Vision Fleet: Fleet Assessment Overview

Alternative fuel vehicles for fleets: Low Cost, Low Carbon, Low Hassle

Overview:

A Vision Fleet Opportunity Assessment is both quantitative and qualitative and will pinpoint opportunities for cutting costs, saving fuel and reducing carbon emissions in your fleet. Whether it's zero-emission electric vehicles, plug-in hybrids, a car-sharing program or simply a strategic right-sizing, you'll have a clear picture of what steps you can take to cut costs by increasing asset utilization and overall fleet efficiency.

What We Offer

- A full inventory of your light-duty fleet;
- A scrubbed dataset including calculated vehicle-specific figures such as trailing-twelve-month (TTM) and life-to-date (LTD) dollar per mile fuel, service, repair, capital and financing costs as well as an all-inclusive, vehicle-specific total cost of ownership estimate for each vehicle;
- A complete list of the vehicles Vision Fleet believes can be reasonably replaced with a more efficient substitute;
- A concise right-sizing recommendation; and
- A comprehensive proposal incorporating numerous strategies with an eye towards maximizing financial and fuel savings and environmental benefits.

What We Ask of You and Your Team

Vision Fleet will, at every opportunity, seek to minimize the effort required on the part of your agency and its employees but some degree of engagement is required and high-quality input(s) will produce more meaningful results. Accordingly, we request the following:

- One or two designated points of contacts[1] who will be held accountable for the project;
- All readily-available asset-specific information such as make, model, year, unique vehicle identifier, departmental designation and purchase price[2];
- All readily available, vehicle-specific TTM and LTD operating data such as vehicle miles traveled, fuel quantities consumed and fuel, maintenance and repair costs;
- Two face-to-face working sessions with the designated points of contacts and other leaders;

Timeline and Commitment

- A typical assessment takes about 45-60 days and requires about 40-80 city man-hours in aggregate across all employees participating in the assessment.

[1] Typically this is the fleet manager, but sustainability and special task force leaders can also play the role

[2] In the event such data is not readily available, Vision Fleet will substitute in industry-standard figures.

Vision Fleet Opportunity Assessment Detail

Introduction

Many public and private fleets provide excellent opportunities for deploying electric vehicles (EVs). Operational characteristics such as route predictability, high utilization duty cycles, central parking facilities, established data tracking systems and a total cost of ownership (TCO) mindset together often serve as the foundation for a successful transition to EVs. However, not every vehicle in a particular fleet is a good candidate for electrification. A Vision Fleet Opportunity Assessment that incorporates quantitative and qualitative information about a fleet's vehicles can provide the insights necessary to understand the potential size, scope and general economics of a fleet's EV opportunity.

This briefing provides an overview of Vision Fleet's diagnostic process. It describes the types of data required, which metrics are evaluated, and several qualitative considerations which determine what role EVs might play in a fleet's operations. The Vision Fleet Opportunity Assessment gives decision makers and fleet managers a meaningful and reasonably accurate assessment of their fleet's fit and can inform the decision about whether to move forward with additional data collection and analysis.

Vehicle Lifecycle Perspective: Total Cost of Ownership (TCO)

Vision Fleet's total cost of ownership, or TCO, approach answers the fundamental question: how much is a fleet spending, in total, to own and operate its vehicles? Vision Fleet's comprehensive calculations include all costs associated with both the acquisition and operation of a vehicle – from purchase and depreciation to fuel costs and maintenance. The below formula illustrates a basic TCO calculation:

$$\frac{Capital\_Costs + Operating\_Costs}{Vehicle\_Miles\_Traveled(VMT)} = TCO(\$/mile)$$

Because it is measured on a cumulative cost-per-mile basis, TCO provides the best platform for comparing the long-term operating cost savings often associated with advanced fuel vehicles (AFVs), especially EVs, to other fleet options. Appendix Exhibit 1 provides a summary of the different components that may be included in a TCO analysis, such as capital, fuel, maintenance, telematics, and financing.

When Electric Vehicles Make Sense (and When They Don't)

Electric vehicles can provide substantial operating savings over a vehicle's service life; however, not every vehicle use case accords with an EV transition (at least with current technology). In general, passenger vehicles (e.g., sedans, minivans and SUVs) provide good opportunities for considering an EV. Some light cargo applications (e.g., vans or light pickup trucks) may also be good candidates.

