

Fuel economy

WHY YOU'RE NOT GETTING THE MPG YOU EXPECT

For years, automakers have been criticized for producing vehicles that get so-so gas mileage. But as gas prices climb and consumers seek more miles per gallon, it turns out that fuel economy is much worse than it appears—50 percent less on some models, a new CONSUMER REPORTS analysis reveals.

Drivers who track their own fuel economy have long known that their results seldom match the gas mileage claimed by the Environmental Protection Agency on new-car stickers. Our study, based on years of real-world road tests over thousands of miles, quantifies the problem across a wide swath of makes and models.

We compared the claimed EPA fuel economy with the mileage per gallon we measured for 303 cars and trucks for model-years 2000 to 2006. Our selection represents a good cross-section of mainstream, high-volume vehicles. We looked at city, highway, and overall mpg.

Highlights of our study:

- Shortfalls in mpg occurred in 90 percent of vehicles we tested and included most makes and models.
- The largest discrepancy between claimed and actual mpg involved city driving. Some models we tested fell short of claimed city mpg by 35 to 50 percent.
- Hybrids, whose selling point is fuel thriftiness, had some of the biggest disparities, with fuel economy averaging 19 mpg below the EPA city rating.
- The EPA ratings are the result of 1970s-era test assumptions that don't account for how people drive today. Automakers also test prototype vehicles that can yield better mileage than a consumer could get.
- Despite federal certification, it appears that U.S. vehicle fleets, all cars and light

trucks produced in one model year, don't meet government fuel-economy standards. For example, fleet mpg for 2003-model-year vehicles we studied was overstated by 30 percent.

For consumers, the news means that their vehicles typically cost hundreds more per year to operate than they were led to believe. Put another way, when gas in August hit \$2.37 per gallon, the mpg shortchange effectively boosted the price for some motorists to \$3.13 per gallon.

For the nation, where the fleet average

fuel economy is near its lowest point in 17 years, the findings suggest that the country is far short of its energy goals.

"We are concerned about the differences," Margo Oge, director of the EPA's Office of Transportation and Air Quality, said of our study. "I think we can do a better job to help consumers assess actual fuel economy."

HOW THEY TEST, HOW WE TEST

Almost from the dawn of EPA testing in 1975, automobile buyers have com-

closeup

FOR CITY DRIVING, CLAIMED MPG IS WAY OFF

The biggest gaps between claimed and actual miles per gallon are in city driving. That's because the federal test protocol is far afield of how people really drive. For the vehicles listed below, the shortfall was 35 to 50 percent of claimed mpg.

VEHICLE TYPE	MAKE & MODEL	CITY MPG		
		EPA mpg	CR mpg	EPA shortfall
SMALL SUV	Jeep Liberty Diesel Ltd. 4WD	22	11	50%
HYBRID	Honda Civic sedan	48	26	46
LARGE SEDAN	Chrysler 300 C	17	10	41
MIDSIZED SUV	Chevrolet TrailBlazer EXT LT 4WD	15	9	40
MINIVAN	Honda Odyssey EX	20	12	40
LUXURY SEDAN	BMW 7 Series 745Li	18	11	39
PICKUP	Dodge Ram 1500 SLT crew cab 4WD	13	8	38
FAMILY SEDAN	Oldsmobile Alero GL	21	13	38
LARGE SUV	Dodge Durango Limited 4WD	13	8	38
SMALL SEDAN	Ford Focus ZX4 SES	26	17	35

plained that the government rating was impossible to achieve. In 1984, a rising clamor from consumers prompted the EPA to shave its test results by 10 percent for city mpg and 22 percent for highway mpg. But the agency did not change its test protocols and rules, which the Government Accountability Office had criticized in 1981. This “adjusted mpg” is what you find on a new car’s window sticker today.

In the two decades since, the driving world continued to change, and the EPA rating again drifted from real-world mpg.

For one thing, Americans drive more miles in dense traffic. “Idle times are longer in real life than in the EPA test cycle; you’re stopped at traffic lights longer,” says Mike Duoba, who is an engineer at the Department of Energy’s Argonne National Laboratory near Chicago and has studied the EPA test.

Many automobiles today spend 62 percent of their annual miles in city stop-and-go traffic, where fuel economy is the lowest. The EPA formula still uses a 55/45 percent city/highway ratio to calculate combined fuel economy.

