJECT COST-EFFECTIVENESS SUMMARY

Case / Variation	NPV	IRR	ROI	PP	Life
1. Base Case: 10 vehicles, 2 stations					
Variation 1: DBOM, 0% Incentive	$89,724	12%	99%	10.4	20.5
Variation 2: P3, 0% Incentive	$6,404	4%	3%	14.8	20.5
Variation 3: DBOM, 50% Incentive	$51,941	7%	28%	14.8	20.5
Variation 4: P3, 50% Incentive	$135,261	26%	297%	6.7	20.5
2. Fewer Vehicles, 5 vehicles, 1 station					
Variation 1: DBOM, 0% Incentive	$44,862	12%	99%	10.4	20.5
Variation 2: P3, 0% Incentive	$2,451	3%	2%	14.8	20.5
Variation 3: DBOM, 50% Incentive	$25,219	6%	27%	14.8	20.5
Variation 4: P3, 50% Incentive	$67,630	26%	297%	6.7	20.5
3. Low Fuel Prices: 10 vehicles, 2 stations					
Variation 1: DBOM, 0% Incentive	$192,698	19%	212%	8.6	20.5
Variation 2: P3, 0% Incentive	$109,378	8%	48%	12.2	20.5
Variation 3: DBOM, 50% Incentive	$154,915	11%	84%	12.2	20.5
Variation 4: P3, 50% Incentive	$238,235	35%	523%	5.9	20.5
4. High Fuel Prices: 10 vehicles, 2 stations					
Variation 1: DBOM, 0% Incentive	($14,405)	1%	-16%	18.5	20.5
Variation 2: P3, 0% Incentive	($97,725)	-5%	-43%	>20.5	20.5
Variation 3: DBOM, 50% Incentive	($52,188)	-2%	-28%	>20.5	20.5
Variation 4: P3, 50% Incentive	$31,131	12%	68%	9.6	20.5

School Bus

This project evaluates transition to Autogas school buses for Nassau County Schools. Results (Table 16) show that it is feasible under all scenarios.

Incentives do improve feasibility, but the project would likely be feasible without them. Reducing the number of vehicles involved in the transition does not appreciably change feasibility.

The cases evaluated are as follows. Variations are the same for all cases.

- Base Case: 60 new school buses. Four fueling stations located at current fueling facilities.
  - Variation 1: DBOM delivery new fueling infrastructure without any incentives.
  - Variation 2: P3 delivery of new fueling infrastructure without any incentives.
  - Variation 3: As Variation 1 with a 50 percent vehicle incentive.
  - Variation 4: As Variation 2, with a 50 percent vehicle incentive.
- Fewer Vehicles: 30 new school buses. Two fueling stations located at current fueling facilities.
- Low Fuel Prices: 60 new school buses. Average annual price increases of 2.1, 2.0 and 2.4 percent for gasoline, diesel and Autogas, respectively.
- High Fuel Prices: 60 new school buses. Average annual price increases of 5.7, 5.9 and 4.6 percent for gasoline, diesel and Autogas, respectively.

TABLE 16: AUTOGAS SCHOOL BUS PROJECT COST-EFFECTIVENESS SUMMARY

Case / Variation	NPV	IRR	ROI	PP	Life
1. Base Case: 60 vehicles, 4 stations					
Variation 1: DBOM, 0% Incentive	$1,079,105	30%	299%	6.1	20.5
Variation 2: P3, 0% Incentive	$1,027,039	21%	164%	7.5	20.5
Variation 3: DBOM, 50% Incentive	$1,207,364	31%	271%	5.7	20.5
Variation 4: P3, 50% Incentive	$1,259,430	65%	698%	3.6	20.5
2. Fewer Vehicles: 30 vehicles, 2 stations					
Variation 1: DBOM, 0% Incentive	$539,552	30%	299%	6.1	20.5
Variation 2: P3, 0% Incentive	$511,381	20%	162%	7.5	20.5
Variation 3: DBOM, 50% Incentive	$601,543	29%	267%	5.7	20.5
Variation 4: P3, 50% Incentive	$629,715	65%	698%	3.6	20.5
3. Low Fuel Prices: 60 vehicles, 4 stations					
Variation 1: DBOM, 0% Incentive	$1,761,717	37%	488%	5.5	20.5
Variation 2: P3, 0% Incentive	$1,709,651	26%	273%	6.7	20.5
Variation 3: DBOM, 50% Incentive	$1,889,976	38%	424%	5.2	20.5
Variation 4: P3, 50% Incentive	$1,942,042	76%	1077%	3.2	20.5
4. High Fuel Prices: 60 vehicles, 4 stations					
Variation 1: DBOM, 0% Incentive	$528,196	21%	146%	7.0	20.5
Variation 2: P3, 0% Incentive	$476,130	14%	76%	8.8	20.5
Variation 3: DBOM, 50% Incentive	$656,456	23%	147%	6.4	20.5
Variation 4: P3, 50% Incentive	$708,521	52%	393%	4.1	20.5

Electricity

Four electric projects were evaluated: fully-electric (EV) passenger vehicles, plug-in hybrid electric (PHEV) passenger vehicles, transit buses and school buses. Unlike other clean fuels, it is not necessary to contemplate a fleet-scale transition for electric vehicles. Electric vehicle charging stations are relatively inexpensive and uncomplicated to install and manage. As a result, vehicles and infrastructure can be introduced into the fleet incrementally.

The project assumes one charging station per 2 EVs will be required at a cost of approximately $6,000 per charge point. The assumed incremental cost of EVs is $8,030, PHEVs are $11,197, transit buses is $75,000 and school buses is $215,000 based on industry data. The estimated gasoline and electric prices in the first year of the project are $2.30 and $3.26 ($0.10 per kilowatt hour) per gaseous gallon equivalent, respectively.

Variations evaluate the effect of financial incentives. There are no common alternative delivery methods for electric vehicles and infrastructure that affect economic feasibility. The North Florida TPO has programmed $450,000 to install EV charging stations in Clay, Nassau and St. Johns Counties. Currently there are no incentives for electric vehicles. However, vehicle incentives may be available for buses via the VW settlement. An infrastructure incentive of 30 percent and a vehicle incentive of 25 percent were evaluated.

