Green Car Guide

81 CARS, TRUCKS, & SUVS

Reviews of the top affordable, midrange, and luxury green vehicles on the market today

NEW HIGH-TECH SAFETY FEATURES + GREEN-DRIVING TIPS
BUYING A USED HYBRID + WHAT’S ON THE HORIZON
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Produced by the Automobile Club of Southern California’s Automotive Research Center

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INTRODUCTION

The AAA Green Car Guide is an annual report produced by the Automobile Club of Southern California’s Automotive Research Center (ARC) that reviews, tests, and ranks hybrid, electric, and alternative-fuel vehicles, as well as fuel-efficient gasoline-powered vehicles and those that emit low levels of smog-forming pollutants. Vehicles are evaluated on the basis of qualities such as fuel economy, emissions, ride comfort, braking, and handling. The Guide can help motorists make better choices when buying a car by providing them with the latest information about green vehicles and technologies. The ARC has produced the AAA Green Car Guide since 2010.

Located in Los Angeles, the ARC is a premier vehicle-emissions test laboratory. It has state-of-the-art facilities and equipment operated by experienced Auto Club engineers and technicians. Its purpose is not only to run emissions and fuel-efficiency tests but also to investigate the latest advances in vehicle technologies and provide useful automotive information to AAA’s 54 million members.

As a complete guidebook to green vehicles, the AAA GREEN CAR GUIDE:

- DEFINES what a green car is and explains why buying a green car can be good for both you and the planet.
- EXPLAINS the differences between various types of green cars, the advantages and disadvantages of each, and how to choose one that’s best for you.
- PREVIEWS green cars scheduled to come on the market in the next few years.
- EVALUATES green cars both on the road and on a test track to determine their usefulness in daily driving.

The AAA Green Car Guide ranks cars from highest to lowest based on a total point score from 13 types of evaluations and specifies the best green car at different price levels. And it provides summary snapshots of the cars, including strong and weak points.

The Guide groups the green cars that were tested into six categories according to size or body type—subcompact, compact, midsize, large, SUV, and pickup truck—and specifies a winner and finalists in each category. This year, the Guide also features a chapter on the latest automotive safety technology: features that make driving safer and more convenient. Safety features for each vehicle tested are included in the car-reviews section.

When you finish reading the AAA Green Car Guide, you’ll have the tools you need to find the green car that best suits your driving needs.
CHAPTER 1
WHAT DOES IT MEAN TO BE GREEN?
Green cars can benefit both individual car owners and the planet.

CHAPTER 2
GREEN ALTERNATIVES
How to decide which green car best suits your driving needs.

CHAPTER 3
HOW AAA CHOOSES, TESTS, AND SCORES VEHICLES
How AAA puts the green cars it tests through their paces.

CHAPTER 4
WHAT’S ON THE HORIZON?
Snapshots of green cars coming soon, plus more models that are available now.

CHAPTER 5
GREEN CAR SAFETY
Today’s high-tech safety features reduce injuries and deaths and help prevent crashes in the first place.

CHAPTER 6
MORE WAYS TO DRIVE GREEN
Use these driving, maintenance, and lifestyle tips to maximize your mpg and cut your emissions.
WHAT DOES IT MEAN TO BE GREEN?

This is a good time to buy a new car. Auto sales set a record in 2015, with 17,470,700 vehicles sold, topping the previous record of 17,422,500 vehicles sold in 2009. That kind of demand means consumers have lots of choices. In addition, gas prices were consistently low in 2015, averaging $2.20 a gallon nationwide for regular gas, 94 cents below the 2014 national average of $3.34 a gallon.

The price of oil dropped below $30 a barrel in January 2016, its lowest price in 12 years. The U.S. Energy Information Administration (EIA) forecasted lower crude oil prices—and lower gas prices—through 2016, and AAA estimates that gas prices nationwide in 2016 will average between $2.25 and $2.45 a gallon. That can signal many consumers to shift their interest from fuel-efficient, low-emitting cars to SUVs and light trucks—and indeed, sales of those vehicles have increased.

Still, gas prices fluctuate from year to year. Also, there are plenty of other good reasons to buy green besides the price of gas. And in response to consumer interest and to meet increasingly strict government regulations, automakers will continue to bring a wide variety of green cars to the marketplace.

HYDROGEN FUEL-CELL VEHICLES
run on electricity produced by hydrogen reacting with oxygen in an onboard fuel cell.

HYBRID VEHICLES
(including plug-in hybrids, or PHEVs) usually run on a combination of gasoline and electricity.

CLEAN-DIESEL VEHICLES
run on low-sulfur diesel fuel.

FLEX-FUEL VEHICLES
(FFVs) can run on gasoline or a gasoline-ethanol blend.

NATURAL-GAS VEHICLES
run on compressed natural gas (CNG).

ELECTRIC VEHICLES (EVs), which plug into household current or chargers, store electrical energy in large onboard batteries and are propelled by electric motors.

CARS WITH ADVANCED INTERNAL-COMBUSTION ENGINES (ICEs) run on gasoline. Because of their design, they use much less fuel and produce fewer emissions than the average car and are therefore considered green.
FUEL EFFICIENCY
Automakers attempt to improve fuel efficiency in various ways, including:
- Installing a more fuel-efficient powertrain, such as hybrid-electric, electric, compressed natural gas, or diesel.
- Reducing vehicle size and weight by using lightweight materials, such as aluminum and carbon fiber.

For cars with internal combustion engines (ICEs), automakers also continually improve engine and transmission design, using features such as:
- Turbocharging and supercharging, which increase an engine’s efficiency and power by forcing more air into the combustion chamber.
- Stop-start technology, which saves gas by automatically shutting down and restarting the engine when it would otherwise be idling—for example, at a stoplight.
- Cylinder deactivation, which conserves gas by shutting down one or more of an engine’s cylinders when they’re not under load, such as when the car is cruising on a level highway.
- Continuously variable transmissions (CVTs), which enable engines to run more efficiently.
- Increasing the number of speeds in automatic transmissions (some cars now have as many as nine) to reduce engine rpm at cruising speed, thereby improving fuel economy.
- Improved vehicle aerodynamics (pictures) to reduce drag and increase efficiency via such elements as special underbody panels, air deflectors, and grilles that open and close.
- Regenerative braking systems, which convert a car’s kinetic energy into electricity to power the car’s accessories, a task usually left to the engine.
- “Economy” driving modes, which adjust a vehicle’s throttle, transmission, climate system, and cruise-control settings for maximum fuel efficiency.
- Instrument-panel gauges that let drivers know when they’re driving in the most fuel-efficient manner.
- Low-rolling-resistance tires, which maximize mpg.

REDUCING EMISSIONS
Typically, carmakers use three types of technology to build vehicles with lower levels of harmful emissions:
- Improved powertrain design, including direct fuel injection and an engine control unit (ECU) that regulates the air/fuel ratio, ignition timing, idle speed, and valve timing to achieve more complete combustion.
- Catalytic converters, which use elements such as platinum, palladium, and rhodium as catalysts to convert hydrocarbons, carbon monoxide, and nitrogen oxide in a car’s exhaust into less-harmful gases.
- Evaporative-emissions systems, which use charcoal canisters to absorb vehicle’s fuel system harmful vapors that might otherwise escape and pollute the atmosphere.

Technological improvements to motor fuels—such as removing lead from gasoline and reducing the amount of sulfur in gasoline and diesel fuel—have also helped reduce the harmful emissions that vehicles produce.

PRINCIPAL POLLUTANTS in vehicle exhaust
- **Nitrogen oxide (NOₓ)**, caused from superheating nitrogen and oxygen during fuel combustion.
- **Volatile organic compounds (VOCs)**, comprised primarily of unburned fuel and evaporation of hydrocarbons. When VOCs combine with NOₓ in sunlight, ozone is created. Ozone serves as a protective layer in the Earth’s stratosphere but is unhealthy to breathe.
- **Carbon monoxide (CO)**, caused from the incomplete combustion of carbon-based fuel (for example, oil, natural gas, alcohol, coal, or wood).
- **Carbon dioxide (CO₂)**, one of the two main constituents in the exhaust of vehicles burning carbon-based fuel (gasoline, diesel, natural gas, and alcohols). If perfect combustion occurred, the only exhaust ingredients would be CO₂ and water vapor. Unfortunately, CO₂ is a potent greenhouse gas and cause of climate change. Increased ground-level temperatures attributed to global warming also lead to increased low-level ozone. According to the EPA, in the U.S., passenger vehicles account for about 17 percent of CO₂ emissions.

EMISSIONS CATEGORIES
Below are descriptions of the current California Air Resources Board (CARB) LEV-II emissions categories. The new LEV-III categories are being phased in over the next several years and will eventually be adopted nationwide.

- LEV: Low-emissions vehicles emit about 45 percent of the smog-forming pollutants permitted under the former LEV I standard. Example: Buick LaCrosse eAssist (2.4-liter 4-cylinder, auto).
- ULEV: Ultra-low-emissions vehicles emit half the carbon monoxide (CO) and hydrocarbons (HC) of a LEV vehicle. Example: Nissan 370Z (3.7-liter V6, auto).
- SULEV: Super-ultra-low-emissions vehicles meet even stricter standards than ULEV when fueled with low-sulfur gasoline. Example: BMW 328i (2.5-liter 4-cylinder, auto).
- PZEV: Partial-zero-emissions vehicles meet SULEV requirements and have no evaporative emissions. Example: Toyota Prius (1.8-liter 4-cylinder, CVT).
- AT PZEV: Advanced technology partial-zero-emissions vehicles meet PZEV emissions requirements but use technology deemed “advanced” by CARB. CARB is changing the AT PZEV terminology; these vehicles will be called T2EV (transitional-zero-emissions vehicles). Example: Ford Fusion Energi (2.0-liter 4-cylinder, auto).
- ZEV: Zero-emissions vehicle. The only current technologies that meet this standard are EVs and hydrogen fuel-cell vehicles. Examples: Volkswagen e-Golf and Toyota Mirai.
WHY GO GREEN?
The two main reasons to buy a green car are to save money and save the planet.

SAVING MONEY
If you want to spend less money on gas, buying a car that gets great fuel economy is one of the most effective ways to do it. But if gas prices are low, they have been for the past year, why shop for a fuel-efficient car? Because at some point, they'll go back up.

Unfortunately, where gas prices are concerned, most car buyers have short memories. When prices trend downward, many buy larger cars, trucks, and SUVs. They base a long-term decision—buying a car—on short-term information.

Gas prices are volatile. In the past eight years, the national average price of regular gas reached a high of $4.70 a gallon in July 2008, dropped to a low of $1.67 in December of the same year, rose again to $3.85 in May 2011, dropped to $2.05 by January 2015, and finished the year at $2.40, according to the AAA Daily Fuel Gauge Report (fuelgaugereport.com). The point? No one could have predicted these extreme price swings, so who knows where gas prices will be five or 10 years from now?

What’s more, low gas prices can be a boon for green-car buyers. When lots of people are buying big cars and trucks, dealerships are more likely to offer incentives to attract buyers to fuel-efficient models.

Why go green? The two main reasons to buy a green car are to save money and save the planet.

GREENHOUSE GASES

Here’s how much you could save in one year if you switched from a 20-mpg vehicle to a more fuel-efficient one—based on 15,000 miles of driving annually with gas priced at $2.50 a gallon. (Savings rounded to the nearest $25.)

<table>
<thead>
<tr>
<th>Gas Mileage</th>
<th>Saving per Year</th>
<th>Total Saving</th>
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<td>20 mpg</td>
<td>$75</td>
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<td>$225</td>
<td>$3,375</td>
</tr>
<tr>
<td>45 mpg</td>
<td>$275</td>
<td>$4,125</td>
</tr>
</tbody>
</table>

That’s not necessarily true, especially for green cars powered by fuel-efficient internal combustion engines (ICEs). Take, for example, subcompact and compact green cars such as the Chevrolet Sonic, Ford Fiesta, Honda Civic, Kia Forte, Mazda2, Nissan Versa, Subaru Impreza, and Toyota Corolla. They’re fun to drive, reliable, and cost less to buy and maintain than cars that use more fuel. They also offer plenty of creature comforts and many of the latest safety features. Despite these advantages, though, there are some trade-offs. They’re not as roomy, not as comfortable for long trips, and typically have less powerful engines.

That’s where larger vehicles with fuel-efficient ICEs come in. For example, the Buick LaCrosse, Ford Escape, Honda Accord, Hyundai Sonata, Mazda Mazda6, Subaru Forester, and Toyota Camry offer more room and higher comfort levels. They also don’t cost much more than subcompact and compact cars and exact little penalty in fuel economy.

Some kinds of green cars—hybrids, electric cars, and diesels—do cost more than their conventional counterparts because they use additional or specialized powertrain components, such as electric motors, battery packs, or diesel engines. For example, a 2016 Hyundai Sonata Hybrid costs about $4,200 more than the nonhybrid Sonata SE, and a 2016 Lexus ES 300h costs about $2,900 more than an ES 350, its nonhybrid equivalent. In some cases, the price discrepancy can be even higher.

Of course, a green car’s fuel savings may recoup the higher purchase price—but not always, and it may take a long time. For example, if regular gas is priced at $2.24 a gallon and you drive 15,000 miles a year, it would take more than 14 years to make up the $4,200 price difference between the Sonata SE (30 mpg) and the Sonata Hybrid (42 mpg), according to the EPA’s calculator.

But the time required to make up the difference can also be relatively short. For example, with the same gas price and mileage parameters, it would take just under three years to make up the $700 price difference between a 2016 Toyota RAV4 AWD (25 mpg) and a 2016 Toyota RAV4 Hybrid AWD (35 mpg). Of course, as gas prices rise, the time it takes to recoup any purchase-price premium for a green car goes down.

Sometimes the price difference between hybrids and nonhybrids is minimal or nonexistent. For example, the manufacturer suggested retail price (MSRP) for a 2016 Buick LaCrosse eAssist is the same as for a 2016 nonhybrid LaCrosse. However, the eAssist version gets a combined 29 mpg versus the nonhybrid’s 22 mpg, which saves $368 a year at $2.24 a gallon and 15,000 miles of driving annually.

The same is true for the 2016 Lincoln MKZ: The MSRP for the hybrid saves $452 a year in fuel costs. There’s another way to save money by buying green: New all-electric (EV) and plug-in electric hybrid (PHEV) cars may be eligible for a federal income tax credit of up to $7,500, depending on the battery that powers the vehicle. (Hybrids used to qualify for tax breaks and incentives, but no longer.) To find out which cars qualify and the amount of the tax credit, go to the U.S. Department of Energy website, fueleconomy.gov/feg/taxevb.shtml.

In addition, state and/or local incentives may also apply. For a list of the most recent updates to state laws and incentives for EVs and PHEVs, go to the Alternative Fuels Data Center at afdc.energy.gov/laws/state. Knowledgeable salespeople at car dealerships should be able to tell you about current incentives, as well.