Vehicles have also changed. Computerized engine systems have improved efficiency, but the potential fuel savings has been traded for increased engine horsepower. Since 1981, horsepower is up 89 percent for cars and 99 percent for trucks. Automatic transmissions, air conditioning, four-wheel drive, and bigger and heavier vehicles are also more common, all of which burn more gas. Moreover, vehicles burn up to 10 percent more fuel per mile simply by traveling at today’s faster highway speeds.

Automakers conduct the government fuel-economy tests on a laboratory dynamometer. They can use hand-built prototype vehicles, within the EPA rules, to maximize miles per gallon in simulated city and highway driving. “Anybody taking a test, you’re going to figure out what the rules are and figure how to optimize your chances of passing that test,” says Reg Modlin, director of environmental affairs for Daimler-Chrysler. “So in that sense, yes, everyone attempts to put their best face on for the test.”

By contrast, CONSUMER REPORTS testers check fuel economy on roads and on our

test track. We buy models anonymously from dealers, as consumers do.

We gauge overall fuel economy from our city, highway, and mixed-driving tests. Overall, the gas-powered vehicles we studied delivered 9 percent fewer mpg on average than their EPA stickers claimed; diesels and hybrids, 18 percent fewer mpg than claimed. The numbers ranged from 21 percent better than the EPA sticker to 28 percent worse.

The discrepancy between our numbers and the EPA’s is increasing. For gas-

trust that the fuel economy of the Honda Civic EX (33 claimed mpg, 29 actual) is considerably better overall than that of the BMW X5 (18 claimed mpg, 17 actual). But as a predictor of real miles per gallon, if the EPA ratings are exaggerated, they are a deceptive sales tool.

Consumers are clearly frustrated. “According to Honda, the Element gets 21 mpg,” says Tom Mannino, a retired firefighter from Staten Island, N.Y., one of many readers who have complained to CONSUMER REPORTS about being short-

HYBRID HYPE Our road tests show that hybrid vehicles, especially, get fewer miles per gallon than claimed. We checked mpg for the Honda Accord Hybrid, at right, using a fuel meter attached to a readout, like the one below.



powered vehicles, the shortfall was 6 percent for 2000-model-year cars that we tested, but about 12 percent for 2005- and 2006-model-year cars.

Big differences between claimed and actual city mpg were the main reason for the discrepancy in overall mpg. Our city mpg figures ranged from 13 percent better than the EPA sticker to 50 percent worse. On average, our highway mpg more closely reflected the EPA rating.

Ironically, six fuel-thrifty hybrids we tested had some of the largest discrepancies, mostly on city mpg, where real fuel economy ranged from 11 to 25 mpg below EPA ratings. City traffic is supposed to be the hybrids’ strong suit, but their shortfall amounted to a 40 percent deficit, on average. Still, hybrids won three of the best five spots in our tests for overall mpg, along with the diesel Volkswagen Golf and the all-gas Toyota Echo.

HOW YOU’RE SHORTCHANGED

The EPA ratings do allow comparisons among models, so that consumers can

changed. “My Element, however, gets 14 mpg. Isn’t this false advertising?”

Our study found that only 10 percent of vehicles achieved fuel economies as good as or better than EPA estimates, including the 2003 Infiniti FX35, the 2004 Chrysler Crossfire, and the 2000 Honda S2000 convertible.

The EPA’s estimates can cause real pain at the pump over the five years you’re likely to own the vehicle. The extra fuel cost depends on make and model: \$1,316 more for a Nissan Quest, an extra \$1,742 for a Mercury Grand Marquis LSE, and \$2,558 more for a Dodge Ram 1500. That assumes driving 12,000 miles per year and no further rise in gas prices.

WHO BENEFITS

Bigger problems emerge when incorrect fuel-economy numbers are used by Congress and the National Highway Traffic Safety Administration to set U.S. energy policy and enforce fuel-economy standards. Here, the distortion is magnified to the benefit of three groups:

- Automakers, who get false passing grades on fuel-economy standards.
- Government, including lawmakers, who can point voters to their “successful” standards, and regulators, who can appear to crack the whip while actually going easy on a powerful industry lobby.
- Oil interests, which benefit from the seeming energy efficiency of what appears to be a responsible national energy policy.