EVs

This project evaluates transition of passenger vehicles to EVs. Results (Table 17) show that it would be feasible under any scenario.

Reducing the number of vehicles involved in the transition does not appreciably affect feasibility. The project performs better under a high future fuel price scenario but remains very viable even under a low-price scenario. Incentives for infrastructure or vehicles improve project performance but are not necessary for economic feasibility.

The cases evaluated are as follows. Variations are the same for all cases.

- Base Case: 50 new EVs and 25 stations, based on the organizations' stated replacement potential.
  - Variation 1: DBOM delivery of new fueling infrastructure without any incentives.
  - Variation 2: As Variation 1, with a 30 percent infrastructure incentive.
  - Variation 3: As Variation 1 with a 25 percent vehicle incentive.
  - Variation 4: As Variation 1, with a 30 percent infrastructure incentive and a 25 percent vehicle incentive.
- 50% Fewer Vehicles: 25 new EVs, 12 stations.
- Low Fuel Prices: 50 new EVs, 25 stations. Average annual price increases of 2.1, 2.0 and 2.9 percent for gasoline, diesel and electricity, respectively.
- High Fuel Prices: 50 new EVs, 25 stations. Average annual price increases of 5.7, 5.9 and 3.6 percent for gasoline, diesel and electricity, respectively.

TABLE 17: EV PASSENGER VEHICLE PROJECT COST-EFFECTIVENESS SUMMARY

Case / Variation	NPV	IRR	ROI	PP	Life
1. Base Case: 50 vehicles, 25 stations					
Variation 1: 0% Infrastructure; 0% Vehicles	$312,340	16%	58%	7.3	13.5
Variation 2: 30% Infrastructure; 0% Vehicles	$353,323	19%	71%	6.8	13.5
Variation 3: 0% Infrastructure; 25% Vehicles	$403,755	23%	90%	6.3	13.5
Variation 4: 30% Infrastructure; 25% Vehicles	$444,738	27%	109%	5.9	13.5
2. Fewer Vehicles: 25 vehicles, 12 stations					
Variation 1: 0% Infrastructure; 0% Vehicles	$140,647	14%	49%	7.6	13.5
Variation 2: 30% Infrastructure; 0% Vehicles	$165,237	17%	63%	7.1	13.5
Variation 3: 0% Infrastructure; 25% Vehicles	$186,354	20%	77%	6.6	13.5
Variation 4: 30% Infrastructure; 25% Vehicles	$210,944	24%	97%	6.1	13.5
3. Low Fuel Prices: 50 vehicles, 25 stations					
Variation 1: 0% Infrastructure; 0% Vehicles	$424,935	19%	79%	6.8	13.5
Variation 2: 30% Infrastructure; 0% Vehicles	$465,918	22%	93%	6.5	13.5
Variation 3: 0% Infrastructure; 25% Vehicles	$516,350	27%	115%	6.0	13.5
Variation 4: 30% Infrastructure; 25% Vehicles	$557,333	31%	137%	5.6	13.5
4. High Fuel Prices: 50 vehicles, 25 stations					
Variation 1: 0% Infrastructure; 0% Vehicles	$230,350	13%	43%	7.7	13.5
Variation 2: 30% Infrastructure; 0% Vehicles	$271,333	16%	54%	7.2	13.5
Variation 3: 0% Infrastructure; 25% Vehicles	$321,765	19%	72%	6.6	13.5
Variation 4: 30% Infrastructure; 25% Vehicles	$362,748	23%	89%	6.2	13.5

PHEVs

This project evaluates transition of passenger vehicles to PHEVs. Results (Table 18) show that transition of passenger vehicles to PHEVs, like EVs, is economically feasible under any scenario. Economic benefits are about 20 to 60 percent higher for EVs, due to lower upfront costs and greater fuel savings.

Unlike EVs, PHEVs can utilize a gasoline internal combustion engine when its electric batteries have discharged. This provides operational flexibility for fleets concerned about the range of EVs and the availability of charging infrastructure. These benefits tend to make PHEVs more expensive than EVs.

Like EVs, reducing the number of vehicles involved in the transition does not appreciably affect feasibility. The project performs better under a high future fuel price scenario but remains viable under a low-price scenario. Incentives for infrastructure or vehicles improves project performance but are not necessary for economic feasibility.

The cases evaluated are as follows. Variations are the same for all cases.

- Base Case: 50 new PHEVs and 25 stations, based on the organizations' stated replacement potential.
    - Variation 1: DBOM delivery of new fueling infrastructure without any incentives.
    - Variation 2: As Variation 1, with a 30 percent infrastructure incentive.
    - Variation 3: As Variation 1 with a 25 percent vehicle incentive.

- Variation 4: As Variation 1, with a 30 percent infrastructure incentive and a 25 percent vehicle incentive.

» Fewer Vehicles: 25 new PHEVs, 12 stations.

» Low Fuel Prices: 50 new PHEVs, 25 stations. Average annual price increases of 2.1, 2.0 and 2.9 percent for gasoline, diesel and electricity, respectively.

» High Fuel Prices: 50 new PHEVs, 25 stations. Average annual price increases of 5.7, 5.9 and 3.6 percent for gasoline, diesel and electricity, respectively.

