


Opportunities for Police Cost Savings Without Sacrificing Service Quality:

Reducing Fuel Consumption



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Foreword

For many state and local governments, the recent economic crisis in the United States has caused revenues to decline while demand for services has increased to its highest level. Budget constraints forced many jurisdictions to institute painful funding cuts. However, some agencies have been able to develop strategies that trim spending while also maintaining—and often improving—the services on which so many constituents depend. Often these individual governments do not have time to document their cost saving approaches. And many governments that would be interested in using these approaches do not have adequate staff time to find them, nor to evaluate them.

The Urban Institute seeks to identify promising local and state government approaches for which sufficient available evidence demonstrates that costs are reduced without sacrificing service quality—and then share the results nationally. This report focuses on reducing police fuel consumption. Other reports in the series have focused on reducing police responses to false alarms and reducing inmate health care costs.

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Opportunities for Police Cost Savings Without Sacrificing Service Quality: Reducing Fuel Consumption

SUMMARY

The Issue

Police departments spend considerable amounts of money on purchasing fuel for patrol vehicles, which are almost constantly in motion. For example, fuel for the Washington DC Metropolitan Police Department (MPD) marked and unmarked patrol vehicles cost \$3.7 million in 2011. The cost fluctuates with the price of gasoline, but stays in the millions of dollars.

Many opportunities exist for reducing fuel costs significantly without degrading police services. An especially promising approach is to use hybrid, high-fuel-economy vehicles for part if not all of the patrol fleet. Hybrids typically use one-third the fuel of conventional vehicles, and quickly pay for the higher initial cost and conversion to police patrol use. A variety of driving practices and policies also can contribute savings without sacrificing service quality

The use of hybrids instead of conventional patrol cars can save about \$4,300 per year per vehicle in operating costs, and about \$21,500 over the life of each vehicle, after the higher initial cost of a hybrid (typically an extra \$3,000–4000) is deducted from the savings. Table 1 illustrates the potential savings per vehicle, using actual data from New York City and Washington, DC. Assumptions are given in the footnotes. The savings should be representative for use throughout the United States.

Concerns about start-up costs are outweighed by the net total saved, about \$1,800 per vehicle in the first year, as shown in exhibit 2.

Exhibit 1. Hybrid vs. Conventional Vehicle Cost Comparison per Police Patrol Car			
	Conventional Patrol Car	Hybrid Patrol Car	Savings: conventional less hybrid cost
Annualized Purchase and Outfitting Cost¹	\$7000	\$7639	-\$639
<i>Annual fuel cost²</i>	\$4,322	\$1,585	\$2,736
<i>Annual maintenance cost³</i>	\$3,898	\$1,668	\$2,230
<i>Annual cost of accident repairs</i>	\$389	\$393	-\$4
Annual Operating Cost	\$8,609	\$3,647	\$4,962
ANNUALIZED NET SAVINGS PER HYBRID VEHICLE			\$4323
TOTAL SAVINGS OVER LIFE OF VEHICLE (5 YEARS)⁴			\$21, 615

Source: Urban Institute

¹For the purchase cost of the police patrol version of a conventional car, we used the average cost of Crown Victoria and Intrepid models in Washington, DC Metropolitan Police Department in 2012. For the hybrid vehicle the cost used was the base hybrid price plus cost of modifications needed to make it into a patrol vehicle (e.g., prisoner cage added in rear), as paid by NYPD in 2012. The annualized cost is the purchase and equipment cost divided by five years, which is a typical working life of these vehicles.

² Based on typical mileage obtained in New York for hybrids and in DC for conventional vehicles: both cities have heavy traffic in much of the city. In DC the police patrols get only 7.52 mpg for conventional vehicles. Hybrids in NYC get 20.5 mph. Mileage per gallon varies with drivers and driving conditions, but these numbers are representative. The total fuel cost in the table is based on the above mileage per gallon for 10,000 patrol miles driven per year. The cost of a gallon of gas was \$3.25 as purchased by DC at the time of the analysis. If more miles were driven or the price of gasoline is higher, the savings from using hybrids would be proportionally greater.

³ Hybrid data from NYPD; conventional vehicle data from DC.

⁴This comparison excludes the difference in any salvage value between hybrids and conventional vehicles, and is based on constant 2012 dollars.

Exhibit 2. Start- up Net Cost per patrol Vehicle (First Year of Use)			
	Conventional	Hybrid	Savings with hybrid
Car Purchase and Outfitting for Patrol	\$35,000	\$38,195	-\$3,195
Operating Cost	\$8,609	\$3,647	\$4,962
FIRST YEAR NET SAVINGS WITH HYBRID			\$1,767

Source: Urban Institute

Even if just 40 percent of a fleet is converted to hybrids—limited to allay concerns about depending entirely on hybrids—fuel costs can be reduced by about a third annually without reducing service quality. The conversion can be phased in over a five-year period, with 20 percent of the fleet replaced annually, and 40 percent of the new purchases being hybrids. New York City and Indianapolis are notable examples of police departments that have been phasing in hybrids. The amount of savings scales up if hybrids comprise greater portions of the fleet.

Looking broadly at potential fuel savings, this report analyzes the feasibility and potential benefits of investing in more fuel-efficient police vehicles and various other ways police departments can save on fuel consumption. The report summarizes some of the best approaches being used by police departments across the nation. We provide data on the extent to which they work, and the degree to which they do or do not affect quality of police services.

A major issue in using more fuel efficient vehicles and fuel conservation driving practices is their acceptability to police officers. Having the data presented here to show actual savings without degrading police activities, and acceptability of the practices to police officers in some major cities, may help convince skeptics.

Police dependence on vehicles

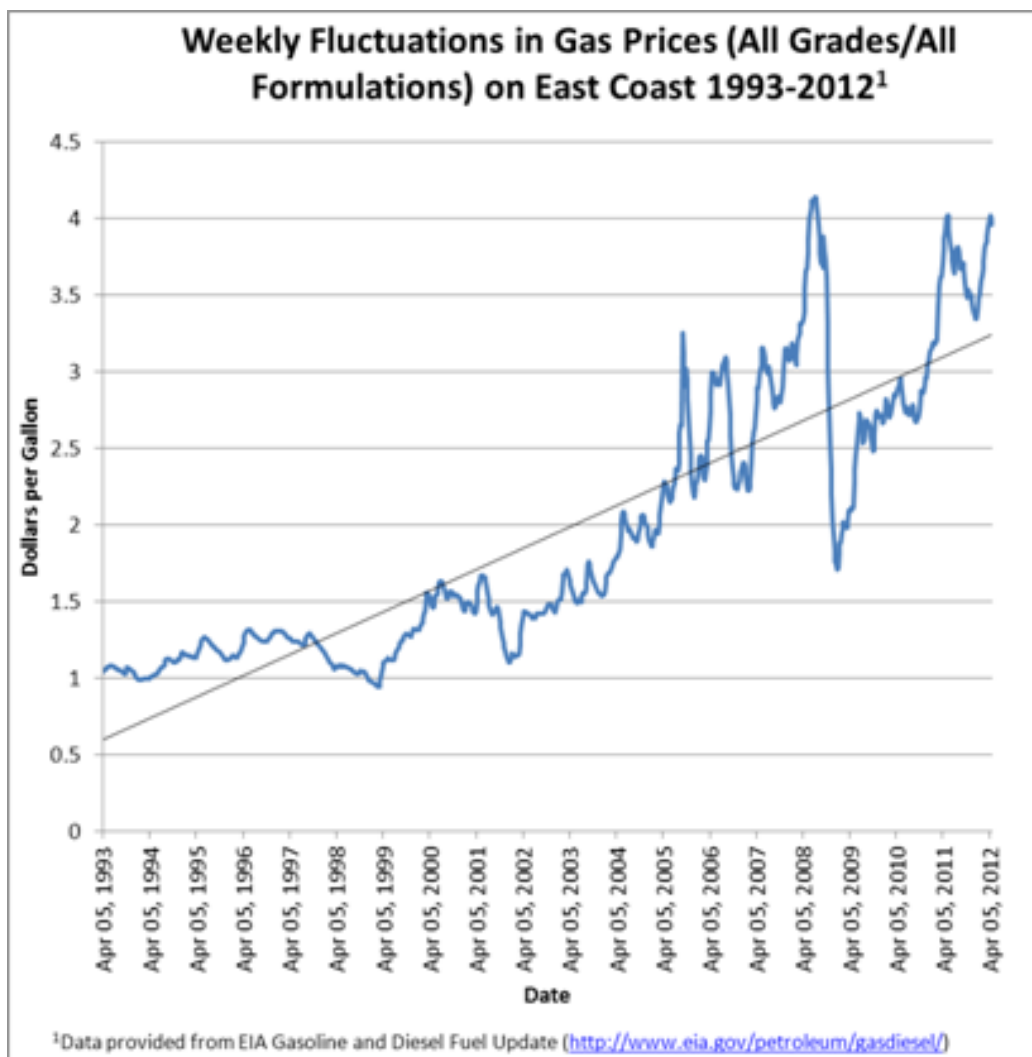
Although metropolitan police departments increasingly use foot, bicycle, and Segway patrols, the bulk of police patrols continue to be made with motor vehicles that are in almost continuous use and get low mileage per gallon in urban driving.