MONEY SAVINGS BASED ON MPG

As mpg goes down, the amount of greenhouse gases released into the atmosphere goes up. (Based on 15,000 miles of driving per year.)
SALVING THE PLANET

Saving money on gas—a short-term benefit—is one reason to buy a green car. But it’s far from the most important reason in the larger scheme of things. Getting more mpg and reducing automotive emissions also have societal benefits. Three of the most important are: environmental benefits, health benefits, and energy security.

ENVIRONMENTAL BENEFITS: Climate change is the most significant long-term threat to a livable world, according to the EPA and the Intergovernmental Panel on Climate Change (IPCC). And because carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) from vehicle emissions contribute significantly to the concentration of greenhouse gases that cause climate change, burning less gasoline and diesel fuel is beneficial to the planet’s (and ultimately our) well-being.

Each gallon of gas burned puts about 19 pounds of CO₂ into the atmosphere. (For an explanation of how this is possible—since a gallon of gas weighs just 6.3 pounds—go to the U.S. Department of Energy website, fueleconomy.gov/feg/contentincludes/co2_inc.htm). And if you take into account the energy that goes into making pounds—go to the U.S. Department of Energy website, this is possible—since a gallon of gas weighs just 6.3 pounds and producing fuel, the total global warming impact equals 25 pounds of CO₂ emissions per gallon of gas, according to greenncars.org, a part of the American Council for an Energy-Efficient Economy.

How serious is the problem? In 2014, Americans burned about 375 million gallons of gasoline every day for personal transportation—about 45 percent of the total U.S. daily oil consumption, according to the U.S. Energy Information Administration (EIA). And passenger vehicles are responsible, on average, for 51 percent of a household’s CO₂ emissions—an average of 7 to 10 tons per vehicle per year, according to the EPA. You don’t need to do much math to realize that driving a vehicle with a higher mpg rating can significantly reduce your contribution to climate change.

Furthermore, the planet could use some help. On a global scale, progress in increasing fuel economy and lowering emissions for passenger vehicles and light trucks is moving at a rate of 2.6 percent annually in developed countries. But in developing countries, which are preparing for rapid growth in their vehicle markets, annual improvement is just 0.2 percent, according to a new study. Fuel Economy State of the World 2016: Time for Global Action, released by the Global Fuel Economy Initiative at the Paris COP21 Climate Summit in December 2015. Both numbers are below the target rate of 3.1 percent annual improvement needed to halve fuel consumption in passenger and light-duty vehicles by 2030. To download the report and see a short film about the importance of improving fuel economy, go to globalfueleconomy.org

Thus far, the United States and other Western nations have not done as good a job improving fuel economy as they have reducing emissions. So in future years, government agencies are likely to focus more on raising fuel-economy standards than on further reducing emissions.

Toward that end, the federal government has set ambitious corporate average fuel economy (CAFE) standards and greenhouse-gas goals for automakers in the next decade and beyond. The U.S. Congress first enacted CAFE standards in 1975 with the goal of reducing energy consumption by increasing the fuel economy of cars and light trucks. By 2025, automakers must raise the average fuel efficiency of new cars and light trucks to 54.5 mpg. CAFE regulations are complicated, but here are the basics. First, smaller vehicles must have a smaller carbon footprint—that is, they must attain a higher mpg rating—than large vehicles. Second, CAFE standards for a given automaker are based on the automaker’s total expected vehicle production, broken down by sales estimates for the specific models the carmaker produces. For example, a carmaker that produces mostly SUVs and pickups has to meet a lower CAFE requirement than a carmaker that makes mostly small cars.

CAFE fuel-economy numbers (54.5 mpg, above) aren’t the same as the EPA mpg estimates listed on a vehicle’s fuel-economy label (see page 18). Rather, CAFE standards are issued by the National Highway Traffic Safety Administration (NHTSA, pronounced n-h-t-s-a), a division of the U.S. Department of Transportation.

What’s more, CAFE standards are based on EPA fuel-economy tests from decades ago, whereas EPA estimates are based on current testing procedures (see “How the EPA Calculates Fuel Economy,” page 15). In general, EPA estimates are about 30 percent lower than CAFE numbers.

The new CAFE standards should significantly reduce both CO₂ emissions from passenger vehicles and the nation’s demand for petroleum. By 2025, the average new passenger vehicle is expected to reach a real-world average of about 42 mpg.

The technology needed to achieve higher fuel standards will increase new-vehicle costs by an estimated $1,800 each, but that should be offset by fuel savings over a vehicle’s 15-year lifespan, according to the EPA. (Incidentally, Americans are keeping their cars longer these days. In mid-2015, the age of the average car in the U.S. was a record 11.5 years.)

By 2025, the EPA estimates that the new CAFE standards will reduce oil consumption by about 2.2 million barrels a day and as older vehicles are replaced by newer ones, that number will rise to more than 4 million barrels a day. It’s also good for the planet when car buyers choose a vehicle with an engine and drivetrain that produces fewer harmful emissions. The cleanest gasoline-powered cars are those with a PZEV (partial-zero-emissions vehicle) rating issued by the California Air Resources Board (CARB).

PZEVs (see “Emissions Categories,” page 9) meet super-ultra-low-emissions vehicle (SULEV) exhaust emissions standards and also produce zero evaporative emissions. PZEVs typically achieve lower emissions through modifications to the catalytic converter and engine control module (ECM).

Many, if not most, carmakers offer PZEVs, although not necessarily in all states. Some—Subaru, for example—make PZEV versions of their cars available in nearly every model type and in many regions of the U.S. (To find vehicles with a PZEV rating, check out the EPA’s Smartway Vehicles list at fueleconomy.gov/feg/findacar.shtml.)

PZEVs sometimes cost a bit more, but they require no special maintenance and, in some states, they receive longer emissions performance and defect warranties, including those for the onboard diagnostic (OBD II) vehicle system. Cars with PZEV emissions ratings have such tight pollution controls and burn fuel so completely that in smoggy urban areas, exhaust from the tailpipe of a PZEV can be cleaner than the ambient air.

To find out a specific vehicle’s fuel economy and emissions ratings, go to fueleconomy.gov/fg/findacar.shtml. The site lists official EPA mpg estimates, annual fuel costs, unofficial mpg estimates from vehicle owners, and much more. The Energy and Environment section (see below), under a header near the top of the homepage, details many vehicles’ energy impact scores, greenhouse gas emissions, and EPA smog ratings.

HEALTH BENEFITS: In the mid-1990s, emissions from passenger vehicles produced 50 percent of the gases that resulted in smog, which causes respiratory and cardiopulmonary disease, lung cancer, and higher mortality rates. That situation started to change with the
passage of the Clean Air Act in 1973, and since the 1980s, agencies such as the EPA and CARB have led the way in requiring automakers to produce an increasing number of low- and zero-emissions vehicles. Because of federal and state regulations, today’s cars are many times cleaner than in the past. And even though many more cars are on the roads today and they drive many more miles than before, passenger vehicles now account for less than 25 percent of smog-producing emissions. For example, in 1965 a new car emitted on average 228 pounds—a 95 percent reduction. The payoff for these emissions reductions is that the air we breathe is significantly cleaner than it was three decades ago. From 1980 through 2014, levels of four key pollutants dropped by more than 50 percent.

**ENERGY SECURITY.** Until recently, most of the oil the U.S. consumed was imported. But after the gasoline shortages caused by the 1973 oil embargo by the Organization of Petroleum Exporting Countries (OPEC), the U.S. government worked to ensure that the country didn’t become dependent on oil supplies from potentially unfriendly governments.

Today, the U.S. produces more oil than it imports. In large part due to the expansion of hydraulic fracturing (“fracking”), U.S. petroleum net imports fell from 60 percent in 2005 to 27 percent in 2014, the lowest level since 1985, according to the EIA. The EIA’s 2014 Annual Energy Outlook predicted that by 2037 the U.S. will be energy self-sufficient, so reducing fuel consumption for security reasons may not be as important as it once was. But burning less fuel still reduces our dependence on foreign sources of oil.

**FUTURE SCENARIOS**

In the near term, whether people buy green cars will depend largely on factors such as fuel prices, government tax credits, and perks like HOV lane access and EV charging stations at work—all of which are subject to change. (For example, some states have proposed special taxes for EVs because owners don’t pay gasoline taxes.) And because conventional gasoline-powered vehicles cost less to buy and continue to improve in fuel economy, they’re likely to outsell cars with alternative powertrains, at least through the end of this decade—and as long as gas prices remain low.

Few motorists are willing to put public interest before perceived self-interest if buying green costs more or is inconvenient (for example, if a green vehicle has a limited driving range or if recharging/charging locations are scarce). However, automakers will continue to introduce more cars with alternative powertrains, if for no other reason than to meet increasingly strict government mandates. As these vehicles become more mainstream, their costs will come down and people will be more inclined to buy them.

numbers also dropped, but not as precipitously. Despite such improvements, there is still cause for concern. A recent study by the American Lung Association, State of the Air 2015, reports that more than 40 percent of Americans live in places with unhealthy air. And although air pollution levels have dropped in the U.S., worldwide they’ve stayed about the same because of rising pollution levels in Asia.

**U.S. AIR QUALITY HAS IMPROVED SIGNIFICANTLY.** In the past several decades. From 1990 to 2014, the levels of four key pollutants dropped by more than 50 percent.
Most automakers now produce a variety of green cars—subcompacts and compacts, midsize cars, large cars, crossover SUVs—and even pickup trucks that focus on getting better gas mileage and reducing emissions.

But it’s much more than a matter of vehicle size or body style. Ten or 15 years ago, if you wanted to buy a green car, you had to settle for a gasoline-powered subcompact or an early Toyota Prius or Honda Insight hybrid. Today, it’s easy to find green cars that run on gasoline, a combination of gasoline and electricity, flex fuel (a mixture of gasoline and ethanol), electricity, compressed natural gas, diesel fuel, fuel cells, and soon perhaps even diesel and electricity (plug-in diesel hybrids, which are currently available in Europe).

The AAA Green Car Guide will help you sort out what’s most important and simplify the decision-making process for you. For even more information, go to AAA.com/greencar. In this chapter, we’ll describe the major types of green cars and list the advantages and disadvantages of each.
FINDING A GREEN VEHICLE
If you’re in the market for a green car, how do you know you’re buying a high-mpg, low-emissions vehicle? Start by checking out a vehicle’s EPA Fuel Economy and Environment label (pictured below), which contains a lot of useful information. It’s attached to the side window of all new cars and light trucks. The label varies depending on the type of vehicle (gasoline, hybrid, plug-in hybrid, natural gas, diesel, or electric).

The example below is for a gasoline-powered vehicle. Take note of four numbers on the label: fuel economy (upper left), fuel-economy and greenhouse-gas rating (center), smog rating (center right), and gallons per 100 miles (directly below mpg).

- The fuel-economy score lists city, highway, and combined mpg, with combined as the most prominent. In a box below fuel economy, you’ll find an estimate for annual fuel costs and, in the upper right, how much you can expect to save over five years compared with fuel costs for the average new car. Alternatively, it lists how much extra you’ll spend if you buy vehicle that is less fuel efficient.
- For plug-in hybrids, the combined fuel-economy number is expressed both as an mpg and an MPGe (miles per gallon equivalent) because PHEVs run on both gasoline and electricity. For EVs and fuel-cell vehicles, the combined-fuel-economy number is expressed solely as an MPGe. MPGe is defined as the estimated number of miles a vehicle can go on the quantity of fuel with the same energy content as a gallon of gas, which the EPA states has 115,000 BTUs, or 33.7 kilowatt-hours, of energy. An example of an MPGe label is on page 23.
- The fuel-economy and greenhouse-gas score assigns a rating from 1 to 10 (worst to best) for fuel economy and greenhouse-gas emissions; that is, how much CO₂ the vehicle’s tailpipe emits. As we mentioned earlier, higher fuel economy correlates with lower greenhouse-gas emissions.
- The smog rating (1 to 10, worst to best) is a rating for vehicle tailpipe emissions that cause smog and other local air pollution.
- The gallons-per-100-miles score is a more useful way to calculate fuel consumption, because thinking strictly in mpg terms can be misleading. Here’s why:
  - If you drive a car that gets 10 mpg, you’ll burn 10 gallons of gas to travel 100 miles. And if you trade that car in for one that gets 20 mpg, you’ll use just five gallons of gas, a five-gallon savings.
  - But suppose you traded in a car that gets 33 mpg for one that gets 50 mpg. You might think you’d be saving even more fuel—but you’d be wrong. Do the math: A car that gets 33 mpg burns three gallons of gas to travel 100 miles, and one that gets 50 mpg burns two gallons. So you’d save just one gallon of gas per 100 miles, even though it’s a 17 mpg improvement. And if you could buy a car that gets 100 mpg, a 100 percent improvement over the 50-mpg car, you’d still save just one gallon of gas.
  - In other words, not all mpg gains are equal, and improvements in mpg aren’t linear. At the high end of fuel economy, they’re less significant. So in terms of fuel usage, there’s more benefit to trading a gas guzzler for a midsize sedan than trading a midsize sedan for a fuel-sipping hybrid.

ADVANCED-TECHNOLOGY INTERNAL COMBUSTION ENGINES (ICEs)
When most people think of green cars, they don’t think of gasoline-powered vehicles. But numerically speaking, most green cars on the road are equipped with high-tech ICEs that burn gasoline, get high fuel economy, and produce low emissions. As we mentioned in Chapter 1, these vehicles use a variety of advanced technologies in their drivetrains to achieve such high fuel-economy standards, including turbocharging, direct fuel injection, CVTs, and so on.

They also produce fewer harmful emissions than conventional cars, as the following table illustrates. Although not all cars listed are available in all states, some examples of 2016 vehicles with advanced ICEs that can have SULEV (super-ultra-low-emissions vehicle) or PZEV (partial-zero-emissions vehicle) ratings include:

<table>
<thead>
<tr>
<th>Vehicle</th>
<th>Drivetrain</th>
<th>Combined mpg</th>
<th>Greenhouse-gas rating</th>
<th>Smog rating</th>
</tr>
</thead>
<tbody>
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<td>2.0L, 4 cyl, auto</td>
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<td>7</td>
<td>9</td>
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<td>7</td>
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<tr>
<td>Ford Focus</td>
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<td>31</td>
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Not long ago, many auto enthusiasts thought that the future of green technology lay strictly in alternative fuels and hybrid, electric, or hydrogen-fuel technology. But as you can see from this list, lots of vehicles qualify as green cars. (For more information about the EPA’s fuel-efficient, clean Smartway vehicles, go to fueleconomy.gov/feg/SmarWay.do.)

One of the big surprises in the past few years has been how far automakers have been able to push the envelope in improvements to the internal combustion engine. For example, in mid-December 2015, the EPA named Mazda as the top carmaker for fuel efficiency for the third consecutive year. Mazda produces no hybrids or EVs. It relies on 4-cylinder engines (turbocharged and naturally aspirated) and its SkyActiv powertrains to achieve high levels of fuel efficiency.
Hybrids (sometimes referred to as HEVs, or hybrid-electric vehicles) have been on the market since the late 1990s, and for many people, they’re synonymous with the term green car. Hybrids aren’t viewed as quirky or exotic anymore—EVs have taken on that role. In many parts of the country, hybrids like the Toyota Prius are considered mainstream and are among the most popular vehicles sold.