Federal fuel-economy requirements were enacted in 1975 in response to the 1973 Arab oil embargo, which sparked fuel shortages and sent gas prices skyrocketing. The requirements, known as Corporate Average Fuel Economy (CAFE, pronounced café) standards, are national goals designed to prod automakers to produce more fuel-thrifty vehicles.

In 1975, passenger cars got only 14 mpg on average, light trucks just 10.5. By 1985, CAFE required the fleet of passenger cars to average 27.5 mpg and light trucks, 19.5. The different standards for cars and trucks can be traced back to the late 1970s, when the auto industry pressured Congress to cut the mileage requirements for light trucks, which included mainly pickup trucks and cargo vans used commercially.

That move had unanticipated consequences when light trucks, including pickups, SUVs, and minivans, began to take off in sales as passenger vehicles. Today, that segment accounts for about half of all new vehicles sold. In addition, CAFE standards don't apply to vehicles that exceed 8,500 pounds when fully loaded, such as GM's Hummer H2 and the Ford Excursion.

NHTSA uses the EPA ratings, automobile manufacturing data, and a set of formulas to calculate the average fuel consumption for the entire fleet of cars and trucks sold each model year. By doing so, NHTSA ensures that automakers meet CAFE standards.

Automakers that don't comply are subject to fines; since 1983, they've paid more than \$625 million. But CAFE credits and loopholes allow many automakers to reduce or avoid payments. For example, Subaru raised the ground clearance of its 2005 Outback sedan and wagon by about an inch. That change qualified the vehicles as light trucks as defined by

CAFE, meaning they could meet that category's lower fuel economy standards.

Because EPA ratings are inaccurate, resulting national fleet estimates are wrong, too. In fact, NHTSA's national estimate is farther off-base than the EPA sticker mpg. That's because Congress requires NHTSA to use the unadjusted EPA test results. They are higher than the adjusted mpg and thus more inaccurate.

Why the congressional mandate? Automakers argued that if the lower, adjusted EPA ratings represented real-world fuel economy, then the CAFE standards should have been relaxed accordingly to reflect the new reality. “Nobody wanted to go to that trouble,” says Michael Love, national regulatory affairs manager for Toyota. But Russell Long, founder of Bluewater Network, a San Francisco-based environmental group that has petitioned the government

for more accurate new-car fuel-economy stickers, has a different explanation. “Automakers give terrific amounts of money to members of Congress,” he says. NHTSA officials declined to be interviewed for this report.

If more-accurate mpg figures were used to rate CAFE compliance, most automakers would fail to meet the standards, our study shows. For example, the fleet fuel economy for the 2003 model year was off by 30 percent when calculated using our road tests. By NHTSA's reckoning, the fleet of 2003-model-year passenger cars we tested averaged 29.7 mpg. We got no better than 22.7, below the federal target of 27.5 mpg. NHTSA says the fleet of light trucks in our tests averaged 21.4 mpg; we got only 16, below the 20.7 mpg target.

The mpg inflation has allowed automakers to trade fuel economy for per-

whatyoucando

BUY A FUEL-EFFICIENT VEHICLE

Look for a vehicle that gets good fuel economy for its class. The vehicles at right have provided the best and worst overall fuel economy within their class in our recent tests, and they are still sold. Some appear in more than one category, if appropriate.



Toyota Scion xB

SMALL CARS

Best Overall mpg
(manual transmission)

Honda Insight	51
Toyota Echo.....	38
Toyota Scion xB.....	32
Toyota Scion xA.....	31

(automatic transmission)

Toyota Prius	44
Honda Civic Hybrid.....	36
Toyota Scion xA.....	30
Toyota Scion xB.....	30

Worst

(automatic transmission)

Subaru Impreza 2.5 RS	22
Chevrolet Cobalt LS	23

OTHER WAYS TO SAVE MONEY ON AUTO TRAVEL

››› **Be skeptical of EPA ratings.** The EPA sticker can help you evaluate relative gas mileage among vehicles, but not absolute mpg. Until the EPA ratings are made more realistic, discount the EPA sticker numbers for city travel as follows: conventional cars and trucks, 30 percent; larger hybrids, 35 percent; diesels, 36 percent; smaller hybrids, 42 percent.

››› **Buy regular.** If your car owner's manual doesn't recommend a particular grade of gasoline, fill 'er up with regular. And don't waste money on so-called gas-saving devices; our tests have shown that they don't work.