The nature of police work requires officers to be mobile—quick to the scene and capable of redeploying rapidly in changing circumstances. Vehicles increase police productivity. Fewer police are needed to patrol an area than would be possible on foot. So the vehicles are not going away—their use is critical to policing functions. But the vehicle use can be made more fuel-efficient.

Fuel prices fluctuate from month to month and year to year, but the long term trend is upward, as shown in exhibit 3 (which was taken from the Environmental Protection Agency.) Additionally, greater

fuel usage by conventional patrol vehicles contributes to environmental degradation. So strategies for fuel reduction are likely to be of increasing importance over the next several years.

Exhibit 3



Promising Fuel Reduction Practices

Exhibit 4 lists promising practices for further fuel reduction without compromising quality of service. These practices have been already implemented to varying extent by many police departments; the question now is how much more aggressive to be in expanding their implementation, especially the use of hybrid vehicles.

Exhibit 4. Summary of Promising Fuel Reduction Practices

Practices primarily intended to reduce fuel consumption
<ul style="list-style-type: none"> • Replacement of gasoline-powered vehicles with smaller, more efficient vehicles (hybrid, electric, biofuel, natural gas). • Fuel-saving driving practices (e.g. reducing idling, reduced unnecessary accelerations). • Fuel-saving maintenance practices (e.g., proper tire pressure, working oxygen regulator). • Use of devices in vehicles to monitor inefficient fuel use patterns. • Reduction of unnecessary cargo weight. • Stricter accountability for take- home vehicles.
Practices with the side effect of reducing fuel consumption (not their primary purpose)
<ul style="list-style-type: none"> • Increased patrols on foot, bicycle, Segway, and with other alternative vehicles (they reduce patrol vehicle mileage though are primarily intended for community policing) . • Providing police officials with electronic personal data assistants (PDAs) (they increase communication capabilities from the field to save time and increase convenience, which reduces vehicle trips back to the station). • Deploying laptops or other mobile data terminals to patrol and school officers (to enable report filing from the field, which reduces trips to and from station). • Use of online citizen reporting for minor incidents where an officer’s presence is unnecessary (which reduces response trips). • Use of automated traffic enforcement installations to detect and report traffic violations (which reduces traffic patrols). • Reduction of false alarms (which reduces response trips). • Revising police district boundaries and PSAs, to better geographically match resources with needs (which reduces trip lengths).

Use of Hybrid Vehicles

A particularly promising practice for reducing fuel consumption is use of hybrid vehicles. They are being adopted by an increasing number of police departments. Hybrids comprise a significant and growing portion of the New York Police Department (NYPD) fleet and much of the patrol fleet in other police departments.

Hybrid vehicles run partly on gasoline and partly on electricity. They are the leading alternative vehicle for saving fuel on police patrols, though there are also other alternative-fuel vehicles, running on natural gas or biofuels.

Exhibit 5 lists criteria that should be considered in selecting police vehicles that reduce fuel consumption. The specifics of how each aspect compares to current vehicles, and whether it is acceptable, are discussed later in the detailed analysis section.

Exhibit 5. Considerations in Deciding on Use of Fuel-Saving Patrol Vehicles

Cost Considerations

- Initial investment
- Modification costs (e.g., added prisoner cage, adequate cargo space)
- Fuel cost
- Maintenance cost
- Accident repair costs
- Vehicle life
- Number of vehicles needed to ensure availability (function of downtime)

Performance Criteria

- Pursuit capability (are they fast enough?)
- Safety (for officers and public)
- Driving characteristics (e.g. handling, suspension, visibility, acceleration)
- Capacity for carrying arrestees safely
- Capacity for carrying equipment (in driver/passenger space, trunk)
- Officer comfort
- Room for modifications (computer, cage)
- Reliability (frequency of breakdowns in the field)
- Down-time (including frequency of refueling, preventive maintenance)
- Environmental impacts (carbon footprint)
- Availability and convenience of fueling stations
- Public perceptions of police
- Officer morale

Start-Up Costs: Hybrids have a considerable start-up cost, about \$3000–4000 per vehicle above the cost of current cruisers, depending on which make is chosen and the amount of modifications necessary (like adding prisoner cages and gun racks).

Cost Savings: Hybrids produce fuel reductions on the order of one-third to two-thirds of the fuel consumption of current vehicles, depending on make and model. These hybrids also have reduced maintenance and longer vehicle life. Together the fuel savings and reduced maintenance needs lower operating costs significantly. Over one year, hybrids produce cost savings that more than pay for their initial extra investment, as was shown earlier.

Exhibit 6 illustrates the potential magnitude of the cost savings for a whole fleet. The assumptions remain the same as earlier. We used as an example the number of marked patrol vehicles purchased in one year by the Washington, DC police department, which happens to be 143 new vehicles, about a fifth of their marked fleet. The exhibit shows the potential costs and savings for three scenarios: purchasing hybrids for 20, 40, or 60 percent of each year's new patrol vehicles. The cost of purchasing all conventional vehicles is \$5,005,000. Costs for having hybrids range higher.

Vehicles are assumed to be purchased on the first of the year and immediately put into service. The table is based on the fairly typical rate of replacing about 20 percent of a marked car patrol fleet annually, based on a typical five-year life for these vehicles. Early indications suggest that hybrids may last longer than conventional vehicles, but for this example we assumed the two types of vehicles have the same life.

The rows in the table show comparative costs over five years. The first row is the status quo (no hybrids purchased). The next three rows show costs if 20, 40, or 60 percent of the fleet is hybrids. If only 20 percent of the marked fleet were replaced by hybrids, then after 5 years the annual net savings would be about \$630,000 per year. If 60 percent were hybrids, the annual savings after 5 years would be over \$1.8 million.

Still using DC as the example, if the unmarked patrol fleet had proportionally the same use of hybrids as the marked patrol fleet, the total savings for the combined fleet would be about 20–25 percent higher than if just the marked fleet were converted. The unmarked fleet in DC is about half the size of the marked fleet and the unmarked cars are driven less than marked vehicles. The unmarked fleet's lower miles driven means that reducing fuel consumption reduces costs less than for the marked fleet. But the savings from use of hybrids in the unmarked fleet still would be substantial.

Exhibit 6. Comparison of Savings from Hybrid vs. Conventional Marked Patrol Vehicles (hypothetical example based on Washington DC purchases and NYC police hybrid experience)							
Percent of New Cars Purchased Annually as Hybrids	Number of Hybrid Vehicles Purchased (of 143 total new cars)	Initial Investment for vehicles ⁵	Investment Compared to no hybrids	Annual Operating Cost	Annual Savings compared to no hybrids	Savings at End of Year 1 Compared to No hybrids	Savings at End Year 5 Compared to no hybrids
0%	0	\$5,005,000	NA	\$3,909,000	0	0	0
20%	29	\$5,097,655	+\$92,655	\$3,765,017	\$144,466	\$51,811	\$629,675
40%	57	\$5,187,115	+\$182,115	\$3,626,673	\$282,809	\$100,694	\$1,231,930
60%	86	\$5,279,770	+\$274,770	\$3,484,153	\$425,329	\$150,559	\$1,851,875

Source: Urban Institute

Service Quality and Officer Perceptions: Despite the potential for major cost savings, many police officers have questions about how the different characteristics of hybrids affect their suitability as police cruisers, especially as compared to the widely used police version of the Ford Crown Victoria. Can the hybrids adequately pursue offenders? Do they have room to hold arrestees and equipment? Do they operate reliably in the field?

Evidence from recent use of hybrids in other police departments suggests favorable answers to these questions for urban patrols, where high speed chases are rare and often undesirable. The evidence is building that the police officer objections have been overcome, as discussed in the detailed analysis section. The newest generation of hybrids, some now specially designed for police use, overcomes many of the previous objections, some of which were real and some misperceptions. A surprising positive side effect of hybrids found in New York City has been reduced officer fatigue compared to conventional vehicles.

Current Usage: Hybrid vehicles are being adopted by an increasing number of police departments. The New York Police Department has more than 1,000 hybrids being used for patrol. Other police departments that are less far along but expanding their use of hybrids includes such varied communities across the nation as Honolulu (Hawaii), Fort Wayne (Indiana), Cambridge (Massachusetts), and Salt Lake City (Utah).

⁵ Investment includes vehicle purchase price and, for hybrids, the cost of converting them to a police patrol vehicle. The conventional cars already offer a police version, so they do not require much if any conversion.

Other Cost Saving Options

Besides use of hybrids, there are a number of other approaches to reduce fuel consumption.

Alternative Fuels: Cities have been using vehicles fueled by natural gas, hydrogen, biofuel, and all-electric energy as well as hybrids. Some alternative fuels are starting to be used by police vehicles—we later cite examples. The alternative fuels require setting up new types of fueling stations, but more and more cities are doing this as they convert buses and other vehicles to these fuels.

