

Harnessing the Power of

ADVANCED FLEET VEHICLES

A Hybrid Electric Vehicle Fact Sheet for Government Officials ♦ February 2004

Written and produced by the Center for a New American Dream in collaboration with the National Association of Counties



Hybrid electric vehicles (hybrids) are exciting new additions to the car market for government fleet purchases. Powered by both an internal combustion engine and a battery-operated electric motor, hybrids can achieve up to twice the fuel economy of a conventional car and produce 30 to 50 percent fewer greenhouse gas emissions. In addition to reducing our dependence on oil and improving the environment, hybrids can offer cost savings over the lifetime of vehicle ownership.

For governments wanting to improve air quality and set an example of environmental stewardship for their community, hybrids are an attractive option. And because nearly 20 percent of all new car registrations are fleet vehicles, fleets not only have the potential to shape the future of the vehicle market, but also to make advanced technologies more widely available and affordable for both institutional purchasers and everyday consumers.

What Are Hybrids?

Hybrid electric vehicles combine the best features of conventional and electric cars to improve environmental performance without sacrificing convenience. They get their driving power from both an internal combustion engine and a battery-powered electric motor, which results in greater fuel efficiency and cleaner emissions than most conventional cars. And unlike other alternative fuel vehicles, hybrids use standard gasoline pumps for refueling.

The Bottom Line for Government Officials

Although the retail price of hybrids exceeds their conventional counterparts by about \$4,000, hybrids can save money when the total cost of vehicle ownership is taken into account.¹ Higher resale values, excellent warranties, lower projected maintenance costs (because the combustion engine receives less wear), and lower fuel costs (as much as 50 percent lower depending on terrain and other driving conditions) can offset hybrid vehicles' higher initial purchase price.

King County, Washington, for example, assessed the economic life cycle of the Chevy Malibu versus the Toyota Prius, based on certain assumptions (see Figure 1), and showed that hybrids can be a viable, even profitable, alternative to conventional vehicles. King County projects a \$2,660 savings per vehicle with the Toyota Prius. Using

The 2005 Ford Hybrid Escape (above), a compact sport utility vehicle that uses advanced hybrid technology. Photo provided by Ford Motor Company.

Why Choose a Hybrid?

Several technological features distinguish hybrids from conventional vehicles.

- Unlike all-electric cars, hybrids do not need to be plugged in to recharge the battery. The battery recovers and stores energy normally lost as heat during braking through a process called *regenerative braking*. The battery is also recharged by the engine when it produces more power than is needed to drive the wheels.

- Because of the extra power the electric motor provides, gasoline engines in hybrids can be built smaller without compromising the vehicle's peppiness. By allowing the engine to operate more efficiently, *engine downsizing* increases the environmental performance of hybrids and their fuel economy.

- Vehicles with *idle-off capability* can turn their gasoline engines off when stopped. This reduces emissions, which are dirtier while idling, and improves fuel efficiency. Idling off makes hybrids a particularly efficient (and quiet) option in city, stop-and-go traffic.

- Some hybrids have *electric-only drive*, powering the car with the battery alone at speeds up to 10 or 15 miles per hour. This provides significant fuel savings and emissions reductions because combustion engines operate least efficiently at low speeds.

this cost methodology, the City of Houston, Texas anticipates saving about \$5,900 by replacing 1997 Dodge Neons with 2002 Toyota Priuses. King County and Houston's experiences suggest that it takes 3-4 years to

Figure 1: King County, Washington

	2003 Chevy Malibu	Adj. For Life Cycle ¹	2003 Toyota Prius	Difference
Initial Purchase Price	\$14,901	\$17,434	\$21,280	(\$3,846)
Projected Residual Value ²	(\$2,117)	(\$2,477)	(\$4,111)	\$1,634
Net Purchase Price	\$12,784	\$14,957	\$17,169	(\$2,212)
Fuel Miles Per Gallon	24	24	44	20
Est. Fuel Cost ^{2,3}	\$5,003	\$5,854	\$3,211	\$2,643
Est. Maintenance & Repair Cost ²	\$4,013	\$4,695	\$2,466	\$2,229
Total Cost of Ownership	\$21,800	\$25,506	\$22,846	\$2,660