››› **Walk, bike, or “chain.”** Fuel economy is worst on short trips. These trips also create the most exhaust emissions and

formance features that draw buyers. Between 1987 and 2005, car and light-truck manufacturers slashed 0-60 acceleration time by 24 percent and bulked up average vehicle weight by 27 percent. Consequently, these vehicles got 1.1 fewer miles per gallon in 2005 than they did in 1987.

Automakers have lobbied against tougher standards, saying that higher mpg is technologically difficult to achieve and that they're making vehicles the public wants. If consumer demand were not a consideration, light trucks could be getting 28 mpg and cars, 38, says John German, manager of Honda's environmental and energy analysis. "The role of government is to create mandates or incentives so some of the ongoing engine-technology-efficiency gains go to fuel economy and not just more horsepower," he says.

Automakers have also stirred fears that to achieve greater fuel economy, vehicles

would have to shed weight, which would lead to more traffic deaths because occupants in lighter vehicles have a lower survival rate in crashes. Some of the horsepower gains, however, could be traded for improved fuel economy without lightening the vehicles, German says.

Inflation of mpg has also let Congress stave off public pressure for better fuel economy. More than 80 percent of 1,221 adults, in a nationally representative sample surveyed by CONSUMER REPORTS in May 2004, said the government should raise fuel-efficiency standards. Congress, however, has kept CAFE standards at the 1990 level of 27.5 mpg for cars. For light trucks, the standard was frozen at 20.7 mpg from 1996 through 2004 and will be raised to 22.2 mpg by 2007.

Finally, mpg inflation has helped energy policies. The exaggerated EPA and NHTSA estimates forestall demand for

more fuel-efficient cars and alternative fuels. And the country gets a distorted view of U.S. energy needs.

REGAINING LOST GROUND

Consumers Union, publisher of CONSUMER REPORTS, supports raising CAFE standards and revising EPA's test.

The EPA says it will propose changes in how it reports fuel economy to the public. But Congress voted to cut back on tax breaks for motorists who buy fuel-efficient hybrids. For more about fuel-economy claims, see Viewpoint on page 65.

Free at ConsumerReports.org

Learn more about our fuel-economy tests vs. government tests, and see results for 303 vehicles, available free from Sept. 7 through Nov. 2. Click on Autos, then select "Fuel economy."

FAMILY SEDANS

Best	Overall mpg
Toyota Prius	44
Volkswagen Passat GLS TDI.....	28
Honda Accord Hybrid	25

Worst

Subaru Legacy GT	18
Hyundai XG350	19

LARGE SEDANS

Best	Overall mpg
Toyota Avalon	22
Mercury Montego FWD	21
Ford Five Hundred	21

Worst

Mercury Grand Marquis LSE ..	16
Ford Crown Victoria LX	16
Chrysler 300 C	16

THREE-ROW SUVs

Best	Overall mpg
Toyota Highlander Ltd. (V6)....	19
Acura MDX	17
Honda Pilot	17

Worst

Ford Expedition Eddie Bauer ..	12
Dodge Durango Limited 5.7	12

TWO-ROW SUVs

Best	Overall mpg
Toyota Highlander Ltd. (V6)....	19
Nissan Murano.....	19

Worst

GMC Envoy SLT	15
Chevrolet TrailBlazer LT	15
Volkswagen Touareg	15

PICKUPS (4-DOOR CREW CAB, 4WD)

Best	Overall mpg
Subaru Baja	20
Toyota Tacoma	17

Worst

Dodge Ram SLT 5.7L	11
Dodge Ram SLT 4.7L.....	12

SMALL SUVs

Best	Overall mpg
Ford Escape Hybrid	26
Honda CR-V EX.....	21
Subaru Forester 2.5 X	21
Toyota RAV4	21

Worst

Jeep Wrangler Unltd. (6-cyl.)..	14
Jeep Liberty Sport (V6).....	15
Kia Sorento LX.....	15

cause the most engine wear. Half of all car trips are under six miles, within walking or biking distance. If you must drive, "chain" several errands into a single trip on a warm engine instead of making separate short trips throughout the day.

>>> **Avoid highway drag.** At highway speeds, where fuel economy is best, more than 50 percent of engine power goes to overcoming aerodynamic drag. Try not to add to that drag by carrying things on top

of your vehicle. A loaded roof rack can decrease a car's fuel economy by 5 percent. Even empty ski racks waste gas.