Driver-related Fuel Saving Practices: Officers can reduce fuel consumption by at least five percent by not sitting with engines idling, not accelerating excessively, not carrying unnecessary heavy cargo, and other practices. The US Department of Energy (DOE) has found that carrying 100 extra pounds in the car increases fuel consumption by one or two percent. Police officers should not focus on fuel saving to the extent it interferes with police operational needs. But being conscious of these good driving practices might save as much as \$200,000 per year in a police department the size of Washington, DC. There are a variety of instruments that can be mounted in police vehicles to provide feedback on fuel efficiency if needed to encourage the good practices, and measure their results.

Maintenance-Related Fuel Saving Practices: Fleet maintenance personnel and police drivers can reduce fuel consumption by maintaining vehicle features to manufacturers' specifications. Maintaining proper tire pressures can affect miles per gallon by as much as 3.1 percent, according to DOE. Conversely, for every psi below recommended pressure, mileage may decrease by 0.3 percent. Vehicles also should be kept well-tuned and in repair; a faulty oxygen sensor can affect mileage by 40 percent, according to DOE.

Stricter Accountability for Take-Home Vehicles: Some cities give take-home vehicles to a limited number of police officers, including some in special units. The take-home vehicles are in part a benefit and in part an expedient to get certain specialists and officials to respond directly from home to crime scenes when needed. The take-home vehicles also add to presence of police in the community. However, these vehicles often are not fueled at the discount price of gas found at city fueling depots, which increases the cost of the fuel. Monitoring the use of the vehicles for personal errands and other unauthorized use can reduce some fuel usage paid by the city.

Fuel Saving as a Side Benefit from Other Strategies: As noted in exhibit 3 above, a group of practices primarily intended to save police officer time or facilitate community policing have the positive side effect of reducing fuel consumption. For example, increased foot patrols, use of Segways, and use of bicycles all reduce gasoline consumption. Officers may need traditional vehicles to get to their beats, but thereafter are not consuming fuel. Provision of PDAs and mobile data terminals in patrol vehicles allow filing reports and obtaining information without returning to stations, which reduces vehicle trips as well as saving time and being convenient. Online or phone reporting of minor crimes reduces the need to drive to the complainant's location for many incidents.

Automated traffic law enforcement installations such as red-light cameras and camera/radar installations reduce the need for traffic patrols and their fuel consumption. Redistricting—changing boundaries of police districts—may as a by-product put vehicles closer to the crimes and other incidents to which they respond.

Reduction of false alarm responses can save most of the patrol trips to check out the alarms. We discuss approaches for reducing false alarms in another report in this series. An estimated 60–96 percent of false alarms can be eliminated, which would save on the order of 50,000 to 80,000 vehicle round trips from patrol beats to and from alarm locations in a city like Washington, DC and the equivalent fuel of driving a police vehicle for a year or two.

DETAILED ANALYSIS

This section provides more detail on current fuel consumption practices and approaches that might be taken to increase fuel savings.

Alternative Fuel Vehicles

As noted earlier, the approach with potential for the largest reduction in fuel consumption is using patrol vehicles that have better gas mileage per gallon. The principal alternative fuel vehicle is hybrid gasoline/electric vehicles, which will be the subject of several examples below. Other alternatives in use in some police departments include all-electric vehicles and hybrids using hydrogen, propane, biofuels or compressed natural gas (CNG). Using alternative fuels requires changes to infrastructure and modifications to vehicles that are not already prepared for these fuels. Many cities are starting to use alternative fuels for buses, public works trucks and other vehicles, and so police departments may have less barriers to break and lower start-up costs in these cities.

Current Typical Police Fleet

Washington DC police cruisers in 2012 all were conventional “gas guzzler” vehicles. The MPD had fewer than 10 hybrid vehicles (Ford Escapes), and they were used exclusively as mobile photo radar units and for administrative uses, not for patrol. As in many police departments the dominant vehicle type was the Ford Crown Victoria. Second in usage was Chevrolet Impalas. Fuel comprises 65 percent of the annual cost of the marked patrol vehicles. The fuel consumption and various vehicle costs for current, non-hybrid marked cruisers are shown in exhibit 7. Exhibit 8 shows the comparable data for the unmarked cruisers.

Exhibit 7. Fuel Consumption and Costs for Washington DC Conventional (Non-Hybrid) Marked Cruisers (one year: July 2011–July 2012)			
	Total	Per Vehicle	Percent of Total Vehicle Operating Cost
Number of Marked Cruisers	716	-	
Miles Driven	7,112,310	9933	
Fuel Consumed (gallons)	945,525	1321	
Average Cost Per Gallon	\$3.25	-	
Fuel Cost	\$3,071,441	\$4,290	65%
Maintenance Cost	\$528,949	\$739	11%
Repair Cost	\$876,664	\$1,224	18%
Warranty Cost	\$1,884	\$2.63	0%
Accident Cost	\$278,264	\$388.64	6%
Total Cost	\$4,757,202	\$6,644	100%

Data (rounded) from MPD, Corporate Support Bureau "Equipment History: Cost and Quantity—Summary Report for the Period 07/17/2011 to 07/17/2012."

Exhibit 8. Fuel Consumption and Costs for Washington DC Unmarked Conventional (Non-Hybrid) Cruisers (one year: July 2011–July 2012)			
	Total	Per Vehicle	Percent of Total Annual Vehicle Operating Cost
Number of Unmarked Cruisers	429	-	
Miles Driven	3,102,116	7231	
Fuel Consumed (gallons)	223,527	521	
Average Cost Per Gallon	\$3.25	-	
Fuel Cost	\$727,743	\$1,696	61%
Maintenance Cost	\$160,501	\$374	14%
Repair Cost	\$242,549	\$565	20%
Warranty Cost	\$0	\$0	0%
Accident Cost	\$52,895	\$123	4%
Total Cost	\$1,183,688	\$2,759	100%

Data (rounded from MPD, Corporate Support Bureau "Equipment History: Cost and Quantity—Summary Report for the Period 07/17/2011 to 07/17/2012."

MPD patrol cruisers have an average life of about 5 years, according to the head of their Corporate Support Bureau. The Chevrolet Impalas and Ford Crown Victoria Police Interceptors comprising the patrol fleet were chosen for their pursuit capabilities, suitability for police work (especially the capacity to store police equipment and transport offenders), and ease of maintenance. The fleet has been limited to two primary vehicle types to allow standardization for maintenance and interchangeability of vehicles between districts and PSAs.

MPD, as many other police departments, has not yet taken up hybrid patrol vehicles because of concerns regarding their suitability for police pursuits, vehicle maintenance, and necessity of modifications for police work in vehicles not designed for that purpose, and officer morale. There also are questions about whether investing in hybrid patrol vehicles would actually produce cost savings, all costs considered.

The remainder of this section synthesizes the experiences of metro police departments in using hybrids for patrol and other functions. We focused on use of hybrids for patrol because that function accounts for the bulk of miles driven.

There are good data on the start-up costs, annual operating costs, and actual fuel savings, and some informal information on perceptions of officers driving hybrids. Full life-cycle cost data is not yet available on hybrids in police use. Their use in quantity in police fleets is still new, and there is not much data on hybrid life span, though they are expected to last longer than conventional vehicles.

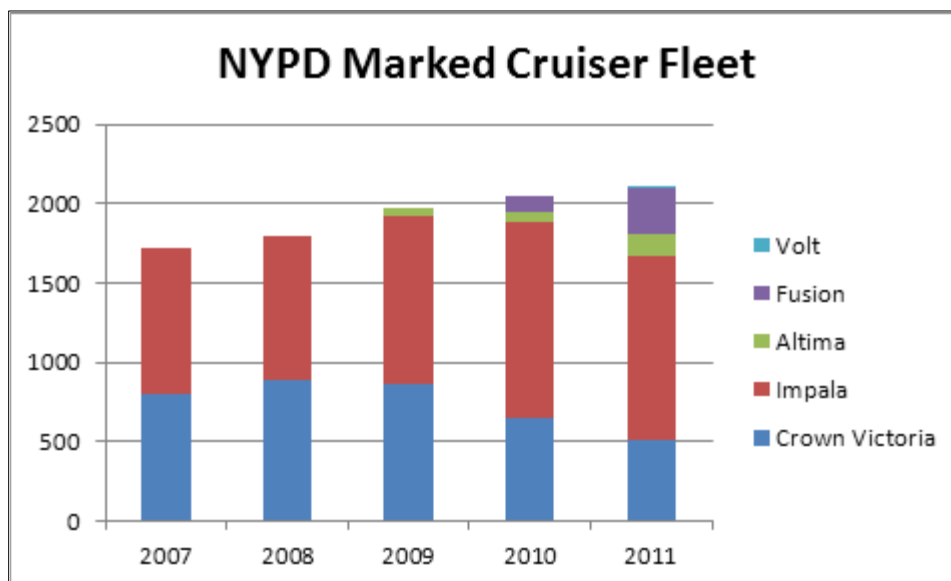
We present data and experience from police or fleet departments in New York City, Indianapolis, Honolulu, Fort Wayne, Cambridge (Massachusetts), and Salt Lake City. Some police departments were reluctant to officially release their data but informed us about their experience. We respected wishes of individuals who gave us data or information but did not wish to be quoted.