TABLE 18: PHEV PASSENGER VEHICLE PROJECT COST-EFFECTIVENESS SUMMARY

Case / Variation	NPV	IRR	ROI	PP	Life
1. Base Case: 50 vehicles, 25 stations					
Variation 1: 0% Infrastructure; 0% Vehicles	$161,807	8%	24%	8.9	13.5
Variation 2: 30% Infrastructure; 0% Vehicles	$202,791	10%	32%	8.5	13.5
Variation 3: 0% Infrastructure; 25% Vehicles	$289,276	14%	52%	7.6	13.5
Variation 4: 30% Infrastructure; 25% Vehicles	$330,259	17%	64%	7.2	13.5
2. Fewer Vehicles: 25 vehicles, 12 stations					
Variation 1: 0% Infrastructure; 0% Vehicles	$161,807	8%	24%	8.9	13.5
Variation 2: 30% Infrastructure; 0% Vehicles	$202,791	10%	32%	8.5	13.5
Variation 3: 0% Infrastructure; 25% Vehicles	$289,276	14%	52%	7.6	13.5
Variation 4: 30% Infrastructure; 25% Vehicles	$330,259	17%	64%	7.2	13.5
3. Low Fuel Prices: 50 vehicles, 25 stations					
Variation 1: 0% Infrastructure; 0% Vehicles	$273,565	11%	40%	8.2	13.5
Variation 2: 30% Infrastructure; 0% Vehicles	$314,548	13%	49%	7.8	13.5
Variation 3: 0% Infrastructure; 25% Vehicles	$401,034	18%	72%	7.1	13.5
Variation 4: 30% Infrastructure; 25% Vehicles	$442,017	20%	86%	6.7	13.5
4. High Fuel Prices: 50 vehicles, 25 stations					
Variation 1: 0% Infrastructure; 0% Vehicles	$80,145	6%	12%	9.6	13.5
Variation 2: 30% Infrastructure; 0% Vehicles	$121,128	7%	19%	9.2	13.5
Variation 3: 0% Infrastructure; 25% Vehicles	$207,614	11%	37%	8.2	13.5
Variation 4: 30% Infrastructure; 25% Vehicles	$248,597	14%	48%	7.7	13.5

Transit Bus

This project evaluates transition to electric transit buses for Nassau Transit. Results (Table 19) show that it would be only if vehicle incentives greater than about 65 percent of incremental cost are available. This is due to the present high upfront cost of electric transit buses of the size used by Nassau Transit. As these buses become more widespread, prices are expected to fall.

A significant incentive for vehicles is required for economic feasibility. Reducing the number of vehicles involved in the transition does not appreciably affect economic performance. The project performs much better under a high future fuel price scenario (with significant incentives). It is likely non-viable under a low-price scenario even with incentives.

The cases evaluated are as follows. Variations are the same for all cases.

- Base Case: 10 new electric transit buses and 5 stations, based on the organization's stated replacement potential.
  - Variation 1: DBOM delivery of new fueling infrastructure without any incentives.
  - Variation 2: As Variation 1, with a 30 percent infrastructure incentive.
  - Variation 3: As Variation 1 with a 25 percent vehicle incentive.
  - Variation 4: As Variation 1, with a 100 percent infrastructure incentive and a 65 percent vehicle incentive.
- Fewer Vehicles: 5 new electric transit buses, 2 stations.
- Low Fuel Prices: 10 new electric transit buses, 5 stations. Average annual price increases of 2.1, 2.0 and 2.9 percent for gasoline, diesel and electricity, respectively.
- High Fuel Prices: 10 new electric transit buses, 5 stations. Average annual price increases of 5.7, 5.9 and 3.6 percent for gasoline, diesel and electricity, respectively.

TABLE 19: ELECTRIC TRANSIT BUS PROJECT COST-EFFECTIVENESS SUMMARY

Case / Variation	NPV	IRR	ROI	PP	Life
1. Base Case: 10 buses, 5 stations					
Variation 1: 0% Infrastructure; 0% Vehicles	($1,108,028)	-5%	-76%	20.5	19.5
Variation 2: 30% Infrastructure; 0% Vehicles	($1,102,956)	-5%	-76%	20.5	19.5
Variation 3: 0% Infrastructure; 25% Vehicles	($652,660)	-3%	-69%	20.5	19.5
Variation 4: 100% Infrastructure; 65% Vehicles	$92,834	5%	-32%	15.5	19.5
2. Fewer Vehicles: 5 buses, 2 stations					
Variation 1: 0% Infrastructure; 0% Vehicles	($564,962)	-5%	-77%	20.5	19.5
Variation 2: 30% Infrastructure; 0% Vehicles	($559,890)	-5%	-77%	20.5	19.5
Variation 3: 0% Infrastructure; 25% Vehicles	($337,279)	-3%	-69%	20.5	19.5
Variation 4: 100% Infrastructure; 65% Vehicles	$43,922	5%	-33%	15.5	19.5
3. Low Fuel Prices: 10 buses, 5 stations					
Variation 1: 0% Infrastructure; 0% Vehicles	($916,463)	-3%	-69%	20.5	19.5
Variation 2: 30% Infrastructure; 0% Vehicles	($911,391)	-3%	-69%	20.5	19.5
Variation 3: 0% Infrastructure; 25% Vehicles	($461,096)	-1%	-58%	20.5	19.5
Variation 4: 100% Infrastructure; 65% Vehicles	$284,398	7%	-10%	13.6	19.5
4. High Fuel Prices: 10 buses, 5 stations					
Variation 1: 0% Infrastructure; 0% Vehicles	($1,243,685)	-7%	-82%	20.5	19.5
Variation 2: 30% Infrastructure; 0% Vehicles	($1,238,613)	-7%	-82%	20.5	19.5
Variation 3: 0% Infrastructure; 25% Vehicles	($788,318)	-5%	-76%	20.5	19.5
Variation 4: 100% Infrastructure; 65% Vehicles	($42,824)	2%	-49%	17.1	19.5

School Bus

This project evaluates transition to electric school buses for Nassau County Schools. Like transit buses, results (Table 20) show that it would be feasible only if vehicle incentives greater than 85 percent of incremental cost are available. This is because of the current high upfront cost of electric school buses. As these buses become more widespread, prices are expected to fall.

A significant incentive for vehicles is required for economic feasibility. Reducing the number of vehicles involved in the transition does not appreciably affect economic performance. The project performs much better under a high future fuel price scenario (with significant incentives). It is likely non-viable under a low-price scenario even with incentives.

The cases evaluated are as follows. Variations are the same for all cases.