Hybrids currently on the road in the U.S. are all of the gasoline/electric variety; they combine a conventional gasoline engine with one or more electric motor/generators, a battery pack, and a controller. Hybrids take advantage of the efficiencies of different powertrains to increase a vehicle’s overall fuel efficiency. Electric motors are more efficient in stop-and-go city driving, and gasoline engines are more efficient when driving on highways at higher speeds. Hybrids’ stop-start technology (see page 8) increases fuel economy and reduces emissions.

European cars with gasoline-powered ICES and diesel engines have used stop-start technology for decades, and some nonhybrid domestic cars with ICES also use it. Stop-start technology became standard on the 2015 Chevrolet Impala, for example. In the near future, an increasing number of cars will use it to help meet fuel-economy mandates.

Hybrids also are equipped with regenerative braking. That means when the car coasts or brakes, the electric motor helps slow it down and functions as a generator, converting the vehicle’s kinetic energy into electricity to charge the battery pack.

In 2015, hybrid sales in the U.S. totaled 384,000 cars and light trucks, a 15 percent drop from the 452,000 sold in 2015. Of 2015 hybrid sales, 30 percent (about 114,000) were the Toyota Prius liftback.

Some sources think the decline in hybrid sales has been due to consistently low gas prices, but others state that hybrid sales figures started to slip shortly before gas prices dropped. Still others believe that loyal Prius customers were waiting for the redesigned 2016 version, which came out in January. Also, because cars with advanced ICES keep getting more efficient, they could be winning over potential buyers from the hybrid ranks.

In the past decade, the hybrid scene has changed significantly, mainly in the range of hybrids that are now available. Initially, the only modern hybrids were subcompacts like the Honda Insight and the Toyota Prius. Now, dozens of hybrid models are available—toyota offers eight models for 2016—ranging from sports cars to SUVs to compact, midsize, and luxury sedans.

As we mentioned in Chapter 1, hybrids usually cost more than their nonhybrid counterparts—but not always, and sometimes not much more. The difference in purchase price depends mostly on the model. And if a hybrid does cost more, how long it takes to recoup the difference in initial cost depends on the difference in purchase price, the price of gasoline, and how much you drive.

But there’s another reason it makes sense to drive a hybrid—the ecological benefits, which go beyond purely financial considerations. For folks with these priorities, buying significantly less gas and polluting less offsets the supposed penalty of paying more to buy the car.

Hybrid technology has proven very reliable. Battery packs rarely fail, have long warranties (up to 10 years/150,000 miles), and usually work flawlessly well beyond the warranty.

PLUG-IN HYBRIDS

In late 2010, Chevrolet began selling the Volt, a plug-in hybrid electric vehicle (PHEV), and in early 2012, Toyota introduced the Prius Plug-in Hybrid. A plug-in hybrid has a larger battery pack than a standard hybrid; it can be recharged by connecting it to an external power source. The larger battery pack allows PHEVs to operate on electricity alone (typically for 15 to 50 miles, depending on the vehicle and driving conditions) before they burn gasoline.

Once the battery is depleted, the gasoline engine seamlessly kicks in, and drivers can travel until they need to stop for gas and/or recharge their battery pack. (In the case of the Volt, the gasoline engine doesn’t power the drive wheels; instead, it runs a generator that produces electricity to power the car.) Because PHEVs run solely on electricity longer than conventional hybrids do, their overall fuel economy is better. And they save more money, because the cost of electricity to recharge a PHEV or EV typically is significantly lower than the cost of gasoline or diesel fuel, especially for utilities that provide discounts for off-peak or nighttime charging. Typically, PHEV batteries can be recharged overnight on a 120-volt outlet and even more quickly—usually in four or five hours—on a 240-volt charger.

PHEV owners often buy their vehicles because they have short commutes and find the idea of driving without having to use gasoline appealing (as well as less expensive). Of course, they’re also not plagued by the “range anxiety” that sometimes afflicts EV owners—who worry that they’ll be stranded if their car runs out of electricity—because of the safety net their PHEV’s gasoline engine provides.

In addition, PHEVs are eligible for federal and (sometimes) state tax incentives (the U.S. Department of Energy has information at fueleconomy.gov/feg /taxevb.shtml, and the Alternative Fuels Data Center writes about incentives at afdc.energy.gov/laws /state). Plus, in many states, PHEVs can use carpool lanes with only the driver aboard.

Plug-in hybrids are becoming more popular because of their convenience, range, and fuel efficiency. (The Volt, which has developed an extremely loyal following, was redesigned for 2016 and is reviewed on page 106.) And Chevrolet and Toyota aren’t the only automakers offering PHEVs. Audi, BMW, Cadillac, Ford, Hyundai, Mercedes-Benz, Mitsubishi, and Porsche currently make PHEVs—and more are on the way (see Chapter 4).
ELECTRIC VEHICLES

Electric vehicles (EVs) are powered by an electric motor (or motors) that draws current from a rechargeable battery pack. Green car buyers like EVs for a variety of reasons. Electric motors are efficient, quiet, and powerful; provide instant, smooth, and strong acceleration; and produce zero emissions at the tailpipe. And because EVs have simpler drivetrains and fewer components, they typically require less maintenance than other types of vehicles (no oil or air-filter changes, no tune-ups, no radiators to repair or refill, no timing belts or water pumps to replace). In many states, EVs can use HOV lanes with only the driver as an occupant (surveys indicate this perk is a big draw for prospective EV buyers).

Like plug-in hybrids, EVs are eligible for federal and (sometimes) state tax incentives (get more information at fueleconomy.gov/fgs/taxevb.shtml and at afdc.energy.gov/laws/state). A 2016 Nissan Leaf has a base price of $29,910. Deduct the federal tax credit, and that’s $21,510—pretty reasonable.

Used EVs are an even better deal—largely as a result of cheap gas, which put a crimp in the used EV (and hybrid) markets. In early January 2016, for example, a popular online list site nearly 600 vehicles had a price of $8,800 to $22,000, with an average price of $12,800.

EVs typically are cheaper to run, too. For example, the U.S. Department of Energy (fueleconomy.gov) estimates that it would cost $1,050 a year in gasoline to drive a VW Golf 15,000 miles, but just $550 in electricity to drive the same mileage in a VW e-Golf.

That being said, there are some downsides. Most EVs suffer from a single significant drawback: the lack of a small, light, inexpensive battery with a large storage capacity, plus the related challenge of high recharge time. Although battery charge times are coming down, most EV batteries require four to eight hours to recharge fully, sometimes longer. Even a “quick charge” to 80 percent capacity can take a half hour.

Nearly 80 percent of Americans have a round-trip commute of fewer than 50 miles, much less than the range of most EV batteries (typically about 75–100 miles). Nevertheless, EV batteries’ limited storage capacity minimizes the cars’ appeal, and for many drivers, reduces their practical utility to that of a second car.

The Tesla Model S and Model X have big, expensive batteries that largely avoid the range-anxiety issue, the carmaker offers batteries with EPA-estimated ranges between 208 and 265 miles. But their MSRP’s also are out of reach of most prospective EV owners.

However, more public and workplace charging stations—including quick-charging stations—are springing up, and battery technology is improving so that in the future, EVs will likely have greater ranges. (The new Chevy Bolt, due out in late 2016, claims a range of around 200 miles on a charge.) Would-be EV owners should be aware that many factors affect an EV’s range, including ambient temperature and the use of power-consuming accessories (air-conditioning, entertainment systems).

AAA and the Automobile Club of Southern California’s Automotive Research Center conducted tests of EV battery-pack performance in cold, moderate, and hot conditions to see how EV battery range fluctuates with temperature.

The driving range of all the vehicles decreased in both extreme hot and cold conditions. The average EV battery range was 105 miles at 75° F, but dropped to an average of 69 miles at 95° F. Cold weather had a more dramatic impact, dropping the range to an average of only 43 miles when the temperature was held steady at 20° F.

In other words, EVs aren’t for everyone. That said, in addition to Nissan and Tesla, BMW, Chevrolet, Fiat, Ford, Honda, Kia, Mercedes-Benz, Mitsubishi, Smart, Toyota, and Volkswagen have produced EVs or will bring them to market soon.

EV sales (including plug-in hybrids like the Chevy Volt and Toyota Prius PHEV) have been strong in the U.S. over the past few years. Sales in 2014 (123,300) topped those in 2013 (97,500) and in 2012 (52,600), and sales worldwide during the past two years have increased. However, EV sales in the U.S. dropped slightly in 2015, to 115,300 vehicles.

The number of public charging stations nationwide is rising, so it’s easier than ever to “fill up” an EV. There are about 11,400 stations with 28,400 charging outlets, up from about 9,000 and 22,000, respectively, in early 2015. (Find charging station locations at afdc.energy.gov or on the AAA App.)

Tesla is continuing to expand its network of Supercharger stations, which provide free quick charges for Tesla owners. At press time, there were about 600 stations in the U.S., equipped with almost 3,500 chargers. (Get locations at tesla.com.)

GREENER FROM START TO FINISH?

EVs are, of course, zero-emissions vehicles (ZEVs). And it’s been noted that the greener a car owner’s sources of electricity (e.g., not getting it from a coal-fired power plant), the greener the EV driving experience. To extend that line of inquiry, one might ask: Are EVs cleaner compared with gasoline-powered cars if we look at their entire life cycle?

The Union of Concerned Scientists has calculated the total global warming emissions of both kinds of vehicles through their manufacturing, driving, and disposal cycles. It found that the assembly stage of a small gasoline-powered car produces about 7 metric tons of emissions, in comparison, the assembly of an EV with a range of 84 miles (think Nissan Leaf) produces about 8 tons of emissions.

By the end of its driving life, the gasoline-powered car will produce 57 metric tons of global-warming emissions (including the refining and transporting of the gasoline it burned) compared with 22 metric tons of emissions for the EV. (Also, the UCS estimates that two-thirds of Americans live in regions where charging an electric car produces fewer emissions than driving even a 50 mpg gasoline car) Disposing and recycling each type of car adds less than 1 metric ton of emissions, and electric batteries can be recycled or reused. The UCS concluded that, within a year of driving, an EV cuts global-warming emissions by more than 50 percent compared with a similar-size gas-powered vehicle, making up for the extra emissions that are produced when the EV battery is created. And as sources of electricity become greener, so will driving EVs. (A UCS video on this topic is at www.ucsusa.org/re reach/ev-analyze.html.)
EV CHARGING 101

Because electrical chargers are an evolving technology, obtaining quick, convenient, and reliable charging remains a significant concern for EV owners. The AAA App and the U.S. Department of Energy’s Alternative Fuels Data Center (afdc.energy.gov/fuels/electricity_locations.html) provide information about public charging-station locations. The following are three categories of EV chargers:

**LEVEL 1**

This is a 120-volt charger, which provides the slowest charging. Almost all currently produced electric cars come with a power cord that can plug in to a standard 120-volt outlet. Many current EVs require about 20 hours to achieve a full charge on 120 volts, but some—Teslas, in particular—can take considerably longer. Recharging for plug-in hybrids typically takes from a few hours to overnight.

**LEVEL 2**

A 240-volt charger can be used by all EVs now being produced; it’s usually at least twice as fast as Level 1 charging. Most public charging stations are Level 2 (including stations at some AAA branches). When a motorist purchases an EV, most manufacturers offer to sell them a Level 2 charger for installation in their garage. Recharging time is generally from 8 to 10 hours for a fully depleted battery. Some cars (Nissan Leaf, Smart Electric Drive, BMW i3, and Ford Focus Electric, for example) have higher-capacity onboard chargers that can speed up Level 2 charging to between 4 and 6 hours. If you choose a Level 2 charger, your garage (or other charging location) will need 30-amp, 240-volt electrical service. The cars listed above with higher-speed Level 2 capabilities will likely need a 50-amp capacity circuit.

**DC FAST CHARGING**

A 480-volt charger converts 480-volt AC power to DC current. DC fast-chargers are generally expensive, fixed-site high-speed units. They can recharge a battery pack to 80 percent in about 30 minutes; the final 20 percent of recharge must be trickled in to prevent battery overheating and takes a couple of hours, no matter which level charger is used. Not all EVs are equipped with fast-charging capabilities.

Most DC fast-chargers use a CHAdeMO adapter, which fits the Nissan Leaf and Kia Soul EV. U.S. and European EVs fitted for fast-charging—including BMW, Chevrolet, Mercedes-Benz, Volkswagen, and Volvo—use the combined charging standard (CCS) adapter. Tesla EV owners use a dedicated Tesla Supercharging stations to recharge their cars’ batteries.

**CLEAN-DIESEL VEHICLES**

Historically, diesel-fueled passenger cars have been extremely popular in Europe—where gas prices are much higher than in the U.S.—because of their high fuel efficiency, reduced CO2 emissions compared with gasoline-powered cars, and durability. Diesel vehicles haven’t sold well in this country, though, with the exception of heavy-duty pickup trucks and SUVs, mainly because they’re reputed to be noisy, smelly, rough-running, and dirty.

These qualities don’t apply to modern diesel passenger vehicles, which are smooth, quiet, and emit virtually no odor. Most people who drive them can’t tell the difference from driving a gasoline-powered vehicle. Diesel engines offer snappy acceleration and are well-suited for towing. But even with low-sulfur diesel fuel and exhaust after-treatment, diesel vehicles are still among the highest-emitting vehicles currently sold, meeting only California’s LEV or ULEV emissions standards.

Diesels often cost more than their gasoline-powered counterparts, and diesel fuel typically costs more than gasoline. According to the U.S. Energy Information Administration (EIA), “Diesel fuel prices have been higher than regular gasoline prices almost continuously since September 2004.” In 2015, diesel prices also dropped but on average were higher than gas prices. The average price of diesel in 2015 was $2.71 per gallon, the lowest for the fuel since 2009. In 2014, by comparison, diesel averaged $3.81 per gallon.

**DIESELGATE**

Diesel passenger vehicles are currently in a state of limbo—perhaps purgatory is a better term. Although we featured a dozen diesel passenger cars in the 2015 AAA Green Car Guide, many of them highly ranked, diesels are conspicuous by their relative absence this year.

In recent years, diesels’ traditional lack of popularity had been changing with the emergence of so-called “clean diesel” technology. Among the most popular models were the Volkswagen Golf TDI and Jetta TDI. It seemed almost too good to be true.