New York City Experience

New York Police Department (NYPD) in 2009 started using as patrol vehicles two types of hybrids, Nissan Altimas and Ford Fusions. They introduced a few hybrids and then gradually increased their numbers to over 500. NYPD found that hybrids generally meet police patrol needs for marked and unmarked patrol while significantly reducing costs of fuel and maintenance, after a higher initial purchase cost for the hybrids, and higher cost for making modifications for service as patrol vehicles. The key selection criteria of vehicles for NYPD are safety and ability to meet demands of the mission. Only if those two criteria are met do they consider fuel efficiency and carbon footprint.

Fleet Size: In 2002, NYPD purchased five Toyota Prius hybrid vehicles, all for non-patrol use. By 2011 hybrids had grown to over 1,026 vehicles out of a police fleet of 8,237 vehicles, and hybrids were being used for patrol, traffic enforcement, and school safety,⁶ marked hybrid patrol vehicles began to be used in 2009. Exhibits 9 and 10 below show the growth of hybrids in the NYPD marked cruiser fleet and their total sedan fleet.

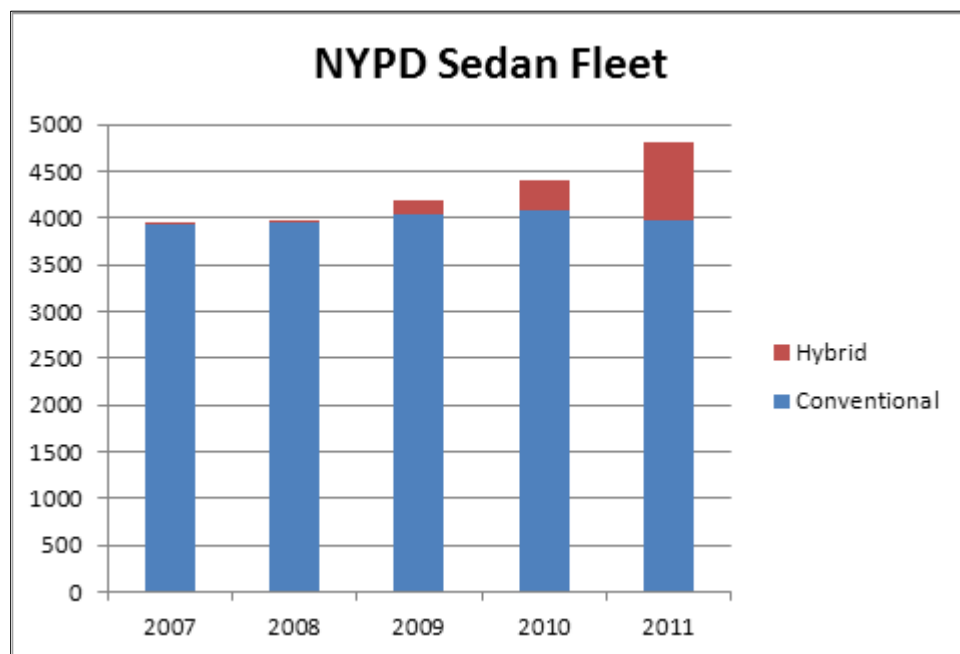
Exhibit 9



Source: NAFA Report

⁶ National Association of Fleet Managers (NAFA) presentation to NYC Fleet Management, "2011 Fuel Management Guide" (hereafter cited as "NAFA report").

Exhibit 10



Source: NAFA report.

The NYPD investment in hybrid patrol vehicles began in 2009 with 50 Nissan Altimas followed in 2010 by two more Altimas and 102 Ford Fusions. By 2011 the marked NYPD hybrid patrol cruisers was sharply increased to 292 Ford Fusions, 144 Nissan Altimas, and two Chevy Volts, a total of 438 out of 2,102 marked patrol cruisers, or 21 percent of the fleet. The other, non-hybrid patrol vehicles included 1,149 Chevy Impalas, and 515 Ford Crown Victorias. The NYPD conventional patrol vehicles were similar models to those used by other police departments, notably Washington, DC (which is used as a comparison in this report).

In 2011, NYPD also used as unmarked cruisers 117 Ford Fusions, 10 Nissan Altimas, and 4 Toyota Priuses, totaling 131 of the 2,101 unmarked cruisers fleet.²

While the Ford Fusion and the Nissan Altima are their predominant hybrid vehicles, NYPD also uses a variety of other hybrid/electric vehicles, though not for patrol. They include Ford Escape (161), Toyota Prius (128), Chevy Volt (19), GMC Yukon (13), Dodge Ram 1500 (5), Toyota Camry (2), Chevy Silverado (2), Toyota Highlander (1), and Honda Accord (1). NYPD uses the T3 Transporter (an upright scooter similar to the Segway) only for parks, as it is illegal to use them on roads. They also have a few Vectrix EMS electric scooters.

² NAFA report, 37

Cost Savings: While it costs more initially to purchase and modify the hybrids, NYPD has realized major net cost savings from introducing them.

Purchase and Modification Costs: The estimated 2012 cost per vehicle for purchasing Ford Fusion Hybrid vehicles for marked patrol is \$40,017 and the cost of Ford Fusions for unmarked patrol is \$31,719. The average initial cost of the hybrids, including modifications for policing, was approximately \$3,195 more than the conventional marked police patrol cars and \$4,029 more than conventional unmarked cars.⁸ The modifications have been necessary as there were not yet hybrid vehicles specifically designed and fitted out for police work.

The modifications to the hybrids after purchase include addition of a front console, modification of front and rear seating areas and rear floor, and addition of a key switch. The hybrid's console needs to be modified to hold a mobile data terminal. The original bucket seats are modified to allow more comfort while wearing the standard police tool belt. A prisoner partition is added to separate the front and rear seats, and a vinyl seat cover is added to the rear seat. Some of these modifications are done in-house and some are outsourced. These changes total \$1305 in parts and labor.⁹

Maintenance Costs: The hybrid patrol vehicles have had significantly lower maintenance costs in NYPD use than traditional vehicles. The maintenance cost of the Impala conventional patrol vehicle averaged \$3,898 per year, versus \$1,668 a year for the Fusion hybrid, and \$2,723 a year for the Altima hybrid.¹⁰ Differences in maintenance costs might be explained by the different ways the vehicles operate mechanically. Hybrids use the engine as part of the braking process and have less brake wear than conventional vehicles—important for the stop-and-go activity of police cars. Hybrid vehicles produce less engine heat, so the prolonged idling common in police work causes less wear and tear on engine parts. The increased heating in conventional vehicles thins the oil, which leads to more frequent oil changes. The one area in which the NYPD hybrids required more maintenance was faster tire wear—possibly related to the braking mechanism.

Replacement Cycle and Need for Backup Cars: The NYPD hybrids so far have tended to last longer than conventional patrol cars, probably for some of the same reasons their maintenance costs are lower. Conventional NYPD patrol cars need to be replaced approximately every 42 months; the hybrids are expected to last 48–60 months. (There has not been long enough usage quite yet to nail this down.) Because of the reduced need for maintenance, there is less downtime for the hybrids. With their longer lives and less downtime, the hybrids require fewer backup vehicles to maintain a given number of vehicles in service.

⁸ NAFA report, 25.

⁹ NAFA report, 40.

¹⁰ Data was not available for the Crown Victoria.

Fuel Costs: NYPD Crown Victorias get 7.5 miles per gallon, the Impala 8.3 miles, the Altima hybrid 14.9 miles, and the Fusion hybrid 20.5 miles.¹¹ The Fusion saved two-thirds of the fuel cost of a conventional vehicle. In 2008–09, NYPD reduced its fuel consumption by 611,362 gallons, from 10,035,498 to 9,424,136 gallons. It reduced it a further 26,542 gallons the following year and another 451,227 gallons between 2010 and 2011. The three-year reduction was 2,338,667 gallons, or approximately 23 percent below the 2008 consumption.

Total Costs: Though initially more expensive than conventional patrol cars, hybrid patrol cars quickly make up for their higher initial price through reduced fuel consumption, reduced maintenance, and a longer replacement cycle. NYPD showed that hybrid vehicles are a better investment than conventional vehicles. Exhibit 6 at the beginning of the report gave an example of the cost savings from introducing hybrids.

Effects on Quality of Service: Generally, the hybrid vehicles have proven satisfactory for patrol in New York. They are considered somewhat less good in overall performance than the conventional vehicles, but are adequate for a time with serious economic pressures.

Pursuit and Response Time: New York City has a speed limit of 30 miles per hour on surface streets and 50 miles per hour on highways. NYPD tries to avoid high speed pursuits, as does MPD, but has many more highways than DC. While the lower pursuit ability of hybrid acceleration does present the risk that an offender may occasionally elude the police, it also lessens the risk that innocent citizens become unwittingly involved and injured in a high speed chase. Therefore, the pursuit rating of hybrid vehicles is not considered an issue by NYPD. Their hybrids are considered fully capable of meeting the response time needs of the department.¹²

Safety: The hybrids did not match the safety rating of the Ford Crown Victoria Police Interceptor, but both the Altima and the Fusion hybrids matched or bettered the safety ratings of the Chevy Impala. The NYPD qualitative crash test ratings of the vehicles are shown in exhibit 11.