Use cases best suited to an electric vehicle include the following:

- Relatively high, consistent utilization (i.e., multiple trips on a daily or weekly basis)
- A majority of trips within an EVs' electric range (35-80 miles based on the vehicle model)
- Drivers with more predictable routes
- Vehicles that return to a specific location each day (i.e., an employee's home or an assigned parking location)

In situations where trip distances may exceed the range of a 100% battery electric vehicle (BEV), a plug-in hybrid electric vehicle (PHEV) is a better choice. After depleting its electric battery charge, a PHEV switches over to a gasoline engine, providing greater range while still capturing the benefits of electrification for a portion of the trip.

Operational savings accrue for each electric mile driven; therefore, low utilization use cases (i.e., vehicles only driven periodically) or vehicles that drive a large number of gasoline miles (for PHEVs) may not support a transition to an EV. In addition, some specialized vehicles (e.g., pursuit-rated police vehicles) may have requirements that cannot currently be met by the available selection of electric vehicles.

Narrowing the Field: Identifying Potential Replacement Candidates

Before conducting any detailed quantitative analysis, it's useful to narrow down the field of potential EV candidate vehicles. Using primarily qualitative data (e.g., vehicle make, model, age and assigned department), this initial filtering process should identify and exclude any vehicle that a fleet is unlikely to be replace with an EV in the next 1-2 years.

The simplest exclusions are those attributable to operational considerations (e.g., pursuit-rated police vehicles). In addition, a fleet manager may wish to exclude newer vehicles (i.e., those purchased in the past 3-4 years) given their remaining useful service life. Existing hybrid-electric vehicles may also be excluded (unless due for replacement), as their greater baseline fuel efficiency may not justify the incremental cost of an EV. Appendix Exhibit 2 provides simple, tangible examples of how these filters might be applied with only basic data on an existing fleet.

Gathering Key Data for TCO Analysis

Once the potential candidate list has been narrowed, the fleet management team should gather the remaining data required for the TCO calculation and initial EV candidate assessment.

At a minimum, this should include information such as: department using vehicle (i.e. Code Enforcement); vehicle year, make and model (i.e. 2012 Chevrolet Malibu); vehicle classification (i.e. passenger vehicle); acquisition cost; date of first service; miles traveled in the past year and over the

vehicle's lifetime; maintenance and repair costs in the past year and over the vehicle's lifetime; fuel quantity and costs in the past year and over the vehicle's lifetime; and vehicle assignment (i.e. assigned take-home, assigned centrally parked, pooled). These data fields are typically sufficient for conducting basic fleet analyses. However, for more detailed and accurate analyses, additional data fields may be required. A summary of these data fields is included in Appendix Exhibit 3.

When assessing a vehicle's TCO, it is important to consider both recent (past 12 months) and long-term usage and costs (at least the past three years). Focusing on only the past 12 months of data creates the potential for a skewed TCO calculation. For example, a lumpy one-time investment in periodic maintenance (e.g., a timing belt replacement) in a particular year could make that vehicle's TCO look higher than that of similar vehicles, even though it may not actually be any higher over the long-term. In addition, comparing a vehicle's statistics from one year to the next can highlight those with significant changes in annual miles driven or recurring high maintenance costs. Either of these factors might influence how one considers that vehicle's TCO calculation or likely replacement timing.

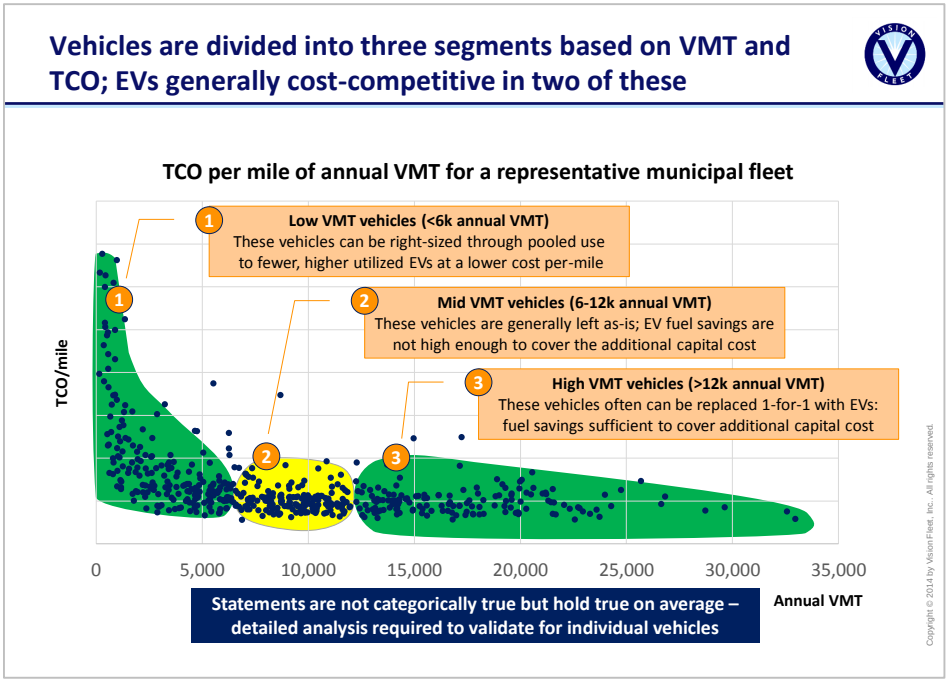
TCO Scenario Analysis: Potential Savings between Baseline and EV Approaches