- Base Case: 60 new electric school buses and 30 stations, based on the organization's stated replacement potential.
  - Scenario 1: DBOM delivery of new fueling infrastructure without any incentives.
  - Scenario 2: As Scenario 1, with a 30 percent infrastructure incentive.
  - Scenario 3: As Scenario 1 with a 25 percent vehicle incentive.
  - Scenario 4: As Scenario 1, with a 100 percent infrastructure incentive and an 85 percent vehicle incentive.
- Fewer Vehicles: 30 new electric school buses and 15 stations.
- Low Fuel Prices: 60 new electric school buses, 30 stations. Average annual price increases of 2.1, 2.0 and 2.9 percent for gasoline, diesel and electricity, respectively.
- High Fuel Prices: 60 new electric school buses, 30 stations. Average annual price increases of 5.7, 5.9 and 3.6 percent for gasoline, diesel and electricity, respectively.

TABLE 20: ELECTRIC SCHOOL BUS PROJECT COST-EFFECTIVENESS SUMMARY

Case / Variation	NPV	IRR	ROI	PP	Life
1. Base Case: 60 buses, 30 stations					
Variation 1: 0% Infrastructure; 0% Vehicles	($9,729,867)	-12%	-88%	20.5	19.5
Variation 2: 30% Infrastructure; 0% Vehicles	($9,680,688)	-12%	-88%	20.5	19.5
Variation 3: 0% Infrastructure; 25% Vehicles	($3,806,451)	-6%	-76%	20.5	19.5
Variation 4: 100% Infrastructure; 85% Vehicles	$67,813	4%	-32%	15.7	19.5
2. Fewer Vehicles: 30 buses, 15 stations					
Variation 1: 0% Infrastructure; 0% Vehicles	($4,864,934)	-12%	-88%	20.5	19.5
Variation 2: 30% Infrastructure; 0% Vehicles	($4,840,344)	-12%	-88%	20.5	19.5
Variation 3: 0% Infrastructure; 25% Vehicles	($1,903,226)	-6%	-76%	20.5	19.5
Variation 4: 100% Infrastructure; 85% Vehicles	$33,906	4%	-32%	15.7	19.5
3. Low Fuel Prices: 60 buses, 30 stations					
Variation 1: 0% Infrastructure; 0% Vehicles	($8,995,957)	-10%	-83%	20.5	19.5
Variation 2: 30% Infrastructure; 0% Vehicles	($8,946,778)	-10%	-83%	20.5	19.5
Variation 3: 0% Infrastructure; 25% Vehicles	($3,072,541)	-4%	-67%	20.5	19.5
Variation 4: 100% Infrastructure; 85% Vehicles	$801,722	7%	-7%	13.5	19.5
4. High Fuel Prices: 60 buses, 30 stations					
Variation 1: 0% Infrastructure; 0% Vehicles	($10,253,367)	-13%	-91%	20.5	19.5
Variation 2: 30% Infrastructure; 0% Vehicles	($10,204,188)	-13%	-91%	20.5	19.5
Variation 3: 0% Infrastructure; 25% Vehicles	($4,329,951)	-8%	-82%	20.5	19.5
Variation 4: 100% Infrastructure; 85% Vehicles	($455,687)	1%	-51%	18.8	19.5

Compressed Natural Gas

Six CNG projects were evaluated as follows: a fleet of natural gas Class 1 / Light Trucks (less than 6,000 - 10,000 lbs); Class 2 / Medium Trucks (10,001 -26,000 lbs); Class 3 / Heavy Trucks (greater than 26,000 lbs) transit buses and school buses; and each of these four vehicle transitions considered separately.

The project assumes the cost of a fast-fill CNG fueling station is about $1.5 million. It also assumes that existing maintenance bays would be retrofitted to work on CNG vehicles at a cost of about $55,000 per bay. A contingency of 30 percent is applied to these costs to account for the uncertainties involved in complex projects. The number of modified maintenance bays varies by case. The assumed incremental cost of Class 1 and 2 trucks is $10,000, Class 3 trucks is $30,000, transit buses is $25,000 and school buses is $30,000 based on industry data. The estimated gasoline and diesel prices in the first year of the project are $2.30 and $2.69, respectively. The estimated CNG price in the first year of the project is $1.24 per gaseous gallon equivalent under a DBOM delivery method. The price under a P3 delivery method varies by case. In the latter case, actual prices will be negotiated between the P3 provider and users.

In addition to the base case and the high / low future fuel price cases, the project includes a case that evaluates two CNG fueling stations.

Variations evaluate the effect of financial incentives and delivery method. Currently there are no incentives for CNG vehicles or infrastructure. The State of Florida provided 50 percent of the incremental vehicle cost until last year. Funding for this incentive program was not renewed in the most recent legislative session. However, vehicle incentive may be available for buses via the VW settlement. The CNG industry provides a P3 delivery method whereby infrastructure is provided at no upfront cost in exchange for a mult-year fuel purchase agreement that amortizes the cost of infrastructure. An infrastructure incentive of 100 percent (equivalent to a no-upfront cost P3) and a vehicle incentive of 50 percent (equivalent to lapsed State of Florida incentives) were evaluated.

Fleet

This project evaluates a fleet of vehicles (Class 1, 2 and 3 trucks, transit and school buses). Results (Table 21) show that it is feasible under scenarios involving one centrally-located CNG station. The number of vehicles potentially available for transition to CNG may make a P3 feasible. This project assumes a fuel price of $1.65 per GGE under a P3.

Two stations may be feasible only if vehicle incentives like those recently offered by the State are restored. Two stations would not be feasible under a low future fuel price scenario.

Under a single station case, the project performs much better with incentives on the scale of the State's recent program. In a low future fuel price scenario, they are necessary for project feasibility.

As the CNG projects that follow suggest (Class 1 trucks, Class 2 trucks, Class 3 trucks, transit bus and school bus), a transition of Nassau County Schools buses to CNG would likely serve as the "anchor" of a fleet transition. This implies that other study participants could cooperatively convert other vehicle types to CNG and utilize the CNG station anchored by Nassau County Schools. However, transitions of Class 1, 2 or 3 trucks or transit buses on their own is not likely to be economically feasible.

Discussions with study participants indicate that a single centrally-located CNG station is not likely feasible from an operational perspective. Further, converting fewer vehicles than assumed in this project would put economic feasibility in doubt, unless vehicle incentives are available to improve economic performance. As discussed, two stations are not feasible under most scenarios. For these reasons, transition to CNG in Nassau County is a challenging prospect.