¹¹ NAFA report, 20.

¹² NAFA report, 24.

Exhibit 11. NYPD Crash Rating Comparisons				
Vehicle	Ford Fusion Hybrid	Nissan Altima Hybrid	Chevrolet Impala Police	Ford Crown Victoria Police
Driver Front	5 star	5 star	5 star	5 star
Passenger Front	5 star	5 star	5 star	5 star
Front Side	5 star	5 star	5 star	5 star
Rear Side	4 star	5 star	4 star	5 star
Rollover Rating	4 star	4 star	4 star	5 star

Source: NAFA Report

NYPD tries to ensure they do not compromise safety features when making the modifications to hybrids. For example, when adjusting the contour shape of the Fusion and Hybrid front seats to allow for officers' gun belts, only a small amount of foam is removed.

Driving Characteristics and Officer Comfort: Both of the hybrid vehicles used by NYPD for patrol are considered to drive well. Officers consider the vehicles to be maneuverable, especially in tight turns. They have good acceleration and are comfortable to drive. The only complaint voiced about driving characteristics of either vehicle is the apparent propensity for the Altima's suspension to bottom out when driven over a curb or when hitting a pothole hard. The Altima is lower to the ground than other police vehicles and bottoming out is slightly more common for them. NYPD fleet management ameliorated the problem somewhat by installing a skid plate on these vehicles. No driving incidents or vehicle damage had occurred as a result of bottoming out.

An unexpected benefit of the hybrids is that they were reported to cause less officer fatigue than conventional police vehicles, according to officers who commented on the issue to fleet management. The reason may be that the hybrid engines are quieter, produce fewer fumes, and have less engine rumble.¹³

Carrying Arrestees and Equipment: As noted earlier, NYPD had to install a prisoner partition and vinyl rear seat cover in the hybrids, and modified them to carry a computer and other officer equipment. In the Altima, the center console of the car was modified to hold a screen and keyboard so that it is accessible to officers in the front seat. The computer and related equipment is mounted in the vehicle's spare tire well in the trunk.

¹³ NAFA, 26–29

The hybrid patrol cars are smaller than the Crown Victorias, but were found sufficient to meet the needs of their mission. The Altima and Fusion are comparable in terms of vehicle dimensions. The Altima hybrid provides slightly more interior space for the officers in the front seats than the Impala.¹⁴

Breakdowns in the Field: NYPD considers the reliability and lessened need for maintenance one of the greater assets of the hybrid patrol vehicles. They have fewer breakdowns than conventional vehicles. For example, during a particularly hot day during the summer of 2012, the fleet manager checked on the relative breakdown rates of the Fusion hybrids and the conventional Impalas, and found that 2 percent of the Fusions had broken down, versus 12 percent of the Impalas.

Because of their reduced fuel consumption, hybrids need to be refueled less frequently, allowing more time for policing. Exhibit 12 shows data on fueling ranges for hybrids versus conventional vehicles (note that these are for generic conventional and hybrids, not those of NYPD.)

Exhibit 12. Fuel Capacity and Range: Hybrids vs. Conventional Vehicles					
	Toyota Camry Hybrid	Nissan Altima Hybrid	Ford Fusion Hybrid	Ford CVPI	Chevy Impala
Cost to Drive 25 Miles	\$2.82	\$2.82	\$2.46	\$5.04	\$4.56
Fuel to Drive 25 Miles	0.7 gallons	0.7 gallons	0.6 gallons	1.3 gallons	1.2 gallons
Cost to Fill the Tank	\$59	\$69	\$59	\$65	\$59
Miles on a Tank	526 miles	612 miles	597 miles	325 miles	321 miles
Tank Size	17.2 gallons	20.0 gallons	17.0 gallons	19.0 gallons	17.0 gallons

Source: www.fueleconomy.gov vehicle comparison. All vehicles are 2010 models.

Environmental Effects: A major selling point of hybrid vehicles is their reduced environmental impact, a key reason for this NYPD investment. They are part of the mayor's city-wide initiative to be more green. Public comments on the hybrids have been largely positive. Officers have received positive comments from the public for driving hybrid vehicles. The fleet has received awards from both 100 Best Fleets in North America and Government Green Fleets.

¹⁴ <http://www.nyc.gov/html/planyc2030/html/about/about.shtml>

Lessons from NYPD: Based on the fact that NYPD continues to expand its use of hybrid vehicles at a greater rate than its fleet, it appears that the benefits of these vehicles have been realized, including a significant reduction of fuel use, less frequent maintenance, and lower maintenance needs. Moreover, the potential for reduced officer fatigue provides an intriguing avenue by which hybrids may not only reduce costs but also help officers work more efficiently.

NYPD appears to have encountered no significant problems with the hybrids. Concerns over the ability for hybrids to participate in high-speed pursuits are obviated by NYPD's policies against such pursuits. Even with these rules, there have not been problems with the hybrid vehicles' abilities to maneuver effectively as police cars. While modifications are necessary they have proven relatively simple to implement.

With all of the benefits provided by the hybrid vehicles, one many wonder why New York City has not been converting their fleet even faster. There is some concern over putting all of one's eggs in one basket with a relatively new technology. Another reason is that when dealing with a large city with diverse policing needs, no one tool is appropriate for all jobs. As has been noted elsewhere, there is a feeling that that there is no perfect police car on the market. The Crown Victoria meets many police demands but it is a heavy fuel consumer. It is thought that a hybrid or fuel efficient Crown Victoria may be closer to ideal. However, since no such car currently exists, NYPD prefers to keep a diversified fleet.

In terms of gaining officer buy-in, there have been surprisingly few issues. Officers tend to be focused on their job. As long as the tools they are provided do not interfere with their duties, there appears to be no problem. Many officers enjoy getting to use the latest equipment, and see the new hybrid cars as more comfortable and high tech.

In sum, one of the most important lessons from NYPD's experience with implementing hybrid vehicles is that they meet the core NYPD tenets of safety and mission, followed by gains in going green. The hybrids do so at less net cost per car. The NYPD experience is strong evidence that hybrids can be successfully used on patrol in many other police departments as well.

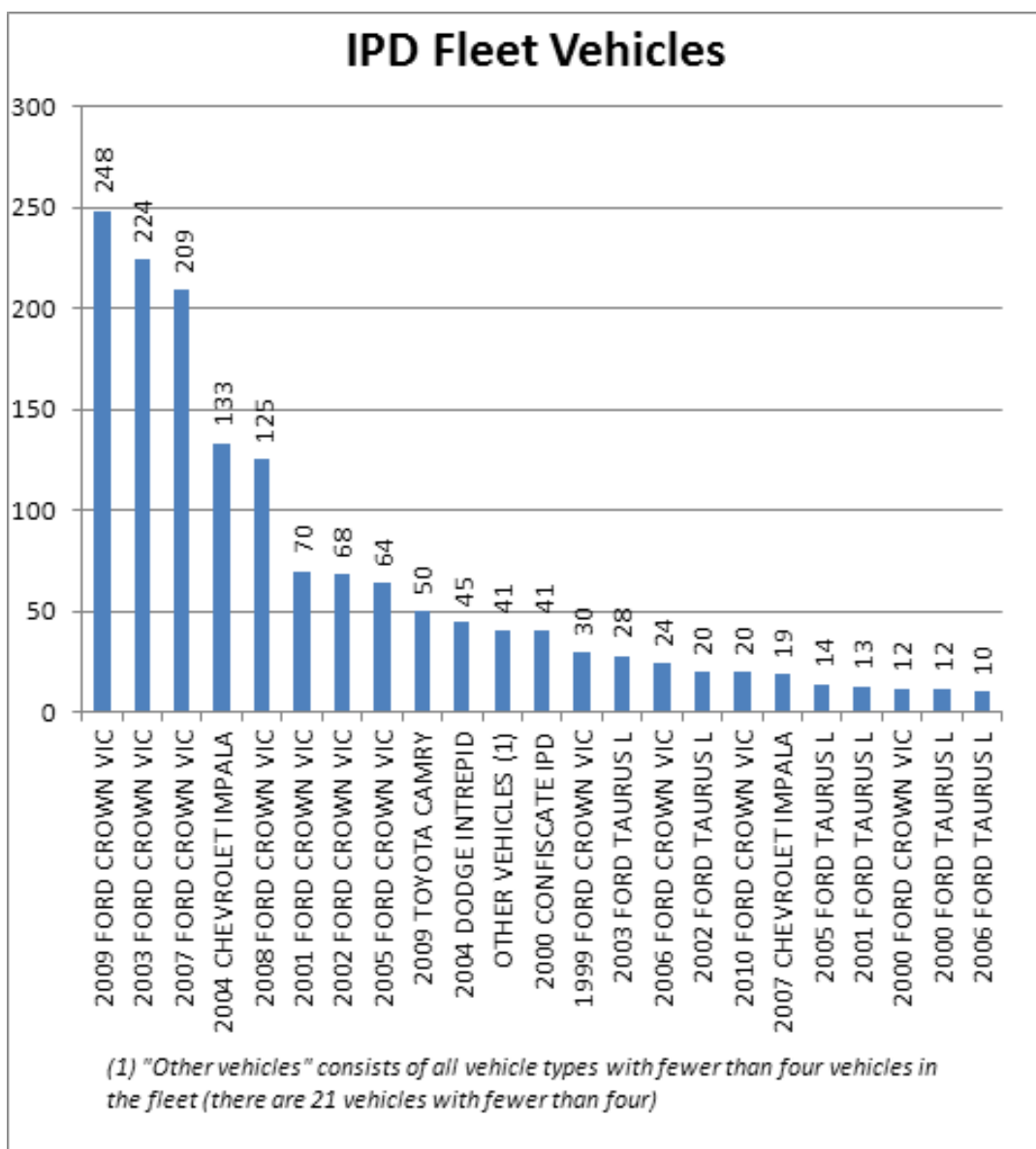
Indianapolis, Indiana Experience

In 2008–09, Indianapolis started implementing a five-year vehicle replacement strategy to upgrade its vehicle fleet to provide more efficient service to city residents. Part of this initiative was an investment in hybrid vehicles for public safety use.¹⁵

As of August 2012, the Indianapolis Metropolitan Police Department had 55 Toyota Camry hybrids in use by detectives. They had not yet used the hybrids as patrol cars. Exhibit 13 shows the composition of the police vehicle fleet. In the exhibit, the Camrys are all hybrids.