Source: Calculations made by Windell Mitchell, Fleet Manager for King County, Washington

- Notes
1. The Prius is assumed to have a life cycle of 100,000 miles and approximately 8 years while the Malibu is assumed to have a life cycle of 85,000 miles and approximately 7 years. Since the Toyota Prius will be driven 17% more during its life cycle than the Chevy Malibu, all of the cost figures for the Chevy Malibu were adjusted 17% upward.
 2. Projected Residual Value, Estimated Fuel Cost, and Estimated Repair & Maintenance Cost calculated using a 3% discount factor.
 3. Fuel cost estimated at \$1.61 per gallon.



recover the increase in net purchase price, yielding roughly a 30 percent return on the initial investment in hybrid technology over the economic life cycle of the vehicle.ⁱⁱ

King County and Houston are examples of two distinct local governments, and their results may not directly apply to every municipal fleet nationwide. The more dominant the following conditions are, the more economically favorable hybrids will be:

- High mileage demands
- Higher gasoline prices
- Majority of city driving
- Moderate climate
- Flat terrain

However, hybrids can save your fleet money even if these conditions aren't present.

What Are the Additional Benefits?

Choosing a hybrid over a conventional car for your fleet can help improve environmental quality, public health, national security, and the economy. Hybrids attain up to twice the fuel economy of their conventional counterparts, burning less gasoline and therefore emitting fewer greenhouse gases that contribute to global warming. Decreasing oil consumption can reduce our dependence on foreign oil and minimize the economy's vulnerability to price increases and supply disruptions. Also, most hybrids produce fewer pollutants than conventional cars. This

translates into cleaner air, less smog, and less acid rain as well as gains in public health. As illustrated in Figure 2, switching from the 2004 Chevrolet Malibu to the 2004 Toyota Prius reduces smog-forming pollutants and particulates by 50 to 90 percent, and decreases emissions of carbon dioxide by 49 percent. Correspondingly, the Prius would require 49 percent less gasoline to operate, and would save over 200 gallons of gasoline annually compared to the Malibu.

How are Hybrids Used in Government Fleets?

A growing number of local and state governments are purchasing hybrids for their fleets. Hybrids are used in agencies' general motor pools, and also can be assigned to specific drivers.ⁱⁱⁱ New York City, for instance, has purchased over 650 Toyota Prius vehicles for use in a range of municipal agencies, such as the Departments of Parks and Recreation, Health, Buildings, and Transportation. In Martin County, Florida, the Sheriff's Office uses 11 Priuses and 8 hybrid Civics for detective work, parking enforcement, and other non-emergency tasks. Due to the hybrids' great gas mileage in city traffic, the county estimates that it saves an average of \$103 a



The Second Generation Prius (above left) and Honda Civic Hybrid (above), two popular hybrid choices. Photos provided by Toyota and Honda Motor Companies.

month in gasoline, compared with the performance of the Crown Victoria — the typical police fleet vehicle — which gets only about 11 mpg. The Sheriff's Department still uses larger cars to chase speeders and transport prisoners, but has identified many uses where the additional engine power is simply not needed.^{iv} Marion and Alachua Counties, also in Florida, both operate several Prius vehicles for crime watch personnel and other light patrol uses. In Santa Clara County, California, the county's 80 hybrid cars are used in many county departments, most commonly in the social services department by social workers and in the district attorney's office by process servers.^v