It was. In September 2015, VW admitted that, beginning with model year 2009, it installed U.S. diesel emissions regulations by installing emissions-cheating software that allowed 10–40 times the permissible level of nitrogen oxides to be emitted from its diesel passenger cars. The software, referred to as a “defeat device,” turned on its cars’ emissions controls for EPA testing and then turned them off during real-world driving. This vast 2015 and that were equipped with 2.0-liter, 4-cylinder diesel engines. Later, it was discovered that VW’s VI diesel engine also used a cheat device, and that Audi and Porsche vehicles (part of the VW Group) were implicated in the scandal, too. The automaker faces up to $18 billion in fines from the EPA, VW dealers, customers, government officials, and auto industry executives exposed shock, anger, disbelief, and dismay at the deception. In early 2016, Volkswagen was working on a plan to compensate owners of affected diesel vehicles by fixing existing vehicles or providing cash payments, buybacks, or replacement vehicles. Does the VW scandal spell the death of diesel cars in the U.S.? Probably not, but it’s unquestionably a major setback. VW sales fell off in the last months of 2015, and industry executives fear that the scandal will affect the entire industry. As business analysts are fond of saying, it’s easy to destroy trust and hard to rebuild it, and Volkswagen has put itself in that situation, in spades.
FLEX-FUEL VEHICLES

Flex-fuel vehicles have engines that can run on both gasoline and gasoline/alcohol blends in ratios up to 85 percent alcohol. Initially, the alcohol used was methanol, but now it’s ethanol. E85 (85 percent ethanol and 15 percent unleaded gasoline) is available in about 2,700 public service stations—about 2 percent of the total number—the vast majority of them in the Midwest. In other regions of the country, E85 is relatively scarce. In 2011, the EIA estimated that there were nearly 10 million flex-fuel vehicles on the road, about 1 million of which actually used E85 fuel. (Find a service station that sells E85 fuel on the Alternative Fuels Data Center website, afdc.energy.gov/fuels/ethanol_locations.html).

Why flex-fuel? For one thing, ethanol is domestically produced, so using it reduces the need to import oil. Acknowledging the importance of energy independence as a national mandate, Congress passed the Energy Independence and Security Act in 2007, which contains a Renewable Fuels Standard that requires blending increasing amounts of biofuels with gasoline over time. By late 2015, however, controversy had arisen over how much ethanol blending is really necessary, and the EPA proposed reducing its original target amounts. Ethanol also burns cleanly and reduces greenhouse-gas emissions. Unfortunately, recent studies have shown that producing ethanol at current levels creates roughly as much extra greenhouse-gas emissions as it saves at the tailpipe. This phenomenon is known as carbon shifting, which means decreasing carbon emissions in one area of manufacture or use but increasing it in another area as a result. Carbon shifting can undermine many voluntary attempts at reducing CO₂ emissions. Additionally, ethanol has a lower energy content than gasoline, resulting in about 25 to 30 percent lower mpg figures.

Most ethanol used in American gasoline today comes from corn, and over time ethanol production has consumed a growing portion of the nation’s corn crop. In 2014, it was estimated that 40 percent of U.S.-grown corn was used to make ethanol. In Brazil, Sweden, and South Africa, fuel ethanol is made from sugarcane and wood chips. It was expected that future U.S. ethanol production would come from cellulosic sources such as corn stover (leaves, stalks, and other leftovers), napier grass, or other motor fuels and cleaner than gasoline. When burned, it yields 60 to 90 percent fewer smog-producing emissions and 30 to 40 percent fewer global-warming gases than gasoline.

CNG typically is also less expensive than gasoline. Since April 2011, the price of CNG has fluctuated very little—between $2.06 and $2.17—unlike the price of gasoline. At press time, the prices of the two fuels were similar.

Only about 500 CNG fueling stations in the U.S. are open to the public, and they’re concentrated mostly in urban areas. This limited availability is a major reason CNG technology hasn’t been more widely adopted. A list of CNG fueling stations can be found at cnglocator.net.

Public transportation across the country has used CNG for decades. About 12 to 15 percent of U.S. public transit buses currently run on natural gas. Despite CNG’s compelling advantages, very few private passenger cars available in this country run on CNG—less than one tenth of 1 percent—and many of those are taxi and governmental vehicle fleets. In the U.S., CNG passenger cars have been called the “neglected stepchildren” of green cars.

The situation took an unexpected turn for the worse in the past year. In mid-2015, Honda announced that, after nearly two decades, it was discontinuing production of its Civic Natural Gas model. The reason? The Natural Gas model costs about $6,000 more than a conventional Civic, and lower gasoline prices have eliminated the appeal of potential fuel savings. As a result, customer demand for the vehicle, which had never been strong, would likely have dropped off even more. In recent years, Honda has sold only about 700 Natural Gas models annually. That leaves the Chevrolet Impala Bi-Fuel (reviewed on page 141) as the only passenger car in production running on CNG. In 2013, Chevy announced it would produce an Impala “hybrid” that would run on both CNG and gasoline. The Bi-Fuel, which lists for about $40,000, has two fuel tanks. The CNG tank takes up considerable trunk space and holds the energy equivalent of 7.8 gallons of gasoline, good for about 150 city miles of range.

When the CNG supply is exhausted, the engine seamlessly switches over to burning gasoline. However, a dashboard-mounted switch allows drivers to choose their fuel at any time. Fuel-economy numbers for the Impala Bi-Fuel are 20 mpg combined (17 city/25 highway) on gasoline and 19 mpg combined (16 city/24 highway) using CNG. Quality-control delays held up the initial release of the Impala Bi-Fuel, but by late 2015 the car was in production, and about 200 vehicles were delivered to customers by the end of the year. It’s expected that most will be used for fleet or commercial purposes. Chevrolet, Ford, GMC, and Ram have introduced CNG-powered pickup trucks or vans into their lineups—medium and heavy-duty vehicles that can also run on gasoline. For more information about CNG-powered vehicles, go to e85vehicles.com.
HYDROGEN FUEL-CELL VEHICLES

Hydrogen fuel-cell vehicles, considered by many as “the cars of the future,” are propelled by electric motors, they create their own electricity through a chemical process in which hydrogen fuel reacts with oxygen from the air. They emit only water and heat.

Currently, most hydrogen is made through a process known as reforming, which converts natural gas into hydrogen gas and carbon dioxide. Hydrogen can also be produced from cleaner sources of energy—for example, by splitting water into hydrogen and oxygen through electrolysis. In addition, methane gas from landfills and sewage-treatment facilities (biomass) can be used to produce hydrogen, although precautions must be taken to minimize methane leakage from landfills.

In 2008, Honda introduced the FCX Clarity, a fuel-cell sedan, in limited numbers and made it available as a lease vehicle, mainly in Southern California. At the Tokyo Motor Show and the Los Angeles Auto Show in late 2015, the automaker unveiled its new five-passenger fuel-cell sedan, the Clarity Fuel Cell, which it planned to begin leasing in Japan in March 2016 as a 2017 model. A U.S. launch is planned for late 2016 to customers in California.

In the spring of 2014, Hyundai released a Tucson-based fuel-cell electric vehicle (reviewed on page 155) to a limited number of customers in Southern California. Production continues at the rate of about 60 vehicles annually.

Toyota made headlines in late 2014 with its Mirai FCEV, which became available for sale or lease in the U.S. in the fall of 2015. Other automakers, including Mercedes-Benz, are also pursuing fuel-cell technology.

Many hurdles must be overcome before fuel-cell vehicles fill new-car showrooms. The technology is expensive and relatively unproven, and the infrastructure for hydrogen refueling is practically nonexistent. For example, Toyota delivered 57 Mirai sedans in October and November 2015, but at the time only four California hydrogen stations were open, so as a stopgap measure, the automaker provided portable hydrogen fueling units to six of the eight California dealers selling the Mirai so that customers could more easily refill their vehicles.

OWNERSHIP COSTS, VALUE RETENTION

Do green cars cost more to own, and do they hold their value? It depends on the type of green car, the specific brand and model, how the car is maintained, the price of the fuel it uses, and your driving habits, among other factors.

Of course, some kinds of green cars—high mpg/low-emissions models with advanced internal-combustion engines (ICEs)—have similar ownership costs to conventional vehicles because they don’t differ from conventional gasoline-powered vehicles in ways that would create higher costs, such as increased maintenance.

Other kinds of green cars—diesel, for example—might have lower ownership costs in some ways but higher ones in others. For example, they’re more durable and less prone to breakdown (assuming the specific diesel car in question has a reputation for reliability), but their purchase price will probably be higher, and the cost of diesel fuel has typically been higher than that of gasoline.

Hybrids generally cost more to buy than conventional cars, and they use complicated, potentially expensive technology such as battery packs. In addition, they have multiple power sources: an ICE and one or more electric motors. However, surveys show that some popular hybrids—the Toyota Prius, for example—are among the most reliable of all cars. And most hybrid components have proven themselves to be durable, too.

As an example, for 2016, the industry trade journal Ward’s Auto picked three hybrid powertrains to be on its list of 10 Best Engines for 2016: those for the 2016 Chevrolet Volt, the 2016 Hyundai Sonata Plug-in Hybrid, and the 2016 Toyota Prius. This is a departure from the journal’s usual practice of choosing stand-alone ICEs for its 10 Best list.

Routine maintenance and repairs for some green cars might be higher than for conventional vehicles. It depends mostly on brand (e.g., regardless of the powertrain, a luxury car generally costs more to maintain than a compact) and how well the car is maintained. But hybrids don’t require extra maintenance, and some hybrid components (such as brake pads) last longer because hybrids have regenerative braking—energy-recovery mechanisms that slow down the vehicle and convert its kinetic energy into electrical energy, thus reducing wear on brake pads. Furthermore, EVs are less complicated, require less overall maintenance, and are likely to be more durable than other types of cars.

Insurance costs make up to 18 percent of total car ownership costs. Regarding green cars, those with advanced ICEs don’t cost any more to insure than conventional cars. However, there are no definitive answers about the relative costs to insure hybrids and EVs. Some studies indicate that hybrids cost slightly more to insure because many are small and don’t fare as well in crashes, and because their parts can be expensive. However, the difference in the premium might be small enough to be recouped by hybrids’ lower fuel costs.

Hybrids cost less to insure than they did a decade ago, when insurers were unfamiliar with them and their potential risks. Also, reports indicate that Nissan Leafs have been less expensive to insure because of their limited range (which means they’re generally driven less).

Do green cars hold their value? The answer depends on a number of factors that can change with the times. For example, in times of high gas prices, hybrids sell at a premium. Popular, prestigious, and reliable green cars tend to hold their value better.

On the other hand, the value of green cars with more-conventional technology—gasoline-powered cars with advanced ICEs—varies little if at all from their less-efficient counterparts.

So, does a green car cost more to own? There’s no black-and-white answer. The bottom line is, if you’re interested in a green car, do the necessary research, and if the numbers are right for you, buy one that’s reliable and maintain it properly. AAA’s car research tools can help; go to AAA.com/auto.

Toyota Mirai

AAA.com/greencar

Four-Year Ownership Costs

For five green cars and their conventional counterparts, based on an analysis of depreciation, financing, insurance, state taxes, fuel, maintenance, and repairs. (Source: kbb.com)

<table>
<thead>
<tr>
<th>VEHICLE</th>
<th>POWERTRAIN</th>
<th>5-YEAR COST OF OWNERSHIP</th>
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<td>2015 Ford Fusion S</td>
<td>ICE</td>
<td>$37,717</td>
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<tr>
<td>2015 Ford Fusion Hybrid S</td>
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<tr>
<td>2016 Hyundai Sonata Hybrid</td>
<td>Hybrid</td>
<td>$38,500</td>
</tr>
<tr>
<td>2016 Infiniti Q50</td>
<td>ICE</td>
<td>$48,364</td>
</tr>
<tr>
<td>2015 Toyota Camry LE</td>
<td>ICE</td>
<td>$53,327</td>
</tr>
<tr>
<td>2016 Toyota Camry Hybrid LE</td>
<td>Hybrid</td>
<td>$56,430</td>
</tr>
</tbody>
</table>

Ownership costs, value retention

AAA Green Car Guide 2016
BUYING A USED HYBRID OR EV

Hybrids and EVs have been around long enough to create a healthy used-car market. Here are some things to keep in mind if you’re thinking about buying a used one.

**USED HYBRIDS**

Hybrids have been available in reasonably large numbers for just over a decade—more than 2 million (mostly Toyotas and Hondas) have been sold since the year 2000—so they have a pretty good track record. Hybrid technology, though complex, is well established, and many hybrids have good to excellent reliability records.

The first step in buying a used hybrid is to research the model you’re interested in. Pay close attention to reliability reports, owner comments, recalls, and price/depreciation information. Once you find a car you like, use the vehicle identification number (VIN) to track a vehicle’s service history and obtain a vehicle history report through a company like Autocheck or Carfax. If you can afford it, look for a car with low mileage and at least a year left on the bumper-to-bumper warranty.

The single biggest potential expense for a used hybrid is replacing the battery pack. That’s not likely to be a major concern, though, because the battery pack and certain other hybrid components are guaranteed for longer than other vehicle parts—up to 10 years/150,000 miles, depending on the state you buy the car in. And perhaps as an indicator of confidence in the technology, Hyundai provides a lifetime guarantee on its hybrid batteries; it will replace the battery and cover recycling costs for the old battery free of charge to the original owner.

Hybrid battery replacement costs vary widely depending on the make of car and where you have it serviced. Again, this is not an especially realistic concern. Most hybrid battery packs last the life of the vehicle.

Even though hybrids are more commonplace nowadays, it’s still likely you’ll have to go to a dealer for service. So if you prefer taking your car to an independent repair shop, check to make sure it will be able to work on the hybrid you’re considering.

When you’ve found the vehicle you’re interested in, tell the dealer or private party you want to have it independently inspected. AAA Approved Auto Repair shops can perform a detailed inspection of a vehicle for under $100.

**USED EVs**

Electric vehicles have only been on the market since 2010, so the used EV market is much smaller and in a much greater state of flux. However, in the fall of 2015, a surplus of used EVs was reported, likely due to the return of EVs from two-and-three-year manufacturer-subsidized leases. Some of the vehicles (three-year-old Leafs, for example) were reported to hold their value at less than one-third their original price—which means that you may be able to get a very good deal on a used EV.

Now, if used EVs are worth buying, why would their value have dropped so much? In part because when they were new, they came with a $7,500 federal tax credit and perhaps some state incentives, so their current pricing reflects that. Also, EVs are considered less desirable by many buyers simply because gas prices were consistently low throughout 2015. Therefore, demand for them is lower.

Another factor: People are less familiar with EV technology and aren’t sure how reliable they’ll be. Here are some things to keep in mind when shopping for a used EV:

- First, have the EV inspected—in particular, have a battery-capacity test done to gauge its condition. Make sure all of the accessories work. Try to determine whether the car has been driven a lot in extreme heat or cold, which can affect battery life. (EV batteries are warranted against total failure for up to 10 years/150,000 miles, depending on the state you live in.)
- EVs require less maintenance, an additional perk. Here are some things to keep in mind when shopping for a used EV:
- First, have the EV inspected—in particular, have a battery-capacity test done to gauge its condition. Make sure all of the accessories work. Try to determine whether the car has been driven a lot in extreme heat or cold, which can affect battery life. (EV batteries are warranted against total failure for up to 10 years/150,000 miles, depending on the state you live in.)
- EVs are simpler vehicles, so many of the items that might wear out or fail on a gas-powered vehicle—clutch, transmission, fuel system—aren’t a concern. Therefore, total mileage driven isn’t as important a consideration as it might be with other kinds of vehicles. Similarily, EVs require less maintenance, an additional perk.
- Some early EV models lack a capacity for fast-charging. Determine how important this feature is to you before you buy. And some EVs (such as the Honda Fit EV and Toyota RAV4 EV) were produced only as compliance cars—that is, to satisfy government requirements for a specific number of zero-emissions vehicles—and have become EV orphans. You’re probably better off buying a used EV that’s still in production and that you know can be serviced where you live.