¹⁵ http://www.strib.com/news/ci_11291085

Exhibit 13. Indianapolis Police Fleet, 2012



Source: Indianapolis Fleet Management, August 2012.

Initial Investment and Modification Costs: Initial investment cost was higher for the hybrids, but operating costs much lower.

Initial Cost: The Toyota Camry hybrids used for detective work cost \$25,770, with no additional modification needed. This was \$6,705 more than the cost of new conventional Impalas they replaced. The Camrys were purchased from a local Toyota dealer.

Fuel Costs: The IDP hybrids had much lower fuel costs than the conventional vehicles, as shown in exhibit 14. The hybrids got more than double the miles per gallon compared to conventional police patrol vehicles. For the exhibit we assumed fuel usage per vehicle was as in Washington, DC in the previous examples, because the data on the mileage driven by type of vehicle (detective versus patrol) was not available for Indianapolis. That allows at least a ballpark comparison of total fuel costs for a year, using the mileage rates per vehicle from IPD. Also, the nature of driving for patrol versus detective work probably affects mileage per gallon, but the fuel-saving difference and the amount of oil saved are so large that it is likely these are secondary effects.

Exhibit 14. Indianapolis Police Department: Comparison of Fuel Consumption			
Vehicle	MPG	Yearly cost for fuel per vehicle	Yearly Cost of Oil per vehicle
Crown Victorias	13.11	\$2,911	\$154
Impalas	15.99	\$2,386	\$154
Tauruses	19.55	\$1,952	\$154
Camry Hybrids	32.22	\$1,184	\$108

Source: Analysis of IPD data

Maintenance Costs: Over the course of one year, the Impalas incurred average maintenance costs of \$1,892 (excluding accidents). The Camry hybrid averaged slightly lower, \$1,845 per year. Hybrids had lower frequency of oil changes—every 5,000 miles versus 3,500 miles for the other vehicles. Oil changes to the fleet Crown Victorias, Impalas and Tauruses averaged \$154 per car per year, versus \$108 for the Camry hybrids, a small savings of \$46 per car.

Replacement Cycle and Need for Backup Cars: Based on early observation, lifetime of the hybrids is expected to be longer than the conventional vehicles, but experiential data is not yet available. IPD is just coming toward the end of the lives of the first hybrids purchased.

Experience of Other Communities

A survey in 2010 by the Police Executive Research Forum (PERF) found that 17 percent of police departments had started using hybrids to some extent.¹⁶ Some examples are given below. However, most hybrid vehicles are still new and data on their savings and performance are limited.

¹⁶ See table 16 for this and other data from the PERF survey.

Salt Lake City, Utah: The Salt Lake City Police Department began purchasing hybrid police vehicles in 2008. They purchased five Toyota Camry hybrids that year, and are phasing in more each year. The department annually replaces about 20 percent of its fleet of approximately 450 vehicles, of which 12 are now (in 2012) hybrids. The cost for each hybrid was about \$4,000 more than the \$23,000 they were spending for conventionally powered police vehicles. The Camry is estimated to get up to 34 miles per gallon—approximately 10 miles per gallon more than the rest of the fleet. They estimate they will save \$1.5 million per year in fuel costs when the hybrids comprise more of the fleet.¹⁷

Raleigh, North Carolina: In mid-2011 the Raleigh Police Department converted 20 police cars to run on propane as well as gasoline. They reported saving \$22,270 in fuel costs. This effort is part of a larger, city-wide fleet plan to use alternative fuels, which now includes propane, natural gas, electric and bio-fuel being used in 461 city vehicles.¹⁸

Honolulu, Hawaii: As part of an initiative to go green and reduce fuel consumption through better gas mileage, Honolulu obtained 25 Ford Fusions and 6 Toyota Camrys in their patrol fleet of approximately 300 vehicles. The Fusions, 20 from 2011 model and 4 from 2012, have been modified with a prisoner partition and vinyl rear seats. Though they are lightly equipped for transport of arrestees, their predominant use is for patrol, with other vehicles providing transport of arrestees when necessary. (This is one way to reduce start-up modification costs of hybrids—relying on other vehicles to do prisoner transport). The Camrys, all 2009 models, are used like the Fusions but have more limited transport capacity, with the only unique modifications being soft partitions in the vehicles.

The HPD fleet manager finds the hybrids, especially the Camry, to be very reliable. The Fusions also have proven to be very reliable after initial problems with the original battery packs, which were too small to power all the equipment on board. Larger batteries were installed and the vehicles then were fine. The vehicles that experienced battery problems had gone unused for a long period, which may have contributed to the problem.

HPD does not have data yet on actual gas mileage obtained, but it is clear that the hybrids' gas mileage has been far better than the traditional patrol vehicles. Officers have enjoyed the new vehicles, calling them "nifty." However, some officers over six feet tall have been less comfortable in the Fusions than in the other cars.

¹⁷

<http://www.cambridgema.gov/cpd/newsandalerts/Archives/detail.aspx?path=%2Fsitecore%2Fcontent%2Fhome%2Fcpd%2Fnewsandalerts%2FArchives%2F2012%2F06%2Fcpdgreen>

¹⁸ Barry Greenfield, EfficientGov electronic online newsletter, "\$85,000 saved with propane cruisers, anti-idling system," October 2, 2012.

Cambridge, Massachusetts: The 273 officer Cambridge Police Department in 2011 obtained 13 hybrid vehicles for unmarked patrol, comprising a third of their total of their 39 unmarked patrol vehicle.¹⁹

Long Beach, California: The Long Beach Police Department added 10 Toyota Prius vehicles to its fleet in 2008 with a plan to continue replacing retired vehicles with hybrids. The vehicles will largely be used for travel and training, by academy staff, crime lab, and civilian employees. The cars are not planned for patrol at this time.

Huntsville, Alabama: Huntsville Police are using electric cars to replace some police cruisers. They are more expensive to purchase but are expected to have life-time cost savings, and reduce pollution and noise.

Iredell County, North Carolina: County police converted 13 Ford Crown Victoria Interceptors to multi-fuel vehicles that can run on propane or gasoline. Propane burns more cleanly, requiring less vehicle maintenance, and costs about \$1 less per gallon than gasoline. Iredell County Police had the conversions made by a business that specializes in such vehicle conversions, but they are now training the county mechanics to make the conversions themselves, reducing the cost of each conversion to approximately \$4,000 per vehicle.²⁰

Greenville, South Carolina: The city has 100 propane-powered police cars. It installed three propane refueling stations around the city.²¹ The director of fleet management expects that the police department will save between \$100,000 and \$125,000 a year on fuel costs with this fleet.²²

Kansas City, Missouri: The Kansas City Police Department is converting 12 administrative vehicles to run on compressed natural gas in an effort to reduce costs and pollution. In addition, the department will purchase a Ford E-350 propane-fueled truck for use. These are the first alternative-fuel vehicles to enter the fleet, according to the fleet supervisor.

Two converted CNG Chevrolet Impalas are already in use, and 10 new 2010 Ford Crown Victorias are expected to be converted by late December 2012 or January 2013. The department has a total of 878 vehicles. They have a CNG fueling station and are getting a propane-auto gas fuel station.²³

¹⁹

<http://www.cambridgema.gov/cpd/newsandalerts/Archives/detail.aspx?path=%2Fsitecore%2Fcontent%2Fhome%2Fcpd%2Fnewsandalerts%2FArchives%2F2012%2F06%2Fcpdgreen>

²⁰ Fox News. 2011. "Police Departments Powering Up with Propane."

²¹ Ibid.

²² Officer.com. 2011. "Gas Prices Rise Causing S.C. Deputies To Make Changes."

²³ Fleet News, September 2012.