King County, Washington saw hybrids as a good way to meet their alternative fuel program goals in a cost-effective and convenient manner. With leadership from King County Executive Ron Sims and the director of Fleet Management, Windell Mitchell, the county purchased 60 Toyota Priuses between 2001 and 2003. In a customer survey, King County employees expressed considerable satisfaction with these vehicles (4.6 on a 5-point scale). The most common concerns about compact vehicle size, trunk space, and power (the battery would drain if vehicle was not driven every couple of weeks) have been corrected in the new mid-sized 2004 Prius. Employees in King County have so enjoyed driving the hybrid vehicles that many request these cars while on the job, and many have chosen to purchase hybrids for personal use. "Buying hybrids is a win-win for King County," stated Mitchell. "They have a positive effect on reducing costs and also reducing emissions."

What Hybrid Models are Available for Purchase?

A few models of hybrids are currently on the market, and the range of available hybrids will increase significantly over the next few years. After the success of Toyota and Honda, other manufacturers are beginning to produce hybrids and expand into other classes of vehicles such as sport utility vehicles (SUVs) and pick-up trucks. For example, the Ford Motor Company will introduce a 2005 Ford Escape Hybrid Compact SUV in late 2004, and Honda recently announced plans to introduce an Accord Hybrid in the 2005 model year. Toyota will be introducing a new hybrid Highlander SUV in about a year, and the new 2004 Prius is far roomier and more powerful than its previous model. Figure 3 highlights the models currently available as well as some models that will be made available in the immediate future.



Wyatt Earp of the Marion County, Florida Sheriff's Office with a Prius from his fleet.

Figure 2: Comparison of Annual Emissions and Fuel Consumption of Mid-size Sedans¹

	2004 Chevrolet Malibu	2004 Toyota Prius	Savings	Percent Reduction
EPA Emission Standard	Tier 2 Bin 8	SULEV II		
Non-Methane Organic Gases (grams) ²	1,527	122	1,405	92%
Carbon Monoxide (grams) ²	51,303	12,215	39,088	76%
Nitrogen Oxides (grams) ²	2,443	244	2,199	90%
Particulate Matter (grams) ²	244	122	122	50%
Carbon Dioxide (lbs) ³	10,470	5,330	5,140	49%
EPA Fuel Economy (city/hwy) ⁴	24/34	60/51		
EPA Fuel Economy (combined) ⁵	28	55	27	
Fuel Consumed Annually (gallons)	436	222	214	49%

Notes

1. Based on 12,215 annual mileage.

2. Data obtained from Smog Forming Pollutants Chart, EPA Green Vehicle Guide: www.epa.gov/autoemissions/0-10chart.htm

3. Calculated using (12,215 miles / Combined MPG) x (24 pounds CO₂/gallon). Includes upstream CO₂ emissions and end-user CO₂ emissions. David Friedman, Senior Engineer, Union of Concerned Scientists. Personal communication 7/25/2003.

4. Fuel economy rating for automatic/continuously variable transmission.

5. Assumes 55% city driving and 45% highway driving.

Emission Standard Key: Vehicles meeting the Federal Tier 2 Bin 8 standard produce: 4.2 g/mi of CO, 0.02 g/mi of particulate matter, 0.2 g/mi of NO_x, and 0.125 g/mi of non-methane organic gases. Vehicles meeting California's SULEV II (Super Ultra Low Emissions Vehicle) standard produce: 1.0 g/mi of CO, 0.01 g/mi of particulate matter, 0.02 g/mi of NO_x, and 0.01 g/mi of non-methane organic gases.