**BEST GREEN CARS FOR TEENS**

If you’re buying a car for your teen, a green car is an excellent choice. However, be aware that your teen might not agree with what you think is the best car. He or she might want something more sporty or performance-oriented. Get ready to put the brakes on that idea. AAA recommends a midsize sedan or crossover with a 4-cylinder engine, automatic transmission, and high crash-test scores. Here’s why:

- A midsize car is big enough to protect occupants in a crash but small enough for a new driver to handle easily.
- A 4-cylinder engine limits a car’s acceleration (and a teen’s desire to show off) and generally provides better fuel economy and a lower carbon footprint.
- Cars with automatic transmissions are easier to drive, allowing teens to focus on steering, proper speed, and braking.
- Traffic crashes are the leading cause of teen deaths, so a car with a high crash-test score could save your teen’s life or reduce the chance that they’ll be seriously injured in a crash.

Based on these criteria and the scores from this year’s reviews, the Top 10 green cars for teens in the 2016 AAA Green Car Guide are:

1. Subaru Outback
2. Volkswagen Passat
3. Subaru Legacy
4. Subaru Forester
5. Honda Accord
6. Lexus NX 300h
7. Toyota Camry Hybrid
8. Lexus ES 300h
9. Mazda Mazda 3 Grand Touring
10. Hyundai Sonata Eco
A 2016 Toyota Prius negotiates the SLALOM COURSE at the Auto Club Speedway in Fontana, California.

The Automobile Club of Southern California’s Automotive Research Center (ARC) has tested and reviewed green vehicles and published the results in the AAA Green Car Guide since 2010. During that time, there has been a tremendous increase in the number of green makes and models, as automakers attempt to meet federal Corporate Average Fuel Economy (CAFE) standards and increasingly stringent smog-forming-emissions standards (see Chapter 1).

The ARC staff actively monitors the car-buying market and green technology to stay current with the latest fuel-efficient and alternative-powered vehicles. ARC engineers and technicians evaluate available vehicles that meet the testing criteria using independent, objective testing procedures. Evaluations are performed at the ARC facility, on Southern California roads, and at the Auto Club Speedway in Fontana, California.

For a vehicle to be included in the Guide, it must have at least one of the following characteristics. It must be a:
- zero-emissions (ZEV) or partial-zero-emissions (PZEV) vehicle
- hybrid or plug-in hybrid vehicle
- battery-electric vehicle
- diesel vehicle that meets California emissions standards
- vehicle that runs on compressed natural gas (CNG)
- vehicle that runs on hydrogen
- vehicle with EPA category-leading fuel economy

For the category-leading fuel-economy group, the ARC staff chooses the leading internal-combustion, gasoline-powered vehicles from the categories established by the EPA and published on its website, fueleconomy.gov.

For example, ARC staff tested a 2014 Mazda Mazda3 sedan two years ago. No significant changes were made to its powertrain for 2015 or 2016, so the 2014 model’s ranking was recalibrated based on the scores of other cars evaluated for 2016.

Based on its research, the ARC compiles a list of potential vehicles to be tested in the current year. ARC staff then ask automakers to lend test vehicles. Manufacturers don’t always have the vehicles needed for testing, either because they’re not yet in press fleets or they’re otherwise not available. If the ARC is unable to acquire a vehicle from a manufacturer, it attempts to acquire vehicles from rental companies and other sources.

The ARC makes every attempt to acquire a vehicle or powertrain that fits within the Guide guidelines. If a vehicle isn’t included in the review section, it’s because the ARC wasn’t able to acquire it by the publishing deadline.

SCORING

After the ARC completes vehicle testing, it ranks the scores for each test area on a zero- to 10-point basis. The best-scoring vehicle receives 10 points, and the lowest receives zero points. Then the scores from all of the tests for a particular vehicle are totaled to determine its overall score. The max possible score is 130.

Next, we divide the point difference between the highest- and lowest-scoring vehicles into nine equal units. We then assign each vehicle a Leaf score (1 to 5 leaves, in half-leaf increments, with 5 being the best) based on where it falls in the unit ranking.
The following are the 13 criteria that ARC staff use to evaluate and score vehicles:

**EMISSIONS SCORE.** A vehicle’s emissions score is taken directly from the EPA’s ratings, which gives every vehicle a score of 1 through 10 (with 10 being the best), determined by the vehicle’s emissions levels. The emissions score is the equivalent of the EPA’s smog rating, which is found on all vehicle window stickers. All vehicles have a federal rating. All vehicles sold in California also must pass California exhaust-emissions standards. So, most vehicles will have both a California and a federal rating, although the EPA window sticker shows only the federal rating.

In some cases, automakers send dealers in California (and the other states that share the same emissions standards) vehicles that produce lower exhaust emissions than vehicles sold in other states. For example, Subaru’s vehicles meet California Air Resources Board PZEV standards. The AAA Green Car Guide uses the federal rating in its calculations, unless the vehicle is one with a dualtrain configuration sold only in California.

**CRASHWORTHINESS.** A vehicle’s crashworthiness score is calculated based on the weight of the vehicle and the number of air bags. Typically, each vehicle is weighed on a public scale with a full tank of gas and no occupants. In some cases, the weight is obtained from the manufacturer. The maximum score based on weight is five points. A vehicle is also awarded points based on its number of air bags, with a maximum of five points. The number of air bags in our scoring often differs from what’s reported by the manufacturer. For example, a manufacturer typically counts a full side-curtain air bag as one air bag, but because it protects both the front and rear passengers, the ARC counts it as two.

**BRAKING.** The braking score is based on recorded stopping distances measured by an optical fifth wheel (a device used to measure time, distance, and speed) attached to vehicles when testing them at the Auto Club Speedway. The braking-distance score is the average of three sudden-stopping distances from 50 to zero mph.

**ACCELERATION.** A vehicle has an acceleration score based on the zero-to-60 mph and 40-to-60 mph elapsed times, which are measured using the optical fifth wheel. A total of 12 acceleration tests per vehicle at each speed are performed on the drag strip at the Auto Club Speedway. The right and left turning radiuses are measured, and the average becomes the Turning Circle. The vehicle with the largest circle receives a score of zero, and the one with the smallest circle receives a 10. All other vehicles are then scored relative to these minimum and maximum cubic-feet values.

**FIFTH WHEEL.** In some cases, the weight is obtained from the manufacturer. For example, a manufacturer typically counts a full side-curtain air bag as one air bag, but because it protects both the front and rear passengers, the ARC counts it as two.

**HANDLING.** The handling score consists of three parts, each based on a slalom-course evaluation. A minimum of two ARC evaluators drive a vehicle through the slalom course at least six times each. The average of the top three slalom times overall is used to obtain the slalom time for that vehicle. The two other subscores (worth 1 point each) that make up the overall handling score are derived from subjective ratings of control and ease of operation.

**ROOMINESS.** This score is based on measurements for leg, head, and shoulder room in the front and rear seat—a total of 10 possible points. After all vehicles have been tested, the minimum and maximum values for each attribute are calculated. The vehicles are then scored relative to the other vehicles in the Guide. Legroom and headroom can receive a maximum of two points, and shoulder room can receive up to one point.

**FUEL ECONOMY.** The ARC uses EPA estimates of mpg, which account for weight of the vehicle and for vehicles such as hatchbacks, the area behind the second seat. In most cases, this number is taken from the current EPA Fuel Economy Guide. The vehicle with the smallest cargo capacity is given a zero, and the vehicle with the largest capacity is given a 10. All other vehicle scores are then rated relative to these minimum and maximum cubic-feet values.

**INTERIOR NOISE.** This measurement is derived from subjective scores of eight ride qualities: bump-impact noise, bump-impact feel, dip response, body shake (smooth road), body shake (rough road), ride firmness, sway (pitch), and sway (rolling). Each ARC evaluator rates the vehicles using scores from zero to 10 for each attribute. The overall average is the ride-quality score.

**CARGO CAPACITY.** This refers to the trunk area, or for vehicles such as hatchbacks, the area behind the second seat. The minimum and maximum values for each attribute are calculated. The vehicles are then scored relative to the other vehicles in the Guide. Legroom and headroom can receive a maximum of two points, and shoulder room can receive up to one point.

**EASE OF ENTRY AND EXIT.** The driver’s seat of the vehicle is set to the comfort level of each evaluator, who then rates 11 attributes associated with the difficulty of exiting and entering the vehicle’s front and rear seats. The vehicle is also given a score based on the door swing or door angle. The average of the two overall ratings (front and rear) given by each evaluator becomes the overall score, on a scale from zero to 10.

**TURNING CIRCLE.** A vehicle’s turning circle is measured at the Auto Club Speedway. The right and left turning radiuses are measured, and the average becomes the turning circle. The vehicle with the largest circle receives a score of zero, and the one with the smallest circle receives a 10. All other vehicles are then scored relative to these minimum and maximum radiuses.

**INTERIOR NOISE.** ARC evaluators measure interior noise with a decibel meter inside the vehicle at idle, at steady-state 30 mph, at steady-state 55 mph, and during an acceleration run from zero to 60 mph.

**ROOMINESS.** This score is based on measurements for leg, head, and shoulder room in the front and rear seat—a total of 10 possible points. After all vehicles have been tested, the minimum and maximum values for each attribute are calculated. The vehicles are then scored relative to the other vehicles in the Guide. Legroom and headroom can receive a maximum of two points, and shoulder room can receive up to one point.

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WHAT’S ON THE HORIZON?

In the coming years, carmakers will offer an increasing number of green vehicles in a variety of body styles and powertrains. The following pages describe green cars that will become available later in 2016 or at some point in the next several years.
Over the course of the next decade and beyond, green cars will continue to evolve. In the next few years, trends will include:

- Further improvements to **traditional gasoline-fueled engines**, including greater use of direct fuel injection, engine stop-start systems, and turbocharging.

- More **hybrid vehicles**, especially more plug-in hybrids—including some that use alternative fuels such as diesel, hydrogen, or natural gas. European automakers known more for luxury and performance cars, including Audi, Porsche, and Mercedes-Benz, are developing hybrids and plug-in hybrids and plan to release significant numbers of them by 2020.

- More **EVs**, from both relatively new car companies, such as Atieva and Faraday Future, and from established carmakers. European automakers are also taking an interest in EVs. Lower battery prices and improvements in battery-pack capacity will continue to spur the trend.

- More **diesel vehicles**—despite the VW diesel scandal (see “Dieselgate,” page 25)—especially from European automakers, including BMW, Mercedes-Benz, and Volvo.

- More **hydrogen-powered vehicles**.

The mid- to long-term picture isn’t as certain. Only about 5 percent of the cars currently on U.S. roads have alternative powertrains (i.e., hybrids, PHEVs, EVs). The vast majority of the U.S. vehicle fleet for the foreseeable future will be traditional gasoline- or diesel-powered vehicles, mainly because petroleum-based fuels are relatively cheap and the infrastructure to deliver them is so well established. In addition, because the average age of U.S. vehicles is more than 11 years, it will take a long time for green vehicles to replace traditional ones.

Nevertheless, because of government mandates to increase fuel economy and further reduce emissions, green automotive technologies—including those using advanced ICEs—will continue to develop and gain ground.
HYBRIDS (CONT.)

Nissan Rogue Hybrid

A hybrid version of Nissan’s popular Rogue compact crossover is slated to go into production in spring 2016 and may be available for sale as early as the summer. It will incorporate a 2.0-liter, 4-cylinder, 141-hp engine; a 30-kW electric motor; a CVT; and a lithium-ion battery pack—a variant on the system used in the discontinued Nissan Pathfinder hybrid. The Rogue hybrid will be offered only in the two higher trim levels, SV and SL, with a base price of just over $28,000, nearly $3,000 higher than a comparable gasoline-powered Rogue. Both FWD and AWD will be offered. Fuel economy numbers are expected to be about 48 mpg combined.

PLUG-IN HYBRIDS

BMW 330e

BMW’s 3 Series plug-in, the 330e, features a twin-turbo, 2.0-liter, 4-cylinder, 180-hp engine; an 87-hp electric motor; a 7.6-kWh lithium-ion battery pack; and an 8-speed automatic transmission with paddle shifters. Total horsepower is 248. The automaker claims a 0-60 time of 5.9 seconds, an all-electric range of 22 miles, and a total range of around 370 miles. The 330e will be in dealer showrooms in spring 2016.

BMW 740e xDrive

BMW’s flagship 7 Series PHEV shares a powertrain with the automaker’s X5 plug-in hybrid: a twin-turbo, 2.0-liter, 4-cylinder, 260-hp engine; a 95-hp electric motor; a 9.9-kWh lithium-ion battery housed beneath the backseat; xDrive; and an 8-speed shiftable automatic transmission. Combined system output is 326 hp. The all-electric range is 23 miles at speeds up to 75 mph. The 740e xDrive will be available in summer 2016.

Cadillac CT6

Cadillac’s flagship, the all-new CT6, has a plug-in hybrid variant that combines a turbocharged, 2.0-liter, 4-cylinder engine; two 100-hp electric motors; an eCVT; and an 18.4-kWh battery pack—larger than that of most PHEVs. Total output is 335 hp and 432 lb-ft of torque. The CT6 PHEV will have rear-wheel drive and can travel about 30 miles at up to 75 mph in all-electric mode. Its 0-40 time is estimated at 5.3 seconds and, according to Cadillac, fuel economy will exceed 65 MPGe. Recharge time is approximately five hours at 240 volts. The CT6 should arrive at dealers late in the third quarter of 2016.

Chrysler Pacifica

Chrysler has dropped the Town & Country name and resurrected the Pacifica moniker for its 2017 model year minivan, one iteration of which will be the first hybrid minivan—plug-in or otherwise—for sale in the U.S. The Pacifica minivan uses a 3.6-liter V6, a twin-electric motor configuration, and a 16-kWh battery pack to produce 260 hp total. Chrysler claims a city MPGe of 80, a two-hour recharge time on 240 volts, and an all-electric-only range of 30 miles. The gasoline-powered Pacifica will go on sale in spring 2016, the PHEV in the latter half of the year.

Kia Optima Plug-in Hybrid

Kia’s first Optima Plug-in hybrid, based on the redesigned 2016 Optima sedan, will arrive in the U.S. in the latter half of 2016. It will have a 2.0-liter, 4-cylinder, 154-hp engine; a 67-hp electric motor; a 6-speed automatic transmission; a 9.8-kWh lithium polymer battery pack; and a 202-hp total power output. All-electric range is expected to be about 27 miles, with fuel-economy ratings of about 40 mpg combined and 94 MPGe. The Optima PHEV will fully charge in less than three hours with a 240-volt charger or in nearly nine hours on a 120-volt power outlet.
PLUG-IN HYBRIDS (CONT.)