Fort Wayne, Indiana: Fort Wayne has been using B-20 and E-85 fuels in police vehicles. B-20 fuel, which is 20 percent soybean oil, has been used in their police diesels since 2005, and ethanol fuel since 2009.²⁴

Hypothetical Scenarios for Purchasing Hybrids

If a police department wished to phase in hybrids, the start-up costs and savings could be as illustrated in the three scenarios in exhibit 15, which is a more detailed version of the data presented earlier in exhibit 6.

The purpose of the scenarios is not to provide exact information on the costs and savings of an investment but rather to provide a general picture of the cost effects to be expected from the initial investments, at various levels and the speed of recovering the higher startup purchase and modification costs of the hybrids.

The more hybrids purchased, the greater the savings. We provided data for three scenarios: purchasing 20 percent, 40 percent, and 60 percent of new vehicles as hybrids to replace current vehicles each year, assuming a five year vehicle life, and one-fifth of the fleet being replaced each year.

Using the actual costs and fuel usage borne by Washington, DC's marked police cruisers, their numbers in 2012, and actual cost data from New York City²⁵ for Ford Fusion hybrids; we projected costs and savings for the three hypothetical purchase scenarios.

Some additional assumptions simplified the comparison and retained the essence of the finances. The savings can easily be recomputed for various other assumptions based on the data in the table. The assumptions we used were close to the DC police department's experience.

- Number of vehicles on marked patrol detail: 716
- Miles driven annually by these vehicles: 7,112,310 distributed across all marked patrol cars.
- Fuel cost: \$3.25 per gallon (savings are greater if cost is higher than this).
- Average miles per gallon for marked patrol fleet: 7.52 mpg (based on 7,112,310 miles driven, and 945,525 gallons of fuel consumed).
- Maintenance costs comparable to those experienced by NYPD for hybrids, actuals for non-hybrids. MPD maintenance costs for conventional cars are those for Impalas; maintenance for the Crown Victorias were not available but in the same general range.
- Accident costs between hybrid and conventional vehicles are comparable.
- New conventional cars would be comparable to similar vehicles in the current fleet.
- Modification needs for hybrids would be similar to those of NYPD.

²⁴ <http://www.cityoffortwayne.org/news-archives/2122-fort-wayne-fleet-recognized-as-national-green-fleet-.html>

²⁵ NAFA Report.

- Average cost of a conventional marked patrol cruiser is \$35,000 and the average cost of a marked patrol cruiser Ford Fusion is \$3,195 more.
- Dollars in constant 2012 values.

The Ford Fusion is used as the sole hybrid vehicle in the comparison because it is the most popularly used hybrid in NYPD's marked patrol force, and had sufficient cost data.

Exhibit 15. Cost Scenarios with Ford Fusion Hybrid Marked Patrol Cars

	Status Quo	20% of New Cars = Fusion Hybrid			40% of New Cars = Fusion Hybrid			60% of New Cars = Fusion Hybrid		
	Total	Total	Conventional	Hybrid	Total	Conventional	Hybrid	Total	Conventional	Hybrid
<i>Marked Cruisers (after new cars added)</i>	716	716	687	29	716	659	57	716	630	86
<i>New Vehicles (20% annual)</i>	143	143	114	29	143	86	57	143	57	86
<i>Percentage</i>	100%	100%	96%	4%	100%	92%	8%	100%	88%	12%
<i>Miles Driven (assumed evenly distributed among all cars)</i>	7112310	7112310	6820705	291605	7112310	6543325	568985	7112310	6258833	853477
<i>Mpg (assumes 50/50 CVPI-Impala fleet as status quo)</i>	7.52	/	7.52	20.5	/	7.52	20.5	/	7.52	20.5
<i>Fuel Consumed (gal)</i>	945786	921233	907009	14225	897878	870123	27755	873925	832292	41633
<i>Average Cost Per Gallon</i>	\$3.25	\$3.25	\$3.25	\$3.25	\$3.25	\$3.25	\$3.25	\$3.25	\$3.25	\$3.25
<i>Fuel Cost</i>	\$3,073,804	\$2,994,008	\$2,947,778	\$46,230	\$2,918,105	\$2,827,900	\$90,205	\$2,840,255	\$2,704,948	\$135,307
<i>Maintenance cost per car, annual (conventional only includes Impala, not CVPI)</i>	\$3,898	/	\$3,898	\$1,668	/	\$3,898	\$1,668	/	\$3,898	\$1,668
<i>Maintenance and Repair Cost (using NYPD figures for all cars for cleaner comparison, only provided for Impala and Fusion, no data on CVPI)</i>	\$557,414	\$492,744	\$444,372	\$48,372	\$430,304	\$335,228	\$95,076	\$365,634	\$222,186	\$143,448
<i>Accident Cost</i>	\$278,265	\$278,265	\$266,856	\$11,409	\$278,265	\$256,003	\$22,261	\$278,265	\$244,873	\$33,392
<i>Total Annual Costs (maintenance, repair, fuel costs)</i>	\$3,909,483	\$3,765,017	\$3,659,006	\$106,011	\$3,626,673	\$3,419,131	\$207,542	\$3,484,154	\$3,172,007	\$312,147
<i>Cost per Car</i>	\$35,000	/	\$35,000	\$38,195	/	\$35,000	\$38,195	/	\$35,000	\$38,195
<i>Investment Costs (assuming conventional car costs average \$35,000, and hybrid average costs are \$3,195 more)</i>	\$5,005,000	\$5,097,655	\$3,990,000	\$1,107,655	\$5,187,115	\$3,010,000	\$2,177,115	\$5,279,770	\$1,995,000	\$3,284,770
<i>New Vehicle Investment + Annual Costs</i>	\$8,914,483	\$8,862,672	\$7,649,006	\$1,213,666	\$8,813,788	\$6,429,131	\$2,384,657	\$8,763,924	\$5,167,007	\$3,596,917

Other Means of Saving Fuel

Besides using vehicles that burn less fuel per mile driven, there are several other ways to reduce fuel consumption. Some are more practical for police use than others, but we present the whole set being used somewhere.

Driver Practices

One way to immediately cut fuel consumption is by using smarter driving practices. Through education, incentives or enforcement, a police department can encourage officers to adjust their on-duty driving practices in ways that will cut fuel use. As an NYPD official pointed out, one does not want officers to be concentrating on saving fuel at the expense of doing the policing job, but there are some practices to encourage that are not incompatible with police duties, and that do not take much effort.

Drive with fuel conserving techniques: Rapid acceleration and rapid braking, when unnecessary, are a waste of gas. Officers should make a reasonable effort to accelerate and decelerate moderately. According to the US Department of Energy, rapid accelerations and decelerations can lower gas mileage by 33 percent at highway speeds and by 5 percent at city speeds.²⁶ In warmer months, drivers can look for shaded and cool places to park, and then use air conditioning intermittently.

Avoid excessive idling: Officers often spend a good deal of time with engines idling, such as while on the scene of an incident, giving a traffic citation, writing a report, or during downtime in the shift. Reducing engine idling will reduce fuel use. When outside the vehicle, and when inside the vehicle and air conditioning or heating is not essential, cars should be turned off when stopped. Much of the new electronic equipment in vehicles, such as computers, lights, radios, and computers, can be operated for short periods without draining much of the vehicle's battery, and does not require keeping the engine on.

According to DOE, idling can consume one-quarter to one-half gallon of fuel per hour, depending on vehicle size and air conditioner use. Compared to idling with AC off, not idling for one hour can save \$0.60–\$1.80. Compared to idling with AC on, not idling for one hour can save \$1.20–\$2.40. Though these savings seem small, these amounts add up over the many hours and numbers of cars in use.

Other than relying on better driving practices, vehicle fuel management systems can be installed to reduce fuel consumption while idling. Raleigh, North Carolina police installed anti-idling technology in 29 police vehicles in 2011, saving 962 gallons in the first three months evaluated.²⁷ That equates to about

²⁶ DOE-projected cost savings are based on a fuel price of \$3.87/gallon.

²⁷ Barry Greenfield, EfficentGov electronic online newsletter, "\$85,000 saved with propane cruisers, anti-idling system," 10/2/12.

10 gallons per vehicle per month or \$390 per vehicle per year. For a 1,000 vehicle fleet that saves \$390,000 per year.

Remove excess vehicle weight: Removing 100 lbs. from vehicles can save 1–2 percent in gas mileage, according to DOE. The necessity of carrying extra equipment should be considered from this perspective. The effect of additional cargo weight varies in proportion to the size of the vehicle, with larger vehicles being less affected than smaller ones.

Maintenance of Vehicles: Good maintenance reduces fuel consumption and helps lengthen the useful life of the vehicle. Implementing good maintenance practices is a shared responsibility of vehicle operators and fleet management. The practices were well summarized by E. Sweeney in a *Police Chief Magazine* article:²⁸

Check tire pressure: Officers or others should frequently check vehicle tire pressure and maintain it within manufacturers' guidelines. According to DOE, fuel economy can be improved by about 3.3 percent by maintaining recommended tire pressure. There is a reduction of gas mileage by 0.3 percent for each psi below manufacturer specifications in each tire.

Refuel the vehicle at the coolest parts of the day: When possible, officers should refuel vehicles at the beginning or end of the day (morning and evening) when fuel in underground tanks is coolest and less is lost through evaporation.