Figure 3: Current and Future Hybrid Models¹

	Toyota Prius Gen 2	Honda Civic Hybrid	Honda Insight	Honda Accord	Ford Escape	Toyota Highlander ²	GM Silverado/Sierra
Model Year	2004	2004	2004	2005	2005	2005	2004
EPA Class Size	mid-size sedan	compact sedan	two-seater	mid-size sedan	compact SUV	mid-size SUV	full-size pickup
EPA Emission Standard ³ (Nat'l/Select)	Tier 2 Bin 3/ SULEV II	Tier 2 Bin 5/ SULEV II	Tier 2 Bin 5/ SULEV II	N/A	SULEV II expected	N/A	Tier 2 Bin 8
EPA Fuel Economy City/Hwy	59/51	47/48	57/56	mid-30s	Up to 40	up to 40	18/20
Annual Greenhouse Gas Emissions (CO ₂ equivalent) ⁴	6,546 lbs	7,660 lbs	6,429 lbs	Around 10,286 lbs	Around 10,286 lbs	Around 10,286 lbs	Around 20,000 lbs
Hybrid Technology	I,R,D,E	I,R,D	I,R,D	I,R,D	I,R,D,E	I,R,D,E	I, some R

- Notes**
1. Based on best available information to date from automakers. Delivery dates and specifications subject to change.
 2. Lexus will produce a similar vehicle, the RX 400h, beginning in model year 2005.
 3. Vehicles meeting Federal Tier 2 standards (77 to 95 percent cleaner than current vehicles) are being phased in from 2004 to 2009 and will be available nationwide. Vehicles meeting the SULEV II (Super Ultra Low Emission Vehicle) standard are available primarily in California, New York, and Massachusetts. For more information about EPA emissions standards and availability, see www.fueleconomy.gov.
 4. Calculated using (15,000 miles / Combined MPG) x (24 pounds CO₂/gallon). Includes upstream CO₂ emissions and end-user CO₂ emissions. David Friedman, Senior Engineer, Union of Concerned Scientists. Personal communication 7/25/2003.
- Technology Key: I=Idle-Off Capability, R=Regenerative Braking, D=Downsized Engine, E=Electric-Only Drive, NA= not available.

Helping Local and State Governments Purchase Hybrids



The Center for a New American Dream, a nonprofit organization dedicated to assisting institutions and individuals to make environmentally responsible purchasing decisions, is helping local governments, states, and private entities purchase hybrid electric vehicles for their fleets. In 2003, the Center hosted a conference call with 280 participants to provide an overview of hybrid electric vehicles and fleet applications. The Center provides information on hybrids to organizations through a variety of formats. For information about the Center's Hybrid Project, contact Naomi Friedman, naomi@newdream.org or (301) 891-3683.



The National Association of Counties (NACo), which is collaborating with the Center, is the only national organization that represents county governments in the United States. NACo is a full-service organization that provides an extensive line of services including legislative, research, technical, and financial services to its more than 2,000 county members. For information on NACo's Environmental Program contact: Beth Bleil, Community Services Associate, (202) 942-4246 or bbleil@naco.org.

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- Endnotes**
- ⁱ Friedman, David, "A New Road: The Technology and Potential of Hybrid Vehicles," Union of Concerned Scientists, January 2003.
 - ⁱⁱ Adjusted as though both vehicles were driven the same 12,215 miles/year.
 - ⁱⁱⁱ "Fleets Pleased With Hybrids' Performance," in *Fleet Executive*, National Association of Fleet Administrators, May 2003.
 - ^{iv} John J. Fialka, "Police Vehicles Go Green and Help Save Green," *Wall Street Journal*, February 6, 2003.
 - ^v M. Mindy Moretti, "County Hybrid Fleets Go Unplugged," *County News*, February 2, 2004.

A National Cooperative Purchasing Contract for Fleets

The Center has joined forces with U.S. Communities, a national cooperative purchasing alliance, to test the feasibility of creating a national contract to purchase hybrid electric vehicles for government fleets. The National Association of Counties, a founding member of U.S. Communities, is providing support for this effort as well. King County, Washington is acting as lead public agency, and cities, counties, schools, states, and other local government agencies will be able to purchase hybrid vehicles for their fleets if the contract is successful. The solicitation is under development and information about the project's progress is available through the Center's website at www.newdream.org and the U.S. Communities' website at www.uscommunities.org.