With each vehicle's data in hand, the next step in the diagnostic is to calculate the fleet's expected business-as-usual (BAU) TCO forecast. This baseline TCO calculation assumes that each current internal combustion engine (ICE) vehicle will be replaced with a similar model at the end of its expected duty cycle. Future mileage patterns and maintenance costs are assumed to align with each vehicle's historical statistics, while fuel economy will reflect that of the comparable replacement vehicle's most recent model year. Future per-gallon fuel costs are typically based on a continuation of historical long-term price trends. The resulting baseline TCO provides the reference framework for vehicle replacement decisions.

Next, for each candidate vehicle, the diagnostic provides an EV TCO forecast based on the projected costs and performance of an appropriate EV replacement (either a BEV or PHEV based on range requirements). This EV replacement TCO assumes the same driving patterns for each replacement vehicle, but factors in the expected lower maintenance costs and long-term fuel savings from the lower per-mile cost of electricity.

Calculating average cost is an important exercise, as it allows for simple comparisons to external benchmarks, but it is also important to de-average the fleet in order to identify specific vehicles and duty cycles where EVs can deliver the maximum possible savings. In the below scatterplot of a representative municipal fleet's sedans, each sedan's plot of mileage over the past twelve months and TCO illustrates the wide range of use cases and helps highlight specific vehicles that may be best suited for EV replacement.

Chart 1: Scatter plot of individual vehicles' TCO / mile versus annual mileage



Most fleets will find that a Vision Fleet Opportunity Assessment provides startling insights regarding the normalized costs of vehicles that were previously assumed to be low cost or economical in relation to available alternatives. Appendix Exhibit 3 illustrates how a portion of the fleet often carries with it disproportionate costs when evaluated in terms of TCO per mile – highlighting substantial fuel efficiency, maintenance, and fleet right-sizing savings opportunities.

Additional sensitivity analyses around key assumptions in the TCO calculation can reveal important thresholds beyond which an EV will or will not make sense on a purely economic basis. For example, changing one's assumption about long-term gasoline costs or the percentage of electric miles driven by a PHEV can have a significant impact on the long-term TCO for a particular vehicle. Each of these thresholds represents an operational risk area that any organization will need to track and manage if they wish to optimize their deployment of electric vehicles.

Next Steps: Start a Conversation and Ask the Tough Questions

The quantitative aspects of Vision Fleet's Opportunity Assessment are a great starting point for transitioning to an EV fleet, but ideally, they should be complemented by interviews with department heads, maintenance staff, drivers and others who understand the vehicle usage patterns and can help identify potential issues and opportunities that are not revealed by quantitative analyses alone.

Once fleet leadership makes the decision to move forward to evaluating the electric vehicle opportunity in further detail, continuing the conversation and conducting more rigorous analysis is crucial to

addressing critical questions around the potential scope of an EV deployment and the savings that are expected to result. Issues such as charging infrastructure, employee training and acceptance, and ongoing operational requirements can each play substantial roles in the long-term success of an EV fleet.

This important analysis and planning can be undertaken internally by existing fleet staff if sufficient resources and expertise are available. However, many government agencies will find that efforts are enhanced substantially by engaging an experienced external partner, such as Vision Fleet, that is capable of applying deep EV expertise and established analytical approaches as it evaluates these questions.