>>> **Keep your vehicle in top shape.** A poorly maintained engine can cut gas mileage by 10 to 20 percent. A clogged air filter can cause up to a 10 percent increase in fuel consumption. Underinflated tires require more energy to roll and can reduce fuel economy by 5 percent. Follow the maintenance schedule in your owner's

manual, and keep the tires properly inflated.

>>> **Drive smart.** As much as possible, avoid hard acceleration and braking. Once up to speed, maintain a steady pace in top gear; varying your speed a lot wastes fuel. A vehicle's gas mileage decreases rapidly at speeds above 60 mph. With most gasoline engines, it's more efficient to turn off the engine than to idle for any longer than 30 seconds. If you have air conditioning, use it sparingly.

NOTE: The box below will go on CRO ONLY.

OUR TESTS VS. GOVERNMENT TESTS

THE VEHICLES

Our tests. We anonymously buy production models at retail. All vehicles are preconditioned for about 2,000 miles. Tire pressures are set to manufacturer specifications.

Government tests. Automakers are allowed to use hand-built prototypes.

DRIVING CONDITIONS

Our tests. All testing is done outdoors year-round, never during precipitation, with all results adjusted to a standard temperature of 60° F. For gasoline-electric hybrids, we start our tests with the battery at the charge level you normally find—about half. A calibrated fuel-flow meter is used to measure gas consumption.

Government tests. EPA fuel-economy tests are done in a laboratory with the test vehicle's drive wheels resting on a dynamometer, which has a roller that allows the automobile to simulate driving while remaining stationary. Gasoline consumption is calculated based on the amount of carbon emitted from the vehicle's tailpipe, which the EPA says is more accurate than a fuel gauge.

To test all-wheel-drive vehicles, automakers and the EPA remove the front prop shaft and adjust the inertia weight on the dynamometer to account for four-wheel-drive factors. To test hybrid fuel economy, the EPA method allows automakers to start with a fully charged battery.

The EPA tests represent driving in southern California at 75° F on a road with no curves or grades, which is ideal for optimizing fuel economy.

CITY MPG

Our tests. These tests are stop-and-go city-driving simulations on our test track, which has a total of 18 stops and 4 minutes of total idle time. Top speed is 40 mph. Two different testers each drive three runs for a total of six 2-minute, 40-second trials on every test vehicle. Total test time is approximately 16 minutes.

Government tests. The city test simulates stop-and-go city driving with 23 stops and includes 5 minutes and 35 seconds of total idle time. Top speed is 56 mph. A professional driver manipulates the gas and brake pedals to follow a prescribed schedule of acceleration and braking while monitoring progress on a real-time graph on a computer display. The test runs for 31 minutes.

HIGHWAY MPG

Our tests. The highway tests are run on a specific section of state Route 2 near our test facility in central Connecticut. Two testers make eight 5-mile runs at a constant 65 mph. The tests are run in both directions to limit the effects of wind and grade differences. Each run is timed and limited to 4 minutes, 38 seconds. Total test time is approximately 37 minutes.

Government tests. These tests simulate free-flow rural and interstate-highway driving. The professional driver starts from zero, maintains a fairly smooth speed averaging 48 mph, then slows to zero over a prescribed 12-minute, 30-second schedule. While under way, speeds range from 30 to 60 mph.

OTHER DIFFERENCES

Our tests. We run a test that the government doesn't require: a one-day trip test, which reflects a mixed driving cycle. Five different engineers drive back-to-back on the same day over a 31-mile route that includes 26 percent (8.2 miles) freeway, 11 percent (3.6 miles) highway, and 63 percent (19.2 miles) stop-and-go driving conditions.

Government tests. Automakers conduct the fuel-economy tests and submit their results to the EPA for certification. The EPA retests 10 to 15 percent of the vehicles. The EPA says that less than 10 percent of the retests are significantly different than the original automaker tests.

THE MATH

Our tests. Trials within each type of test are averaged and corrected for ambient temperature to produce our published city and highway mpg ratings and our one-day trip rating. Our published overall mpg estimate is calculated as an equally weighted harmonic average of the city, highway, and one-day-trip results.

Government tests. The raw test results are adjusted downward by 10 percent for city mpg and 22 percent for highway mpg, and a combined mpg is calculated as a weighted harmonic average using the two in a 55/45 city/highway ratio. Those adjusted figures are the ones published on vehicle fuel-economy stickers.