Mercedes-Benz C350e

The Mercedes-Benz C350e plug-in hybrid will use the C300’s turbocharged, 4-cylinder, 204 hp engine with an 80-kW electric motor for a total power output of 275 hp. Other drivetrain components include a 7-speed automatic transmission and a water-cooled 6.24-kWh lithium-ion battery. A choice of five transmission modes (Individual, Sport, Sport Plus, Comfort, and Econ) and four engine modes (Hybrid, E-Max, E-Save, and Charge) are available. Up to 19 miles of electric-only driving is possible; the 0-40 mph time is 5.9 seconds. Top speed in electric mode is 80 mph, and overall top speed is 130 mph. The C350e initially will be produced with 4WD only.

Mercedes-Benz GLC350e

The GLC replaces the GLK Class in Mercedes’ lineup with a new selection of compact SUVs, one of which is the GLC350e PHEV. It’s powered by a turbocharged, 4-cylinder engine and a 112 hp electric motor that produce 320 total hp and 473 lb-ft of torque; 0-60 mph takes just under 6 seconds. Other drivetrain components include a 7-speed transmission and an 8.7 kWh lithium-ion battery pack. AWD is standard. Electric-only range is estimated at 20 miles, charging time should be about four hours at 240 volts. The GLC350e will likely be in dealer showrooms in late 2016 or early 2017.

Mercedes-Benz GLE550e

The GLE Class replaces the venerable M Class, and a new plug-in hybrid SUV, the GLE550e, debuts in spring 2016 only in ZEV states (California, Connecticut, Maine, Maryland, Massachusetts, New Jersey, New York, Oregon, Rhode Island, and Vermont). It’s powered by a twin-turbo, 3.0 liter, V6 good for 329 hp; a 116 hp electric motor; a 7-speed automatic transmission; and an 8.8 kWh lithium-ion battery pack. Total output is 463 hp, with 479 lb-ft of torque. AWD is standard. Driving range on electricity alone is estimated at about 20 miles, and recharge time is expected to be two hours on 240 volts or four to five hours on 120 volts.

PLUG-IN HYBRIDS (CONT.)

Mitsubishi Outlander

The Outlander PHEV crossover is equipped with a 2.0-liter 4-cylinder gasoline engine and two 80 hp electric motors (one at the front of the vehicle and another at the rear). Its electric motors provide the Outlander with full-time 4WD and are powered by a 12.4 kWh lithium-ion battery. In its EV mode, it has a range of about 25 miles and a top speed of 70 mph. The Outlander PHEV went on sale in Japan and Europe in 2013, where it has sold well. But its entry into the U.S. has been delayed repeatedly. At press time, it was scheduled to arrive in late summer 2016, as a 2017 model, with the same styling as the redesigned 2016 non-hybrid Outlander.

Volvo S90 T8 Twin Engine

Volvo unveiled its new luxury flagship sedan, the S90, at the 2016 Detroit auto show in January, highlighting a hybrid powertrain option—essentially the same drivetrain found on the redesigned XC90 T8, which went on sale in the U.S. in fall 2015: a 2.0-liter, 4-cylinder gasoline engine, a turbocharger and a supercharger, a 48 hp starter motor that acts as an engine booster, a rearmounted 82 hp electric motor that drives the rear wheels in electric and power-boost modes; an 8-speed automatic transmission; and a 9.2 kWh lithium-ion battery pack. Total power output is 400 hp; the claimed all-electric range is up to 25 miles. The S90 will be offered only in AWD.

EVs

Chevrolet Bolt

Chevy introduced the production version of its much-anticipated Bolt EV at the Consumer Electronics Show in Las Vegas in January, where GM Chairman and CEO Mary Barra said it would deliver on the promise of long range (200 plus miles) at an affordable price ($37,500 before incentives). The Bolt’s in-floor battery, likely rated at 30-40 kWh, can be charged to 80 percent capacity within 60 minutes using a DC fast charger. Built in Michigan, the Bolt is scheduled to begin production in October; first deliveries may happen by the end of the year.
BUT WAIT, THERE’S MORE …

The 2016 AAA Green Car Guide provides detailed data and reviews of 81 fuel-efficient or low-emission cars and light trucks, but we weren’t able to test every vehicle. The following are snapshots of more green cars currently on the market.

NONHYBRID HIGH MPG

Chevrolet Cruze

Worldwide, the compact Cruze is Chevy’s best-seller, and the automaker has completely revamped it for 2016. It features a turbocharged 1.4-liter, 4-cylinder engine with direct injection that puts out 153 hp. Stop-start engine technology and a 6-speed manual transmission are standard; a 6-speed automatic is optional. EPA-estimated fuel economy is 30 city/42 highway/35 combined. A new Cruze hatchback is scheduled to go on sale in fall 2016, and the Cruze Diesel returns in 2017.

Chevrolet Malibu

Chevy’s venerable midsize sedan has been completely redesigned for 2016. The Malibu’s most fuel-efficient powertrain can be found on the L, LT, and LTZ trim levels: a turbocharged, 1.5-liter, 4-cylinder Ecotec engine producing 160 hp and 181 lb-ft of torque, teamed to a 6-speed automatic transmission. An engine start-stop system is also standard and contributes to commendable EPA fuel-economy numbers: 27 city/37 highway/31 combined.

Ford Escape

Ford’s remodeled Escape—its best-selling vehicle next to the F-150 Series—goes on sale in summer 2016. It features two new engines; the most fuel efficient of which is the 1.5-liter, 4-cylinder Ecoboost. The aluminum-block, twin-cam engine is projected to deliver 180 hp and 181 lb-ft of torque, comparable to the 1.6-liter engine it replaces. Automatic engine stop-start technology is standard on all Escape models.

EVs (CONT.)

Tesla Model 3

On March 31, Tesla unveiled its “mass market” EV, the Model 3. According to the automaker, the Model 3 will list for $35,000 before incentives, have a range of 215 miles, seat 5 adults, go from 0-60 in under 6 seconds, incorporate Autopilot hardware, and be Supercharger-capable. Deliveries are slated to begin in late 2017. Within a week, 325,000 enthusiasts had plunked down a $1,500 deposit to reserve one.

DIESEL VEHICLES

Mercedes-Benz GLC300d

In fall 2016 or early 2017, look for a diesel version of the new Mercedes GLC Class. It will have the same 2.1-liter turbo BlueTec engine found in the C Class and E Class, which puts out 195 hp and 369 lb-ft of torque. Available in either RWD or 4MATIC, it will be equipped with a 9-speed automatic transmission instead of a 7-speed.

HYDROGEN FUEL-CELL VEHICLES

Honda Clarity Fuel Cell

The new Honda Clarity Fuel Cell is equipped with a fuel-cell stack 33 percent more compact than the one in its predecessor, the Honda FCX Clarity, but with a 60 percent increase in power density. The fuel-cell powertrain fits entirely under the car’s hood, allowing for five-passenger seating. Its driving range is expected to be more than 300 miles, with a refueling time of about three minutes. Honda will deliver the Clarity Fuel Cell in late 2016 to select California dealers, starting in Los Angeles and Orange counties, the San Francisco Bay Area, and Sacramento. The price will be about $60,000. Eventually, as hydrogen refueling networks expand, the Clarity will be available in other areas of California as well as in other states.
Hyundai Elantra Eco

Hyundai released the 2017 edition of its best-selling car, the Elantra, in January 2016. However, the greenest Elantra, the new Eco sedan, will hit dealer showrooms in spring. It features a new direct-injected, turbocharged, 1.4-liter, 4-cylinder engine that produces 128 hp and 156 lb-ft of torque. It will be paired with a new 7-speed automatic transmission. Hyundai estimates the Elantra Eco will return 35 mpg in combined city/highway driving.

Hyundai Tucson

The third generation of Hyundai's popular compact crossover, the Tucson, went on sale in summer 2015. The Tucson Eco FWD is equipped with a new turbocharged, 1.6-liter, direct-injected, 4-cylinder engine that produces 175 hp and 175 lb-ft of torque paired with a 7-speed automatic transmission. EPA fuel-economy numbers are 26 city/33 highway/29 combined, an improvement of 5 mpg over the previous 2.4-liter engine.

HYBRIDS

Audi Q5 Hybrid

Audi's Q5 Hybrid receives power from a turbocharged, 2.0-liter, 4-cylinder engine and a 54-hp electric motor that combine to generate 245 hp and 354 lb-ft of torque. An 8-speed Tiptronic automatic transmission and battery pack round out the powertrain. Audi estimates the Q5 Hybrid's 0-60 mph time at 6.8 seconds. EPA-estimated fuel economy is 26 mpg combined.

Lincoln MKZ Hybrid

Introduced in 2013, the midsize Lincoln MKZ Hybrid receives a complete facelift for the 2017 edition, which will go on sale in summer 2016. However, the hybrid powertrain from the 2016 version will carry over a 2.0-liter 4-cylinder engine rated at 141 hp and 129 lb-ft of torque linked to a 118 hp electric motor, CVT, and 1.4-kWh lithium-ion battery. Total system power is 188 hp and 200 lb-ft of torque. The vehicle has an EPA-estimated mpg rating of 41 city/39 highway/40 combined.

BMW ActiveHybrid 5 Series

BMW's 5 Series hybrid features a turbocharged, 3.0-liter, inline 6-cylinder engine rated at 300 hp; an 8-speed Steptronic automatic transmission; and a 35-hp rear-drive electric motor powered by a 120-volt lithium-ion battery. Together, the gasoline engine and electric motor produce 335 hp and 332 lb-ft of torque. Combined fuel economy is 26 mpg. The BMW ActiveHybrid 3 and 7 Series have been discontinued.

Infiniti Q50 Hybrid, Q70 Hybrid

Both the midsize Infiniti Q50 Hybrid and full-size Q70 Hybrid (pictured) are equipped with a 3.5-liter, V6 engine, a 50-kW electric motor, a lithium-ion battery, and a 7-speed automatic transmission. The powertrain produces 360 hp. Both earn a combined fuel-economy rating of 31 mpg.
**HYBRIDS (CONT.)**

**Kia Optima Hybrid**

The Kia Optima sedan was completely redesigned for 2016, but the 2016 Optima Hybrid series was unchanged from 2015. It features a 2.4-liter 4-cylinder, 159-hp gasoline engine paired with a 67-hp electric motor, a 6-speed automatic transmission, and a lithium-polymer battery pack. Combined power output is 199 hp and 270 lb-ft of torque. EPA fuel economy is 38 mpg combined for the base model and 37 mpg combined for the heavier EX trim level. The next-generation Optima Hybrid will likely go on sale later in 2016.

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**PLUG-IN HYBRIDS**

**BMW X5 xDrive40e**

BMW’s plug-in hybrid has a powertrain with a twin-turbo, 2.0-liter 4-cylinder, 245-hp engine, a 95-hp electric motor, a 9.9 kWh lithium-ion battery housed underneath the luggage compartment, xDrive, and an 8-speed automatic transmission. Top speed under electric power is 75 mph; the electric-only range is up to 20 miles. The 0-60 mph time is 6.5 seconds. The X5 eDrive has three selectable driving modes: Intelligent hybrid drive (Auto eDrive), pure electric (Max eDrive), and Save Battery to maintain the current charge level.

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**Mercedes-Benz S550e**

The Mercedes-Benz S550e plug-in hybrid’s drivetrain consists of a twin-turbo, 3.0-liter V6, 329-hp engine, a 114-hp electric motor, a 7-speed automatic transmission, and a water-cooled 8.7 kWh battery pack capable of powering the car for up to 12 miles on electricity alone. Total output is 442 hp. Charging on 240 volts takes about three hours; on 120 volts, about seven. The S550e’s top speed is 155 mph. Mercedes claims the S550e can accelerate from 0-60 in 5.2 seconds. Fuel economy numbers are 26 mpg combined and 87 mpg combined.

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**Porsche Panamera S E-Hybrid, Cayenne S E-Hybrid**

The Panamera S E-Hybrid (pictured) combines a supercharged, 333-hp V6 and a 95-hp electric motor to produce a vehicle with 416 hp; the engine and motor are mated to an 8-speed automatic transmission. In all-electric mode, the Panamera S E-Hybrid has a range of 15-20 miles. The battery can be fully recharged in 2.5 hours on 120 volts. EPA-estimated combined fuel-economy numbers are 51 MPG and 25 mpg. The same basic drivetrain is used in the Cayenne S E-Hybrid SUV, with similar performance figures. AWD is standard.

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**Hyundai Sonata Plug-in Hybrid**

The all new Hyundai Sonata Plug-in hybrid, which went on sale in fall 2015, is powered by a direct-injected, 2.0-liter 4-cylinder gasoline engine rated at 154 hp; an updated 6-speed automatic transmission; a 51-hp electric motor; and a 8.9 kWh lithium-ion polymer battery pack. Total power output is 193 hp. The Sonata PHEV has an all-electric range of up to 24 miles. The combined EPA fuel-economy rating in electric mode is 99 MPGe and 40 mpg combined when running as a hybrid. On a 240 volt charging station, recharging time is 2.5 hours, on a 120 volt outlet, about nine hours.

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**Volvo XC90 T8 Twin Engine**

Volvo redesigned its venerable XC90 7 passenger SUV, which includes a new plug-in hybrid variant, the XC90 T8 Twin Engine. It’s equipped with a 2.0-liter 4-cylinder gasoline engine, a turbocharger and supercharger, a 455-hp starter motor, a rear-mounted 80-hp electric motor; an 8-speed automatic transmission; and a 9.2 kWh lithium-ion battery pack. Total power output is 400 hp. The claimed all-electric range is up to 25 miles. The XC90 went on sale in fall 2015. EPA fuel-economy numbers are 25 mpg combined and 83 MPGe combined.
**EVs**

**Mercedes-Benz B250e Electric Drive**

Mercedes-Benz B250e EV is a compact upscale FWD four- or five-passenger hatchback with a powertrain supplied by Tesla that combines a 177-hp electric motor with a 28-kWh lithium-ion battery housed under the vehicle’s floor. Range is estimated at 87 miles, and a two-hour recharge is good for another 60 miles. It’s now available only in California, Connecticut, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Oregon, Rhode Island, and Vermont.

**Tesla Model X**

The Model X is a three-row, seven-passenger crossover. Based on the Model S platform, the Model X is available with a 90-kWh battery pack, has a maximum estimated range of 230 miles, and can accelerate from 0-60 mph in 3.2 seconds in Ludicrous mode. Among the car’s noteworthy features are rear “Falcon wings” kind of hinged gullwing doors, dual-motor AWD, and front and rear trunks. The Model X has a 5,000-pound towing capacity. Tesla began delivering the Model X to customers in late 2015.

**DIESEL VEHICLES**

**BMW 535d**

BMW’s 5 Series added a diesel-powered variant, the 535d, to its lineup in 2014. It features a turbocharged, 3.0-liter, 6-cylinder engine that produces 255 hp and 475 lb-ft of torque paired with an 8-speed automatic transmission. Engine stop-start is standard. EPA-estimated fuel economy is 20 mpg combined for the RWD and AWD sedans.

**Mercedes-Benz C300d 4MATIC**

The C300d, new for 2016, has a turbocharged, 2.1-liter, 4-cylinder diesel engine (the same one as in the E Class) that puts out 195 hp and 369 lb-ft of torque. The C300d comes with a 7-speed automatic transmission and AWD only. The mpg figures will likely be somewhat better than the E250’s EPA-rated 27 city/38 highway/31 combined mileage.