Appendix:

Exhibit 1: Total Cost of Ownership components:

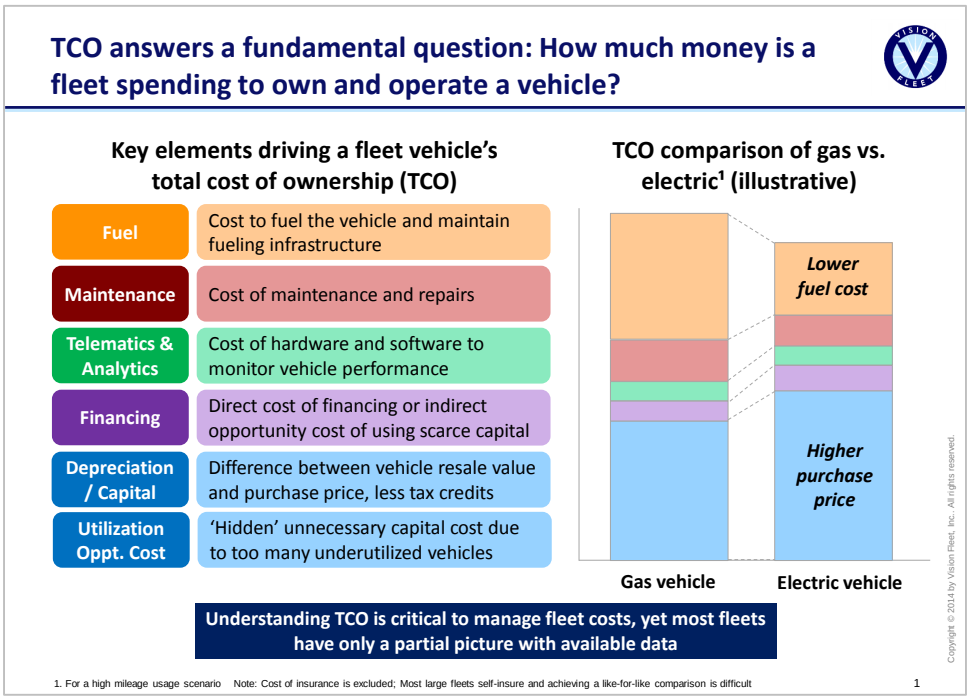


Exhibit 2: Illustrative filters for identifying pool of vehicles to analyze

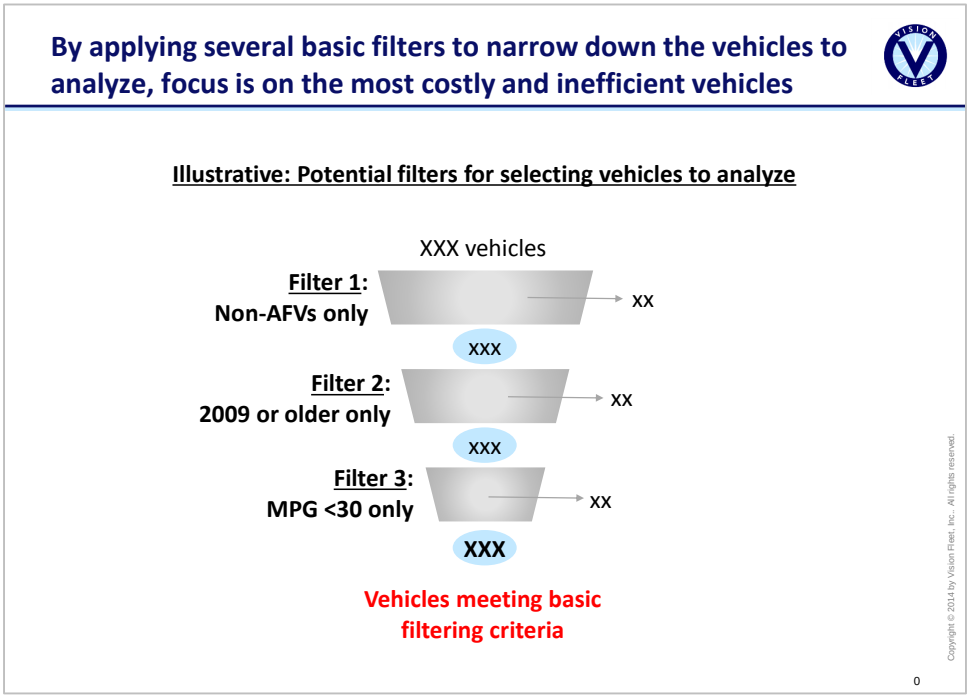


Exhibit 3: Vehicle TCO for a representative fleet of passenger and light duty vehicles