The cases evaluated are as follows. Variations are the same for all cases.

- Base Case: 260 new Class 1, 2 and 3 trucks, transit buses and school buses, based on the organizations' stated replacement potential. One centrally-located fueling station.
  - Variation 1: P3 delivery of new fueling infrastructure without any incentives.
  - Variation 2: DBOM delivery of new fueling infrastructure without any incentives.
  - Variation 3: As Variation 1 with a 50 percent vehicle incentive.
  - Variation 4: As Variation 2, with a 50 percent vehicle incentive.
- Two Stations: 260 new trucks and buses. Two fueling stations located in the east and west of the County.
- Low Fuel Prices: 260 new trucks and buses and one fueling station. Average annual price increases of 2.1, 2.0 and 2.0 percent for gasoline, diesel and CNG, respectively.
- High Fuel Prices: 260 new trucks and buses and one fueling station. Average annual price increases of 5.7, 5.9 and 2.8 percent for gasoline, diesel and CNG, respectively.

TABLE 21: CNG VEHICLE FLEET PROJECT COST-EFFECTIVENESS SUMMARY

Case / Variation	NPV	IRR	ROI	PP	Life
1. Base Case: 115 vehicles, 1 station					
Variation 1: DBOM, 0% Incentive	$256,718	4%	4%	14.0	20.5
Variation 2: DBOM, 50% Incentive	$2,237,565	8%	49%	10.0	20.5
Variation 3: P3, 0% Incentive	$1,059,714	6%	27%	12.2	20.5
Variation 4: P3, 50% Incentive	$2,786,645	19%	141%	7.5	20.5
2. 2 Fueling Stations: 115 vehicles					
Variation 1: DBOM, 0% Incentive	($1,757,322)	1%	-20%	20.2	20.5
Variation 2: DBOM, 50% Incentive	$223,526	4%	3%	13.9	20.5
Variation 3: P3, 0% Incentive	($2,086,221)	-3%	-53%	>20.5	20.5
Variation 4: P3, 50% Incentive	($359,290)	1%	-18%	18.1	20.5
3. Low Fuel Prices: 115 vehicles, 1 station					
Variation 1: DBOM, 0% Incentive	$2,337,676	7%	36%	11.3	20.5
Variation 2: DBOM, 50% Incentive	$4,318,524	12%	94%	8.8	20.5
Variation 3: P3, 0% Incentive	$3,140,673	12%	79%	9.8	20.5
Variation 4: P3, 50% Incentive	$4,867,604	26%	246%	6.5	20.5
4. High Fuel Prices: 115 vehicles, 1 station					
Variation 1: DBOM, 0% Incentive	($1,163,861)	1%	-18%	20.0	20.5
Variation 2: DBOM, 50% Incentive	$816,986	5%	18%	11.9	20.5
Variation 3: P3, 0% Incentive	($360,864)	2%	-9%	17.9	20.5
Variation 4: P3, 50% Incentive	$1,366,066	13%	69%	8.8	20.5

Class 1 Trucks

This project evaluates transition to CNG Class 1 / Light trucks. Results (Table 22) show that it is not feasible under any scenario. This is due to the high cost of infrastructure and the relative fuel efficiency of these trucks. They do not use enough fuel as a group for the upfront investment in new CNG infrastructure to be repaid through fuel savings. Even if a CNG station was available. transition of these vehicles to CNG would likely only be feasible with incentives. This also likely makes a P3 delivery method based solely on converting of Class 1 trucks infeasible.

The cases evaluated are as follows. Variations are the same for all cases.

- Base Case: 115 new Class 1 trucks, based on the organizations' stated replacement potential. One centrally located fueling station.
  - Variation 1: P3 delivery of new fueling infrastructure without any incentives.
  - Variation 2: DBOM delivery of new fueling infrastructure without any incentives.
  - Variation 3: As Variation 1 with a 50 percent vehicle incentive.
  - Variation 4: As Variation 2, with a 50 percent vehicle incentive.
- Two Stations: 115 new trucks. Two fueling stations located in the east and west of the County.
- Low Fuel Prices: 115 new trucks, one fueling station. Average annual price increases of 2.1, 2.0 and 2.0 percent for gasoline, diesel and CNG, respectively.
- High Fuel Prices: 115 new trucks, one fueling station. Average annual price increases of 5.7, 5.9 and 2.8 percent for gasoline, diesel and CNG, respectively.

TABLE 22: CNG CLASS 1 TRUCK PROJECT COST-EFFECTIVENESS SUMMARY

Case / Variation	NPV	IRR	ROI	PP	Life
1. Base Case: 115 vehicles, 1 station					
Variation 1: DBOM, 0% Incentive	($1,668,417)	-4%	-52%	>20.5	14.5
Variation 2: DBOM, 50% Incentive	($1,144,744)	-3%	-43%	>20.5	14.5
Variation 3: P3, 0% Incentive	($1,517,513)	-8%	-145%	>20.5	14.5
Variation 4: P3, 50% Incentive	($1,247,757)	N/A	-238%	>20.5	13.5
2. 2 Stations: 115 vehicles					
Variation 1: DBOM, 0% Incentive	($3,474,887)	-8%	-70%	>20.5	14.5
Variation 2: DBOM, 50% Incentive	($2,951,215)	-7%	-66%	>20.5	14.5
Variation 3: P3, 0% Incentive	($3,638,530)	-15%	-347%	>20.5	14.5
Variation 4: P3, 50% Incentive	($3,368,775)	N/A	-643%	>20.5	13.5
3. Low Fuel Prices: 115 vehicles, 1 station					
Variation 1: DBOM, 0% Incentive	($1,411,747)	-3%	-44%	>20.5	14.5
Variation 2: DBOM, 50% Incentive	($888,074)	-1%	-33%	>20.5	14.5
Variation 3: P3, 0% Incentive	($1,260,842)	-7%	-120%	>20.5	14.5
Variation 4: P3, 50% Incentive	($991,087)	N/A	-189%	>20.5	13.5
4. High Fuel Prices: 115 vehicles, 1 station					
Variation 1: DBOM, 0% Incentive	($1,856,170)	-5%	-58%	>20.5	14.5
Variation 2: DBOM, 50% Incentive	($1,332,498)	-4%	-50%	>20.5	14.5
Variation 3: P3, 0% Incentive	($1,705,266)	-9%	-163%	>20.5	14.5
Variation 4: P3, 50% Incentive	($1,435,511)	N/A	-274%	>20.5	13.5