**New to BMW’s extensive diesel lineup for 2015 was the 740Ld xDrive, equipped with a turbocharged, 3.0-liter, 6-cylinder, 255-hp diesel engine that puts out 413 lb-ft of torque, an 8-speed automatic transmission, and AWD. EPA-estimated fuel economy is 26 mpg combined.**

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HYDROGEN FUEL-CELL VEHICLES

Toyota Mirai
Toyota began selling and leasing its mid-size four-passenger fuel cell sedan, the Mirai, in California in late 2015 as a 2016 model. The powertrain consists of a 114 kW fuel cell stack, a 153 hp electric motor generating 247 lb-ft of torque, and a 1.6-kWh lithium-ion battery pack. The Mirai has a range of 300 miles and has a 94 MPGe rating from the EPA. Toyota provides free hydrogen fuel for three years and warranties the powertrain for eight years/100,000 miles. Initially, the Mirai will be available only in California.

DIESEL VEHICLES (CONT.)

Mercedes-Benz GLE300d
The GLE is the former Mercedes M Class of midsize SUVs, nearly named and updated. A multitude of powertrains are available. The GLE300d has a turbocharged, 2.1-liter, 4-cylinder diesel engine that puts out 201 hp and 369 lb-ft of torque coupled with a 7-speed automatic transmission. EPA-estimated mpg numbers are 22 city/24 highway/24 combined.

Mercedes-Benz GLS350d
Last redesigned in 2013, the largest of Mercedes SUVs, the seven-seat GL Class, has been renamed and updated mechanically and cosmetically as the GLS Class. The 2017 diesel version, the GLS350d, is outfitted with a turbocharged, 3.0-liter V6 that makes 255 hp—15 more than previously—and 455 lb-ft of torque. A 9-speed automatic transmission and 4MATIC are standard. The 2017 GLS Class went on sale in March 2016.

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Green technology is still relatively new, and green vehicles (besides gasoline-powered models with advanced ICEs) are moving from niche to mainstream markets. Many people still have unanswered questions about green vehicles, including concerns about safety.

**ARE GREEN CARS SAFE?**

People concerned with green car safety generally want to know whether a particular alternative powertrain poses a safety hazard. They want to know things like: Will I be electrocuted if I crash in a hybrid or an EV? Will a vehicle powered by natural gas explode if it’s in a collision? Will hydrogen fuel-cell cars catch fire?

Not to worry. All vehicles sold in the U.S., regardless of their fuel source, must meet crash-test standards developed by the National Highway Traffic Safety Administration (NHTSA). The Insurance Institute for Highway Safety (IIHS), an independent safety-research group funded by auto insurers, performs similar crash testing on new cars.

Both organizations conduct tests under controlled conditions that simulate real-world car crashes, including front, rear, and side-impact collisions, a vehicle’s propensity to roll over, and roof-strength tests. Using these tests, they determine a vehicle’s structural integrity and how well it protects its occupants. New cars are not legally obligated to meet IIHS standards, but automakers take IIHS results very seriously and typically fix cars that do poorly on IIHS tests.

Go to nhtsa.gov and iihs.org to learn more about crash-testing and to watch videos about how the tests are carried out. Crash-test ratings from one or both organizations are included in individual car reviews in this Guide.

Green vehicles have fared well in NHTSA’s and IIHS’s testing. None has proved deficient in terms of safety when compared with its conventional counterpart; in fact, safety ratings of some green cars have even surpassed them. For example, in 2013, the Tesla Model S received a five-star safety rating and was ranked as one of the safest cars ever tested by NHTSA. The machine that was used to test roof strength actually broke after applying more than four times the force of gravity to the Model S’s roof.
Let's consider the safety of the various alternative powertrains:

**HYBRIDS, PLUG-IN HYBRIDS, AND ELECTRIC VEHICLES**

We can group these three classes of green cars together because they all have large electric batteries that provide them with power. Concerns about the safety of hybrids or EVs has focused mostly on whether the electric batteries would catch fire or explode through overheating in daily use or after a crash, whether the car’s occupants could be electrocuted in a car crash, or whether safety personnel could be electrocuted when responding to a crash.

Manufacturers have designed hybrids and EVs to minimize the possibility that such events will occur. For example, they typically encase the batteries in a protective covering and locate them under the floor in the front section of EVs have relatively big crumple zones with air or liquid to prevent them from overheating. The batteries also reduce the chance of damage to the battery. Because they must meet stringent industry and governmental safety standards, they’re built to withstand severe impacts and high temperatures far beyond what a CNG vehicle would encounter in everyday use.

**HYDROGEN FUEL-CELL VEHICLES**

Cars powered by hydrogen fuel cells are the latest emerging green technology. Only a few hundred such cars are currently on the road.

Concerns about hydrogen fuel-cell cars catching fire or blowing up are unfounded. “Fuel-cell electric vehicles (FCEVs) have essential safety systems designed to protect passengers and first responders in case of an accident,” states the California Air Resources Board (CARB). The fuel-cell stack and high-voltage battery packs are sealed separately in metal cases that are insulated from the vehicles’ metal body. Other safety systems include color-coded high-voltage circuits, fuel tanks that are double the required strength, and sensors to alert occupants to any problems with the fuel system.

In addition, FCEVs have been involved in real-world collisions without major incident. For example, Hyundai states that its Tucson FCEV “has been subjected to extensive safety testing, including destructive and nondestructive evaluations at the component, system, and vehicle level.” The Tucson Fuel Cell has undergone crash tests for offset frontal, side, and rear-impact, as well as fire tests. Also, in the event of a crash, [impact] sensors stop the release of hydrogen from the tanks.”

In sum, green cars are safe for several reasons:

- In some cases, alternative fuels are themselves safer than gasoline.
- Where an alternative power source might pose a special risk, carmakers have taken precautions to protect drivers and passengers both in daily driving and in the event the vehicle becomes involved in a crash.
- Testing by organizations such as NHTSA and IHS has uncovered no specific risks where green cars are concerned.
- Green cars have proven themselves as safe as conventional vehicles in millions of miles of real-world driving.

**ADVANCED DRIVER-ASSIST SYSTEMS**

The way a vehicle is constructed is essential to the safety of its occupants in a collision, but genuine safety involves much more. Of critical importance are any number of features that have been developed and adopted, such as— to go back a few decades—seatbelts and air bags, which are considered important enough in saving lives and preventing injuries that they’re mandatory in all U.S. passenger vehicles.

In recent years, however, technology has taken a more active role, not just in protecting a vehicle’s occupants during or after a collision, but in helping prevent collisions from occurring in the first place, or at least reducing their severity. These electronic systems, most of which currently are optional rather than standard equipment, are known collectively as advanced driver-assist systems, or ADAS. Such systems can be found on a variety of green vehicles, from the luxury-class Tesla Model S to the entry-level Sion A.

Examples of ADAS include blind-spot monitoring, lane-keeping assist, and adaptive cruise control, which are described later in this chapter. These systems act as a safety net, preventing driver error by alerting drivers to possible dangers, such as cars in adjacent lanes that are in a driver’s blind spot. In other cases, they reduce the effects of mistakes drivers have already made—such as not noticing that they’re about to crash into a vehicle in front of them—by taking temporary control of the vehicle. In doing so, they also make driving more convenient and less stressful.

ADAS typically appear first on high-end vehicles, but they soon migrate down to midpriced and even lower-priced vehicles. Many features are now available on almost every model in a manufacturer’s lineup. For example, the 2016 Scion iA—which has a base price under $18,000—comes with a standard low-speed collision-avoidance system.

Blind-spot monitoring with cross-traffic alert is available on a 2016 Mazda Mazda3 with an MSRP of about $21,000, blind-spot monitoring, lane-departure warning, and lane-keeping assist on a 2016 Ford Fusion costing about $28,000, and Subaru’s effective EyeSight collision-avoidance system on an entry-level Impreza costing about $26,000. Note that the cost of each of these three vehicles is well below the $34,000 price of the average new car.

The following are some examples of ADAS that you can order on green cars right now. The terms used are general categories; individual automakers’ systems will vary and may use slightly different nomenclature. In this year’s Guide, we’ve included available advanced safety features for each of the vehicles in our reviews section.

**REARVIEW CAMERA**

Rearview cameras are hardly new technology. They’re an important safety feature, and they’ll be required equipment on all new cars sold in the U.S. as of May 2018. But some interesting variations have appeared recently that are worth noting. For example, the Ford F-150, Infiniti Q50, and Mercedes-Benz GLC300 offer the option of a camera that give a bird’s-eye view of what’s happening all around the vehicle.
BLIND-SPOT MONITORING

Blind-spot monitoring (BSM) uses radar technology in your car’s rear quarter panels to detect cars that are in adjacent lanes beside and behind your vehicle. The system alerts you so that you don’t make an unsafe lane change and collide with another car. When a car is in your blind spot, a small icon—typically in your car’s side mirror—lights up. If you activate a turn signal while a vehicle is in your blind spot, the light flashes. Sometimes a warning tone sounds as an added alert.

Some systems use cameras to show you what’s going on in your car’s blind spots. With Honda’s LaneWatch, when you activate the right-turn signal, the center screen on the dashboard displays an image of what’s happening on the right side of the car.

BSM may also be paired with a rear cross-traffic alert (RCTA) function, which is useful when you’re backing out of a parking spot. When your car is in reverse, the system flashes a warning signal in the side mirror and sounds a warning tone to alert you if a vehicle approaches from the left or right.

LANE-DEPARTURE WARNING/ LANE-KEEPING ASSIST

Typically using cameras or sensors mounted near the rearview mirror, lane-departure warning (LDW) and lane-keeping-assist (LKA) systems read road markings such as painted lines and raised markers to help you stay in your lane. If your vehicle starts to drift out of its lane, LDW alerts you with a sound, a flashing icon on the instrument panel, a pulsing or vibration in the steering wheel or driver’s seat, or a combination of all three.

LKA systems go even further. When you start to drift out of your lane, the system nudges the steering wheel to direct the car toward the center of the lane or selectively brakes a single wheel to guide it back into the lane. Such corrections are subtle, and you can always override them by turning the wheel yourself.

LDW and LKA systems don’t function when you use your turn signal because they assume (probably correctly) that when you want to change lanes, you won’t want an alert.

If you have an LKA system on your vehicle, it doesn’t mean you can just take your hands off the wheel and expect the car to do the steering for you. On most vehicles, if the car doesn’t sense any steering input from you for a brief period (about 10 seconds), it alerts you to regrip the wheel.

ADAPTIVE CRUISE CONTROL

With conventional cruise control, you must reset the system once you’ve sped up and passed a vehicle or hit the brakes to keep a certain distance from the vehicle in front of you. Not so with adaptive cruise control (ACC), which typically uses radar to detect vehicles ahead of you and automatically adjusts your speed to maintain a safe distance from them.

With most ACC systems, you can adjust the gap or following distance from the vehicle in front of you, within limits, to a comfortable range. If a car moves into your lane in front of you, or if the car in front of you slows down or speeds up, your vehicle makes the adjustment, keeping a safe distance all the while. If the car in front of you moves out of your lane, your car accelerates to and maintains the set speed.

FORWARD-COLLISION WARNING/ MITIGATION/AVOIDANCE SYSTEMS

Several types of systems use cameras and/or radar to help drivers respond safely to traffic in front of them. What follows is a general description of the different systems. Automakers may use one or a combination of such systems in their lineups.

A forward-collision-warning (FCW) system provides audible and visual alerts that warn drivers of a potential crash, but it does nothing to prevent a crash.

A forward-collision-mitigation (FCM) system lets drivers know a collision is imminent and, if the driver doesn’t respond, applies the brakes to attempt to minimize the damage of a collision.

A forward-collision-avoidance (FCA) system alerts drivers to the likelihood of a crash and automatically applies the vehicle’s brakes to either prevent the crash (i.e., bring the vehicle to a complete stop before it hits an object in front of it) or at least reduce the severity of the crash. It also may retract and increase seatbelt tension.

LIMITATIONS OF ADAS

Good driver-assist systems have controls, displays, and touch screens that are easy to understand and operate. Many systems won’t activate until drivers go through two or more steps; that way, drivers won’t turn the systems on accidentally and will be aware that the systems are operating.

However, as with other electronic systems, ADAS don’t work 100 percent of the time. For example, they might not detect other vehicles or lane markers in bad weather (snow, rain, or fog); they might not detect faded lane markers or small objects in the road; and they work better on multilane highways than on narrow country roads. Some systems turn themselves off if they can’t “see” what they need to, and all ADAS can be switched off if drivers don’t want to use them. Chapter 7 further discusses the effectiveness and limitations of ADAS.

It’s also important to understand what any driver-assistance system is designed to do—and not do—before using it. For example, ACC systems may keep your vehicle a safe distance from a moving car in front of it, even when that car comes to a complete stop. But some systems aren’t designed to recognize stationary objects, including cars. So when you pull off a freeway, they might not prevent you from hitting a stopped car at the end of the exit ramp.

In short, drivers are responsible for maintaining control of their vehicles. It’s fine to enjoy the added safety and convenience that ADAS provide. But it’s important not to overly rely on them—they’re driver-support systems, not a substitute for safe, alert driving.
U.S. drivers are ambivalent about self-driving cars, according to a 2014 University of Michigan Transportation Research Institute study. Most people surveyed had heard of self-driving cars and had positive initial feelings about them. Not surprisingly, those whose cars had autonomous features responded more positively to the idea of self-driving cars and expected more benefits from them.

However, the majority of respondents expressed great concern about the safety of riding in self-driving cars (especially those with high levels of automation), and most were very reluctant to allow their children to ride in them. Other concerns included security/privacy issues regarding self-driving cars and whether self-driving cars could perform as well as actual drivers. And although a majority of people expressed a desire to have autonomous technology in their cars, most were unwilling to pay extra for it.

Given existing technical hurdles (which are diminishing) and legal/insurance obstacles (many of which have yet to be raised), it will probably be a decade or more before there are as many self-driving cars on the road as, say, there are EVs on the road today. And it will likely be several decades before self-driving cars are commonplace.

However, as we have mentioned, autonomous elements have been insinuating themselves into mainstream vehicles for years and continue to do so, sometimes in the unlikeliest places. How else to explain that the Ford Focus has a self-park function? People expressed a desire to have autonomous technology in their cars, most were unwilling to pay extra for it.

Tesla’s commitment to developing and refining the technologies to enable self-driving capability is a core part of our mission. In October of [2014] we started equipping Model S with hardware to allow for the incremental introduction of self-driving technology. … Autopilot allows Model S to steer within a lane, change lanes with the simple tap of a turn signal, and manage speed by using active, traffic-aware cruise control. Digital control of motors, brakes, and steering helps avoid collisions from the front and sides, as well as preventing the car from wandering off the road. Your car can also scan for a parking space, alert you when one is available, and parallel park on command … While truly driverless cars are still a few years away, Tesla Autopilot functions like the systems that airplane pilots use when conditions are clear. The driver is still responsible for, and ultimately in control of, the car.