Emphasize regular vehicle maintenance: Vehicles should be regularly checked and tuned to be kept in efficient operating condition. Warning alerts should be responded to promptly. According to the DOE, lack of certain maintenance items can significantly affect gas mileage. One example: replacing a faulty oxygen sensor can improve gas mileage by as much as 40 percent.

Enforcing these requirements or making it easier for officers to implement them may help increase fleet fuel efficiency.

Organizational Strategies and Practices

Some strategies intended primarily to improve policing or save officer time have the side benefit of reducing fuel consumption.

²⁸Sweeney, Earl M. "Maintaining Traffic Patrols in the Face of Rising Energy Costs." *Police Chief Magazine*, 2004

Community Policing: Many officers have been moved out of cars and onto foot patrols, bicycles, and Segways. While these changes usually are not made to reduce fuel consumption, that often is one of the positive side effects.

By the end of FY 2011, Washington, DC had moved over 300 officers to foot patrols, had 20 officers in each of its seven police districts patrolling by bicycle, and had assigned 52 officers using Segways for patrol selected areas. We estimate that these patrols may be saving on the order of 260,000 gallons of fuel a year, or \$840,000 versus using vehicle patrols in their areas. This estimate is based on average annual fuel consumption per patrol vehicle of 1,321 gallons and an assumption that vehicles to replace these patrols would be used about 40 percent of the year, because most of these patrols are not used around the clock, and many of these beats need to be reached by vehicle. The savings could be somewhat more or less depending on the number of vehicle patrols they replace. This estimate just gives some feel for the order of magnitude of fuel that is being saved.

Many other police departments have been reducing vehicle patrols in favor of patrols by foot, bicycle, and Segways. Exhibit 16 shows results of a 2010 PERF survey that found 13–23 percent of departments using various alternatives to vehicle patrols and to conventional vehicles.

Exhibit 16. Police Fuel Reduction Approaches across the Nation	
Steps Initiated	% of Agencies
Eliminate/change take-home car policy	27%
Initiate/increase use of bicycles	23%
Initiate/increase use of hybrid vehicles	18%
Initiate/expand use of foot patrols	17%
Initiate/increase use of two-person cars	15%
Initiate/increase use of Segways	13%
Initiate/expand use of telephone reports	10%

Source: PERF survey, December, 2010 [29](#)

Online reporting by citizens: Some police departments (e.g., Montgomery County, Maryland, and Camden, New Jersey) have introduced online reporting by citizens of minor incidents. Online reporting

²⁹ <http://members.policeforum.org/library/critical-issues-in-policing-series/Econdownturnaffectpolicing12.10pdf>

reduces officer trips to the scene of minor crimes where their presence often is not immediately necessary if at all, thus reducing travel miles and corresponding costs while keeping officers available to respond to more pressing matters.³⁰

Even when online reporting is not used, not all incidents require an officer response in person. Mandating officers to respond in person to minor calls for service that could be handled otherwise may take them away from proactive community policing. The negative side of online reporting is that some citizens may feel less safe or that they are getting less service when an officer does not come when called. Some officers have said that appearing in person also may reduce false calls.

Vehicle Data Terminals for Officers: Doing computer data entry online from the field reduces trips back and forth from the station. One or more vehicle trips can be saved per officer per day.

Street Monitoring Technology: Closed-circuit television cameras set up around a city and ShotSpotter or similar gunshot monitoring detectors can monitor the streets and gather intelligence. These also reduce the need for some trips and speeding responses to crimes.

Reorganization of Districts and Reallocation of Resources: As population and business change in parts of a city, crime may grow disproportionately to the police resources allocated to a particular district. Redrawing district boundaries to better match demand with resources may help reduce travel distances between patrol areas and police stations, cutting mileage and fuel consumption.

Rules regarding take-home cars: Some officers are allowed to take home marked cruisers. The take-home vehicle program serves multiple functions. It is a force multiplier—the community sees more police cars driving around and parked at officer's homes. The program also is an incentive and morale booster for officers, a visible reward especially when salaries have been frozen.

Take-home vehicles also allow faster emergency response by officers who are members of specialty teams when they have to respond from home. Though take-home vehicles may lead to additional fuel costs, the costs can be minimized by enforcing the rules on their use. Restrictions may include rules against using the vehicle for personal errands or second jobs. Alternatively, officers may be asked to pay for fuel used for personal trips. Washington DC MPD reported that tightening enforcement of rules on its take-home car program resulted in saving 48,000 gallons, or 7 percent of the projected fuel consumption in the first four months. Annualized, this was estimated to save approximately \$360,000 in fuel savings in 2009.

The Indianapolis Police Department has been considering fuel surcharges on officers who make personal use of their take home vehicles, an idea supported by their Fraternal Order of Police. Officers

still are allowed to use the vehicles for personal errands and transportation, which gives police extra visibility, but there needs to be an honor system or other way to track and pay for personal use of the vehicles.

Another option is to use mobile data terminals to clock in and begin work upon leaving home. This can reduce unnecessary travel and increase the amount of time officers are in service. It also reduces a trip to the station just to clock in. Instructions can be sent via the terminal rather than in person.

The take-home vehicle program has some drawbacks affecting vehicle costs. Because vehicles are taken home and kept out of duty until an officer's next shift, more vehicles are needed, and the community pays for the fuel used by officers commuting to and from work.

Two-person patrols: Many police departments have long switched from two officers to one officer per patrol vehicle, to increase visibility and coverage, or to reduce staffing costs. Where there are frequent calls or situations requiring two or more officers, deploying two-officer teams can cut fuel use by 50 percent, and may speed up resolution of some calls by dividing tasks between the two officers. However, reduction in the number of patrol vehicles may increase the response time of the first officer on the scene, so use of two-person vehicles has to be sparing and only where appropriate.

Use of Traffic Checkpoints: Checkpoints have the primary purposes of reducing traffic violations and catching offenders, but also impacts use of police resources. With the aim of reducing police fuel consumption while maintaining or improving the level of services provided, **Kentucky State Police** devised a summer traffic campaign in 2008 to operate road checkpoints in high-traffic problem areas. The program, called Operation Safe C.H.E.C.K. (Concentrated Highway Enforcement Checkpoints in Kentucky), used collision data to identify optimum locations, and created high visibility police checkpoints where random license and registration checks took place. Police made 342 DUI arrests, 129 drug arrests, identified 405 seatbelt and 120 child restraint violations, and discovered 254 suspended license violations in the first year of operation. They recovered four stolen vehicles, made 422 other arrests, and performed 35,985 vehicle safety inspections. By use of the checkpoint they saved \$14,000 (approximately 3,770 gallons of gas), in just two months.³¹

Use of targeted checkpoints may help reduce the need for non-targeted traffic patrol. Occasional checkpoint campaigns have the additional benefit of making the public aware of police presence and may have a further, unaccounted for crime deterring effect.

Summary of Findings

According to an article in the Community Policing Dispatch provided by the Community Oriented Policing Services (COPS) section of the US Department of Justice (DOJ):

³¹Bray, Sherry. "Operation Safe C.H.E.C.K.—KSP'S Fuel Reduction Strategy Shows Success." Kentucky State Police, 2008.

“Hybrid patrol cars are a seemingly obvious option, although they are not without disadvantages. A major criticism of hybrid patrol cars is their lack of speed (topping out at about 120 mph), and that at highway speeds they are running on their traditional combustion engines. Nevertheless, hybrids can be remarkably efficient in high-traffic areas; when running on their batteries they use no fuel.”³²

The experiences of the police departments mentioned above demonstrate that hybrids can be remarkably efficient in urban areas, where high-speed pursuits are rare and often undesirable. Used properly, hybrids could significantly decrease fuel and maintenance expenditures. With reduced fuel use and maintenance needs, hybrids quickly provide returns on their initial investment. Though the initial costs are higher and vehicle modifications need to be made, the start-up costs are quickly offset and savings realized within one or two years from the purchase date. Furthermore, the hybrid vehicles last longer than conventional gas powered vehicles, which amortized startup costs over more years, and require fewer backup vehicles because of their inherent reliability.

While investing in hybrid vehicles is a highly visible and viable option to reduce costs and maintain service levels, investing in the conversion of conventional vehicles to use alternative and cheaper fuels provides another means. However, investing in fueling stations and a fuel supply for these vehicles is a major financial undertaking. Without large-scale support, this may be difficult unless alternative fuels are also used for other city vehicles.

Attentive maintenance of vehicles—including frequent oil changes, refueling, tune ups, reducing vehicle weight, and checking of tire pressure—are simple yet effective ways to make vehicles run more efficiently and consume less fuel. Other practices require being fuel conscious while driving, such as by reducing idling, even braking, and no unnecessary rapid accelerations. Ultimately, the focus of the officers should be on policing, not reducing fuel and thus it is the perhaps best to provide fuel efficient technology that allows police work to continue unencumbered.

We have presented a number of proven approaches to reducing fuel consumption. Hopefully this information will help police departments choose from the menu of fuel reduction practices, and significantly reduce both pollution and fuel costs.

³² http://cops.usdoj.gov/html/dispatch/September_2009/green_policing.htm