Class 2 Trucks

This project evaluates transition to CNG Class 2 / Medium trucks. Results (Table 23) show that it is not feasible under any scenario. This is due to the high cost of CNG infrastructure. While not fuel efficient, these trucks do not use enough fuel as a group for the upfront investment in new CNG infrastructure to be repaid through fuel savings. If a CNG station is available, transitioning Class 2 vehicles would likely be economically feasible. However, this makes a P3 delivery method based solely on transition of Class 2 trucks infeasible.

The cases evaluated are as follows. Variations are the same for all cases.

- Base Case: 55 new Class 2 trucks, based on the organizations' stated replacement potential. One centrally located fueling station.
  - Variation 1: P3 delivery of new fueling infrastructure without any incentives.
  - Variation 2: DBOM delivery of new fueling infrastructure without any incentives.
  - Variation 3: As Variation 1 with a 50 percent vehicle incentive.
  - Variation 4: As Variation 2, with a 50 percent vehicle incentive.
- Two Stations: 55 new Class 2 trucks. Two fueling stations located in the east and west of the County.
- Low Fuel Prices: 55 new Class 2 trucks, one fueling station. Average annual price increases of 2.1, 2.0 and 2.0 percent for gasoline, diesel and CNG, respectively.
- High Fuel Prices: 55 new Class 2 trucks, one fueling station. Average annual price increases of 5.7, 5.9 and 2.8 percent for gasoline, diesel and CNG, respectively.

TABLE 23: CNG CLASS 2 TRUCK PROJECT COST-EFFECTIVENESS SUMMARY

Case / Variation	NPV	IRR	ROI	PP	Life
1. Base Case: 55 vehicles, 1 station					
Variation 1: DBOM, 0% Incentive	($1,497,684)	-4%	-55%	>20.5	14.5
Variation 2: DBOM, 50% Incentive	($1,247,232)	-3%	-50%	>20.5	14.5
Variation 3: P3, 0% Incentive	($1,424,475)	-9%	-284%	>20.5	14.5
Variation 4: P3, 50% Incentive	($1,427,940)	N/A	-570%	>20.5	13.5
2. 2 Stations: 55 vehicles					
Variation 1: DBOM, 0% Incentive	($3,330,084)	-9%	-73%	>20.5	14.5
Variation 2: DBOM, 50% Incentive	($3,079,632)	-8%	-71%	>20.5	14.5
Variation 3: P3, 0% Incentive	($3,576,839)	-15%	-714%	>20.5	14.5
Variation 4: P3, 50% Incentive	($3,580,304)	N/A	-1430%	>20.5	13.5
3. Low Fuel Prices: 55 vehicles, 1 station					
Variation 1: DBOM, 0% Incentive	($1,286,904)	-3%	-47%	>20.5	14.5
Variation 2: DBOM, 50% Incentive	($1,036,452)	-2%	-42%	>20.5	14.5
Variation 3: P3, 0% Incentive	($1,213,696)	-8%	-242%	>20.5	14.5
Variation 4: P3, 50% Incentive	($1,217,161)	N/A	-486%	>20.5	13.5
4. High Fuel Prices: 55 vehicles, 1 station					
Variation 1: DBOM, 0% Incentive	($1,651,869)	-5%	-61%	>20.5	14.5
Variation 2: DBOM, 50% Incentive	($1,401,417)	-4%	-57%	>20.5	14.5
Variation 3: P3, 0% Incentive	($1,578,660)	-10%	-315%	>20.5	14.5
Variation 4: P3, 50% Incentive	($1,582,125)	N/A	-632%	>20.5	13.5

Class 3 Trucks

This project evaluates transition to CNG Class 3 trucks. Results (Table 24) show that it is not feasible under any scenario. This is due to the high cost of CNG infrastructure. While not fuel efficient, these trucks do not use enough fuel as a group for the upfront investment in new CNG infrastructure to be repaid through fuel savings. If a CNG station is available, transitioning certain Class 3 vehicles would likely be economically feasible. However, this makes a P3 delivery method based solely on transition of Class 3 trucks infeasible.

The cases evaluated are as follows. Variations are the same for all cases.

- Base Case: 20 new Class 3 trucks, based on the organizations' stated replacement potential. One centrally located fueling station.
  - Variation 1: P3 delivery of new fueling infrastructure without any incentives.
  - Variation 2: DBOM delivery of new fueling infrastructure without any incentives.
  - Variation 3: As Variation 1 with a 50 percent vehicle incentive.
  - Variation 4: As Variation 2, with a 50 percent vehicle incentive.
- Two Stations: 20 new Class 3 trucks. Two fueling stations located in the east and west of the County.
- Low Fuel Prices: 20 new Class 3 trucks, one fueling station. Average annual price increases of 2.1, 2.0 and 2.0 percent for gasoline, diesel and CNG, respectively.
- High Fuel Prices: 20 new Class 3 trucks, one fueling station. Average annual price increases of 5.7, 5.9 and 2.8 percent for gasoline, diesel and CNG, respectively.