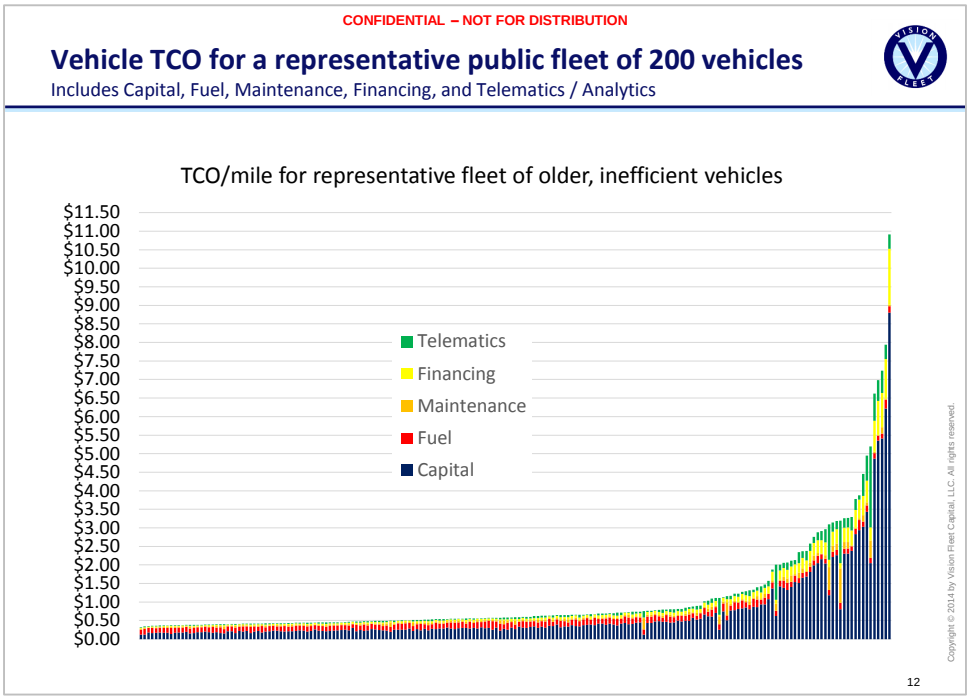


Exhibit 4: Data fields required for detailed vehicle TCO analysis

Data Field	Notes
Primary Vehicle-Level Data (critical to TCO analysis and opportunity assessment)	
Vehicle Identifier	e.g., Asset #, License, etc.
Make	
Model	
Year	
Acquisition cost	
Vehicle in-service date	
Vehicle Classification	e.g., Sedan, Pickup, Van
Fuel Designation	e.g., Gasoline, Diesel, Gas hybrid, E85, Battery electric, Biodiesel, LNG, CNG
Department that Operates the Vehicle	e.g. Police, Fire, Parks and Recreation, etc.
Vehicle assignment	i.e., pool vehicle, assigned take-home, assigned but centrally parked
Vehicle usage	e.g. Fire inspection, Building code enforcement, Under-cover police, etc.
Miles Traveled: Last 12 months	
Miles Traveled: Lifetime	
Maintenance Costs (preventative and reactive) ($): Last 12 months	If possible, exclude accident repairs
Maintenance Costs (preventative and reactive) ($): Lifetime	If possible, exclude accident repairs
Fuel (gas/diesel) Consumed (gal): Last 12 months	
Fuel (gas/diesel) Consumed (gal): Lifetime	
Fuel (gas/diesel) Costs ($): Last 12 months	
Fuel (gas/diesel) Costs ($): Lifetime	
Alt Fuel Consumed (gal, kWh, etc.): Last 12 months	
Alt Fuel Consumed (gal, kWh, etc.): Lifetime	
Alt Fuel Costs ($): Last 12 months	
Alt Fuel Costs ($): Lifetime	

Additional 'nice-to-have' fields	Notes
Accident repair costs ($): Last 12 months	Optional: Only if readily available
Accident repair costs ($): Lifetime	Optional: Only if readily available
Days out of service in trailing twelve months	
Identified for retirement in coming year	i.e. Yes, No
Vehicle Location (for pooled/centrally parked)	If available