TABLE 24: CNG CLASS 3 TRUCK PROJECT COST-EFFECTIVENESS SUMMARY

Case / Variation	NPV	IRR	ROI	PP	Life
1. Base Case: 20 vehicles, 1 station					
Variation 1: DBOM, 0% Incentive	($1,901,184)	-6%	-74%	>20.5	18.5
Variation 2: DBOM, 50% Incentive	($1,627,964)	-5%	-71%	>20.5	18.5
Variation 3: P3, 0% Incentive	($2,186,491)	-15%	-400%	>20.5	18.5
Variation 4: P3, 50% Incentive	($2,167,188)	N/A	-793%	>20.5	17.5
2. 2 Stations: 20 vehicles					
Variation 1: DBOM, 0% Incentive	($3,746,777)	-9%	-85%	>20.5	18.5
Variation 2: DBOM, 50% Incentive	($3,538,609)	-9%	-84%	>20.5	18.5
Variation 3: P3, 0% Incentive	($4,540,890)	N/A	-831%	>20.5	18.5
Variation 4: P3, 50% Incentive	($4,521,586)	N/A	-1655%	>20.5	17.5
3. Low Fuel Prices: 20 vehicles, 1 station					
Variation 1: DBOM, 0% Incentive	($1,789,567)	-5%	-69%	>20.5	18.5
Variation 2: DBOM, 50% Incentive	($1,516,347)	-4%	-66%	>20.5	18.5
Variation 3: P3, 0% Incentive	($2,074,874)	-14%	-380%	>20.5	18.5
Variation 4: P3, 50% Incentive	($2,055,571)	N/A	-752%	>20.5	17.5
4. High Fuel Prices: 20 vehicles, 1 station					
Variation 1: DBOM, 0% Incentive	($1,978,570)	-6%	-77%	>20.5	18.5
Variation 2: DBOM, 50% Incentive	($1,705,349)	-6%	-74%	>20.5	18.5
Variation 3: P3, 0% Incentive	($2,263,877)	-15%	-414%	>20.5	18.5
Variation 4: P3, 50% Incentive	($2,244,574)	N/A	-822%	>20.5	17.5

Transit Bus

This project evaluates transition to CNG transit buses for Nassau Transit. Results (Table 25) show that it is not feasible under any scenario. This is due to the high cost of CNG infrastructure. While not fuel efficient, these buses do not use enough fuel as a group for the upfront investment in new CNG infrastructure to be repaid through fuel savings. If a CNG station is available, transition of transit buses would likely be economically feasible. However, this makes a P3 delivery method based solely on transition of Nassau Transit buses infeasible.

The cases evaluated are as follows. Variations are the same for all cases.

- Base Case: 10 new transit buses, based on the organizations' stated replacement potential. One centrally located fueling station.
  - Variation 1: P3 delivery of new fueling infrastructure without any incentives.
  - Variation 2: DBOM delivery of new fueling infrastructure without any incentives.
  - Variation 3: As Variation 1 with a 50 percent vehicle incentive.
  - Variation 4: As Variation 2, with a 50 percent vehicle incentive.
- Two Stations: 20 new transit buses. Two fueling stations located in the east and west of the County.
- Low Fuel Prices: 10 new transit buses, one fueling station. Average annual price increases of 2.1, 2.0 and 2.0 percent for gasoline, diesel and CNG, respectively.
- High Fuel Prices: 10 new transit buses, one fueling station. Average annual price increases of 5.7, 5.9 and 2.8 percent for gasoline, diesel and CNG, respectively.

TABLE 25: CNG TRANSIT BUS PROJECT COST-EFFECTIVENESS SUMMARY

Case / Variation	NPV	IRR	ROI	PP	Life
1. Base Case: 10 vehicles, 1 station					
Variation 1: DBOM, 0% Incentive	($1,172,865)	-2%	-52%	>20.5	20.5
Variation 2: DBOM, 50% Incentive	($1,059,024)	-2%	-49%	>20.5	20.5
Variation 3: P3, 0% Incentive	($2,035,152)	N/A	-894%	>20.5	20.5
Variation 4: P3, 50% Incentive	($2,175,227)	N/A	-1911%	>20.5	20.5
2. 2 Stations: 10 vehicles					
Variation 1: DBOM, 0% Incentive	($3,746,777)	-9%	-85%	>20.5	18.5
Variation 2: DBOM, 50% Incentive	($3,538,609)	-9%	-84%	>20.5	18.5
Variation 3: P3, 0% Incentive	($4,540,890)	N/A	-831%	>20.5	18.5
Variation 4: P3, 50% Incentive	($4,521,586)	N/A	-1655%	>20.5	17.5
3. Low Fuel Prices: 10 vehicles, 1 station					
Variation 1: DBOM, 0% Incentive	($832,612)	0%	-37%	>20.5	20.5
Variation 2: DBOM, 50% Incentive	($718,770)	0%	-33%	20.5	20.5
Variation 3: P3, 0% Incentive	($1,694,899)	N/A	-744%	>20.5	20.5
Variation 4: P3, 50% Incentive	($1,834,974)	N/A	-1612%	>20.5	20.5
4. High Fuel Prices: 10 vehicles, 1 station					
Variation 1: DBOM, 0% Incentive	($1,397,029)	-4%	-62%	>20.5	20.5
Variation 2: DBOM, 50% Incentive	($1,283,187)	-3%	-60%	>20.5	20.5
Variation 3: P3, 0% Incentive	($2,259,316)	N/A	-992%	>20.5	20.5
Variation 4: P3, 50% Incentive	($2,399,391)	N/A	-2108%	>20.5	20.5

School Bus

This project evaluates transition of Nassau County Schools buses to CNG. Results (Table 26) show that it is feasible under some scenarios involving one centrally-located CNG station. Two CNG stations are not feasible. In the former case, the number of vehicles potentially available for transition to CNG may make a P3 feasible. Under a P3, a first-year fuel price of $2.26 per GGE is assumed. Single-station variations are sensitive to fuel prices. Under the base case for future fuel prices, incentives for vehicles would be necessary; in a high scenario, there are not. In a low scenario, the project is unlikely to be feasible.

The cases evaluated are as follows. Variations are the same for all cases.

- Base Case: 60 new school buses, based on the organizations' stated replacement potential. One centrally-located fueling station.
  - Variation 1: P3 delivery of new fueling infrastructure without any incentives.
  - Variation 2: DBOM delivery of new fueling infrastructure without any incentives.
  - Variation 3: As Variation 1 with a 50 percent vehicle incentive.
  - Variation 4: As Variation 2, with a 50 percent vehicle incentive.
- Two Stations: 60 new school buses. Two fueling stations located in the east and west of the County.
- Low Fuel Prices: 60 new school buses, one fueling station. Average annual price increases of 2.1, 2.0 and 2.0 percent for gasoline, diesel and CNG, respectively.
- High Fuel Prices: 60 new school buses, one fueling station. Average annual price increases of 5.7, 5.9 and 2.8 percent for gasoline, diesel and CNG, respectively.

TABLE 26: CNG SCHOOL BUS PROJECT COST-EFFECTIVENESS SUMMARY

Case / Variation	NPV	IRR	ROI	PP	Life
1. Base Case: 60 vehicles, 1 station					
Variation 1: DBOM, 0% Incentive	($530,101)	2%	-14%	17.7	20.5
Variation 2: DBOM, 50% Incentive	$289,560	4%	9%	14.9	20.5
Variation 3: P3, 0% Incentive	($527,227)	0%	-32%	20.4	20.5
Variation 4: P3, 50% Incentive	$38,517	4%	5%	16.4	20.5
2. 2 Stations: 60 vehicles					
Variation 1: DBOM, 0% Incentive	($2,481,231)	-2%	-43%	>20.5	20.5
Variation 2: DBOM, 50% Incentive	($1,661,570)	-1%	-33%	>20.5	20.5
Variation 3: P3, 0% Incentive	($3,480,495)	N/A	-212%	>20.5	20.5
Variation 4: P3, 50% Incentive	($2,914,751)	N/A	-356%	>20.5	20.5
3. Low Fuel Prices: 60 vehicles, 1 station					
Variation 1: DBOM, 0% Incentive	$631,538	5%	16%	14.5	20.5
Variation 2: DBOM, 50% Incentive	$1,451,199	7%	48%	12.5	20.5
Variation 3: P3, 0% Incentive	$634,411	6%	39%	14.8	20.5
Variation 4: P3, 50% Incentive	$1,200,155	13%	146%	10.9	20.5
4. High Fuel Prices: 60 vehicles, 1 station					
Variation 1: DBOM, 0% Incentive	($1,307,192)	-1%	-34%	>20.5	20.5
Variation 2: DBOM, 50% Incentive	($487,531)	2%	-16%	19.1	20.5
Variation 3: P3, 0% Incentive	($1,304,318)	-5%	-80%	>20.5	20.5
Variation 4: P3, 50% Incentive	($738,574)	-9%	-90%	>20.5	20.5

DATA COLLECTION AND ANALYSIS

A standardized data request was sent to each participating organization at the outset of this project. The data requested is shown in below (Table 27).

TABLE 27: DATA REQUEST

Datum	Description	Unit of Measure	Period
Capital / Operating Expenditures	Detail on the budgets for fleet operations and maintenance, fuel expenditures and vehicle procurement, for the current / upcoming fiscal year, including an estimate of how many vehicles, by type, that will / could be replaced over the next five years.	Dollars ($)	Most recent
Employees	The number of full time equivalent staff (FTEs)	Number of FTEs	2014, 2015, 2016
Transportation Policy	All ordinances, resolutions, directives or policies pertaining to employee use of vehicles (private or fleet), fleet operations and maintenance, alternative transportation, etc., if any.	N/A	Most recent
Transit	Transit service data including routes/stops/headways, or other performance measures, if applicable	N/A	Most recent
Facility/Site/ Asset Location	Name, Description, Address and Zip Code of each facility associated with the vehicle fleet (e.g. storage, maintenance, fueling, etc.), including the number of fleet vehicles stored / maintained at the site, if applicable.	Address and Zip Code, etc.	Most Recent
Vehicle Details	Make, model, model year and fuel type (e.g. gasoline, diesel, electric, etc.) by vehicle.	Make, model, model year, fuel type	2014, 2015, 2016
Non-highway vehicles and equipment	List of all non-highway vehicles directly owned/operated with make, model, model year and fuel type.	Make, model, model year, mpg, fuel type, operating hours/year	2014, 2015, 2016
Gasoline / Diesel Use	Annual gasoline or diesel use by vehicle, including any non-highway vehicles & equipment	Gallons (gal)	2014, 2015, 2016
Alternative Fuel Use	Annual alternative fuel use (e.g. ethanol, CNG, LNG, biodiesel, electricity, propane) use by vehicle, including any non-highway vehicles & equipment, if applicable	Gallons (gal) or Gaseous Gallons Equivalent (GGE)	2014, 2015, 2016
Fuel Expenditure	Annual dollars spent on each fuel type by vehicle, including any non-highway vehicles & equipment	Dollars ($)	2014, 2015, 2016
Mileage / Operating Hours	Annual mileage and/or operating hours by vehicle, including any non-highway vehicles & equipment	Miles per year (mi/year) a/o Hours per year (h/y)	2014, 2015, 2016

TABLE 28, CONTINUED: DATA REQUEST

Datum	Description	Unit of Measure	Period
Maintenance Cost	Estimated annual maintenance cost by vehicle, including any non-highway vehicles & equipment	Dollars ($)	2014, 2015, 2016
Current Value	Current estimated value for resale / salvage by vehicle, including any non-highway vehicles & equipment	Dollars ($)	Most recent

While not all requested data was applicable to each study participant, some participants were unable to provide applicable data in certain cases.

No participants were able to provide data for 2014, 2015 and 2016, where requested. Thus, data analysis is based on the most recent year available for all participants.

The City of Fernandina Beach and Nassau County Schools were unable to provide fuel use type, gasoline and diesel use, fuel expenditure, mileage / operating hours and maintenance costs on a per vehicle basis. Instead, fleet-wide metrics were provided. Nassau County Schools only provided mileage for its school buses, not its full fleet, which also includes passenger vehicles and trucks.

In these cases, assumptions and estimates were made to facilitate analysis.

- Where unidentified, fuel type for individual vehicles was estimated based on vehicle class. For example, light trucks are more likely gasoline vehicles than refuse trucks, which tend to be diesel vehicles.

- Where only fleet-wide data was provided, fuel use, fuel cost and mileage for individual vehicles was estimated by dividing fleet-wide totals by the number of gas and diesel vehicles, respectively, to derive an average.

- Where mileage for fleet classes or individual vehicles was not provided, the average value for all study participants by vehicle class was used.