When CEO Elon Musk introduced Autopilot, he urged users to be careful when using it and to keep their hands on the wheel. New features will be added over time, he said, predicting that Tesla will have a fully autonomous car (NHTSA Level 5)—one that can take occupants from point to point safely without any input from them—in about three years.

WHO’S DRIVING?

They’re coming—self-driving cars, that is. It’s no longer a question of if, but when.

What do we mean by a self-driving car? NHTSA, which is interested in autonomous cars from a regulatory and safety standpoint, defines self-driving vehicles as “those in which operation of the vehicle occurs without direct driver input to control the steering, acceleration, and braking and [which] are designed so that the driver is not expected to constantly monitor the roadway while operating in self-driving mode.” NHTSA has specified five levels (degrees) of vehicle automation:

- **LEVEL 0 NO AUTOMATION**: The driver is in complete and sole control of the primary vehicle controls—brakes, steering, throttle, and motive power—at all times.

- **LEVEL 1 FUNCTION-SPECIFIC AUTOMATION**: These cars include one or more safety-critical ADAS functions—for example, brake assist, where the vehicle automatically assists with braking to enable the driver to regain control of the vehicle or stop faster. However, the driver maintains overall control.

- **LEVEL 2 COMBINED FUNCTION AUTOMATION**: This involves automation of at least two primary control functions that work in unison to relieve driver control of these functions—for example, adaptive cruise control in combination with lane centering. The driver maintains overall control.

- **LEVEL 3 LIMITED SELF-DRIVING AUTOMATION**: This level of automation enables the driver to cede full control of all safety-critical functions under certain traffic or environmental conditions. It also allows the driver to rely heavily on the vehicle to monitor possible changes in the conditions that might require transitioning the control back to the driver. The driver is expected to be available for occasional control, but only with sufficiently comfortable transition time.

- **LEVEL 4 FULL SELF-DRIVING AUTOMATION**: The vehicle is designed to perform all safety-critical driving functions and monitor roadway conditions for an entire trip. The driver will provide destination or navigation input but is not expected to be available for control at any time during the trip.

Under these criteria, many cars are already at Level 2. Google’s self-driving vehicles are at Level 3. But those are test vehicles, not cars in normal, everyday use.

**Tesla’s Autopilot System** is moving toward vehicle autonomy.
Buying a green car isn’t the only way to reduce your fuel consumption and minimize your carbon footprint. Everyone can drive more efficiently—saving fuel and money and reducing emissions—regardless of the vehicle they own.

**DRIVING MORE EFFICIENTLY**

The Automobile Club’s Automotive Research Center (ARC) has studied fuel consumption by recording the mileage motorists achieve while driving normally (or sometimes more aggressively) and comparing that to their mileage when they used the techniques listed below. The results? Driving more efficiently produced mileage improvements ranging from a low of 25 percent to as much as 100 percent (from 10 mpg to 20 mpg).

**DRIVE SENSIBLY.** Generally speaking, the faster you go, the more fuel you burn, because aerodynamic drag increases exponentially with speed. Drive at a steady speed as much as possible, and avoid aggressive driving, which can lower your mpg by up to a third, according to the EPA. For example, a car that gets 30 mpg at 55 mph will get only 25 mpg at 70 mph and 22 mpg at 80 mph.

**KEEP IT SMOOTH.** Driving at a steady speed is much more fuel-efficient than continuously varying your speed. When you drive on the highway, especially on level pavement, use cruise control when it’s safe to do so.

**AVOID JACKRABBIT STARTS.** Instead, accelerate slowly and smoothly. Accelerating uses more fuel than any other single facet of driving and increases pollution. One second of high-powered driving can produce nearly the same volume of carbon monoxide emissions as a half-hour of normal driving, according to the American Council for an Energy-Efficient Economy.

**ANTICIPATE SLOWER TRAFFIC AND TRAFFIC LIGHTS.** When you see stopped or slowed traffic, or a red light ahead of you, take your foot off the accelerator and coast. Zooming up to the light and then slamming on the brakes just wastes fuel and is hard on your car’s suspension and brakes. Cars use very little fuel when coasting, and if you’re driving a hybrid, battery-electric vehicle, or a fuel-cell electric vehicle with regenerative brakes, coasting will recharge the battery, further improving your mileage. Leaving plenty of space between you and the car in front of you allows you to drive in a relaxed manner and is safer, too.
green car guide

Maintain your vehicle properly can make a big difference in increasing your mpg, too.

Stay on schedule. Maintain your vehicle according to the manufacturer’s service schedule, which you can find in your owner’s manual or at the automaker’s website. Regular oil and filter changes, inspection of the vehicle’s emissions-control system, and other services will keep your vehicle running smoothly, prolong its life, and save fuel. You can find a list of AAA Approved Auto Repair facilities at AAA.com/repair. Each shop is inspected on a regular basis to verify that it meets AAA’s strict quality standards.

Keep a log. Track your fuel economy; if it drops suddenly, find out why and fix the problem.

-1 pump it up. Keep your tires properly inflated, which reduces rolling resistance. For every 3 pounds below recommended pressure, fuel economy goes down by about 1 percent.

The correct inflation information is on the driver’s doorjamb, inside the glove-box lid, or in your owner’s manual. Tires normally lose 1–2 pounds of pressure a month, so buy a good tire gauge and check the air pressure regularly.

Get the junk out of your trunk. Reducing extra weight in your car can save up to 2 percent in fuel economy for every 100 pounds you remove. So take heavy items such as golf clubs or other sporting equipment, tools, clothing, and coolers out of your car’s trunk when you’re not using them.

-1 roll easy. When it’s time to buy new tires, ask about low-rolling-resistance tires. They have stiffer sidewalls, so they save energy by flexing less. They could compromise your car’s ride and handling, though, so check with your mechanic or dealer to find the proper ones for your car.

Don’t upgrade needlessly. Check your owner’s manual to see what grade of fuel your car needs. Most cars are designed to run on regular; using anything else is a waste of money. If your owner’s manual says “premium required,” use premium. But if it says midgrade or premium is recommended, read carefully; sometimes you can use regular, although you may experience reduced power or slightly reduced fuel economy.

Fill up with care. Gasoline is a hazardous substance. It’s extremely flammable, its fumes are toxic and carcinogenic, and it can pollute water and poison wildlife. What’s more, spilled gasoline contributes to smog formation when it evaporates. So when you stop to buy gas, don’t top off your tank after the automatic nozzle clicks off.

Vehicle maintenance

Keep it charged. If you drive a plug-in hybrid, you’ll use more electricity and less gas if you keep the battery fully charged. With lithium-ion batteries, topping off a partially charged battery doesn’t degrade it or decrease its useful life. However, some manufacturers advise against repeated recharging if the battery is at 95 percent or higher. Check your owner’s manual or talk to the service personnel at your dealership.

Avoid rush hour traffic. Stop-and-go driving burns more gas and increases pollution.

Avoid tempting the need for speed. When you’re driving under 45 mph; close your windows when you’re driving more than 45 mph; and turn on the air conditioner at higher speeds. Your car’s emissions-control system, and other services will keep your vehicle running smoothly, prolong its life, and save fuel. You can find a list of AAA Approved Auto Repair facilities at AAA.com/repair. Each shop is inspected on a regular basis to verify that it meets AAA’s strict quality standards.

Review your commute schedule. Can you change your working hours so you don’t waste time sitting in bumper-to-bumper traffic? Can you carpool or rideshare a day or two a week? How about telecommuting one or more days a week? All three measures save fuel and reduce vehicle wear.

Lifestyle choices

Choose your most efficient vehicle. If you own more than one vehicle (nearly 60 percent of American households do), use the one best suited for the trip you’re taking. In other words, don’t automatically jump into your big SUV if the more fuel-efficient sedan will do. According to the EPA, we could collectively save $25 billion in fuel costs and reduce CO2 emissions by 100 million metric tons (equivalent to taking almost 20 million cars off the road) by taking this simple step.

Check out a rental. If you don’t own a fuel-efficient car, consider renting one for vacations and long trips. That way, you’ll not only put less wear on your daily driver, you’ll use less gas and produce fewer emissions. Similarly, consider renting a pickup truck instead of buying one if you need a truck to haul things only occasionally.

Just say “no.” Make high fuel economy a priority the next time you buy a car, and pass on those vehicles that get poor gas mileage.
Since its founding in 1902, AAA has provided its members with automotive and road-safety information. To help members keep up with advances in automotive technology, AAA also conducts independent, unbiased research and provides in-depth information on automotive trends and technology to AAA members and the motoring public.

AAA also uses its research and findings to advocate for motorists by working with government agencies and the automotive industry to help establish policies and pass beneficial legislation. Besides the AAA Green Car Guide, research projects include testing and evaluating everything from advanced driver-assistance systems (ADAS) to vehicle fuel economy to automotive maintenance requirements and trends.

The following are summary descriptions of some of AAA’s latest and continuing research projects.
We described advanced driver-assist systems (ADAS) in detail in Chapter 5. The purpose of these systems is to make driving safer and less stressful by providing drivers with useful information about nearby vehicles (for example, blind-spot monitoring) or temporarily assuming some driver functions like braking or steering (for example, forward-collision avoidance). Most systems perform their intended functions well. All can be overridden with driver input.

AAA Automotive Engineering and the Automobile Club of Southern California’s Automotive Research Center (ARC) evaluated the effectiveness of five ADAS technologies. Our goal is to inform members about what the systems can and cannot do.

To test adaptive cruise control (ACC) and autonomous braking functions, AAA replicated a variety of typical commuting scenarios, which demonstrated that ACC did a good job of maintaining a following distance when traveling behind slower-moving vehicles on a highway. Some systems even brought vehicles to a stop and resumed a safe following distance when traveling behind slower-moving vehicles in most—but not all—conditions. However, the detection distance varied considerably depending on the system being tested and on the speed of other vehicles. There were instances in every evaluation where a driver needed to take corrective action. AAA concluded that drivers should not become overly reliant on this technology.

To test forward-collision-avoidance (FCA) systems, vehicles were driven on a test track at varying speeds toward obstructions, including traffic cones, a weather balloon, and a Mylar “space blanket.” This replicated conditions motorists might encounter in real-world driving. The systems didn’t always recognize obstacles, provide a warning signal, or engage the brakes to slow or stop the vehicle. In some cases, the systems slowed the vehicles but didn’t start braking early enough to avoid making contact with the obstacle. AAA is continuing its research on automated braking.

Also, a system’s ability to recognize obstacles varied among vehicles. Although the owner’s manuals for these vehicles warn that the systems may not recognize or react to motorcycles, a stopped vehicle, traffic cones, or other obstructions, people who own automobiles with these systems might not read the manuals or become sufficiently informed to use them safely.

For the research on blind-spot-monitoring (BSM) systems, vehicles were driven on the oval track at the Auto Club Speedway and evaluated for their ability to spot another vehicle or a motorcycle in their blind spots at varying speeds. The results: Blind-spot-monitoring systems detected target vehicles in most—but not all—conditions. However, the detection distance varied considerably depending on the system being tested and on the speed of the approaching vehicle. Detection of a passing motorcycle was, on average, 26 percent later than detection of passing vehicles. There were instances in every evaluation where a driver needed to take corrective action. AAA concluded that drivers should not become overly reliant on this technology.

Sometimes, a blind-spot-monitoring system has a rear cross-traffic alert (RCTA) function, which lets you know if traffic is about to cross at right angles behind your vehicle from either direction. This feature is especially useful if you’re about to back out of a parking spot where visibility to the sides is restricted or completely blocked by other vehicles. RCTA systems are designed to detect only other cars. However, the ARC tested whether the systems worked for motorcycles, bicycles, and pedestrians on the assumption that motorists might assume they would.

Some test vehicles performed well, but others missed obstacles or detected them late, and two of the five cars tested couldn’t detect vehicles passing behind them when there was a large SUV parked on either side. Only two of the five vehicles could detect a pedestrian crossing behind, and just three in five could detect a bicycle. AAA concluded that motorists with RCTA systems should be aware of the systems’ limitations.

Three different vehicles were driven on the road for an evaluation of lane-departure warning (LDW) and lane-keeping-assist (LKA) systems. Lane-departure crashes are one of the most common types of collisions, accounting for about 1.6 million crashes a year, according to the AAA Foundation for Traffic Safety. The LDW systems did a good job of detecting various lane markings to alert drivers both visually and audibly that they were crossing into another lane.

AAA found that these systems worked most of the time, but not always, and sometimes their warnings annoyed test drivers—which means that users might be inclined to turn the systems off. Also, some vehicles could detect certain lane markings better than other types of markings, but there was no consistent marker recognition among vehicles. Worn pavement markers, construction zones, and intersections sometimes caused the system to lose track of lane location. Similarly, LKA systems worked well, although the vibration alert in the steering wheel coupled with the slowing down of the vehicle as it moved back into its lane (typical of some systems) was somewhat disconcerting to test drivers.

AAA recommends that automakers communicate better with car owners to make the limitations of ADAS clear and obvious, and that motorists become familiar with the performance of ADAS before operating their vehicles.

The important takeaway from AAA’s research is that all ADAS have limitations, and multitasking drivers could be caught off guard by relying too heavily on the systems. Their benefits could easily be outweighed if motorists don’t become familiar with their operation or become overly reliant on the systems and less focused behind the wheel. Technology, no matter how sophisticated, is no substitute for an alert, engaged driver.

**Headlight-Effectiveness Study**

Effective vehicle lighting is critical. Although only 25 percent of driving is done at night, it’s when 50 percent of crashes occur, according to the National Highway Traffic Safety Administration (NHTSA).

AAA conducted tests of halogen, high-intensity discharge (HID), and light-emitting diode (LED) headlights to find out, among other things, how much forward lighting is needed for safe nighttime driving, especially, for example, on rural roads. Tests were conducted in collaboration with the ARC.

Testing the three types of headlights side by side revealed that they varied significantly in their performance.

### 1. Halogen Headlights

- **High Beams:** 500 ft, 472 ft, 417 ft
- **Low Beams:** 400 ft, 380 ft, 300 ft

### 2. High-Intensity Discharge (HID) Headlights

- **High Beams:** 500 ft, 472 ft, 417 ft
- **Low Beams:** 400 ft, 380 ft, 300 ft

### 3. Light-Emitting Diode (LED) Headlights

- **High Beams:** 500 ft, 472 ft, 417 ft
- **Low Beams:** 400 ft, 380 ft, 300 ft

### Summary

Both LED and HID headlights outperform halogen headlights, AAA testing determined. Furthermore, LED headlights are marginally more effective at low-beam setting.

### Technology

Automakers that offer advanced technology, no matter how sophisticated, are no substitute for an alert, engaged driver.
**REARVIEW CAMERA EFFECTIVENESS**

Back-over crashes account for a fairly small percentage of total collisions, but they are more likely to lead to severe injury or death. NHTSA estimates that more than 200 fatalities and 15,000 injuries occur annually from vehicles backing over people—and 31 percent of those fatalities are children under 5.

Fortunately, such accidents are preventable, because rearview cameras have proven effective in reducing back-over deaths and injuries, as well as property damage due to collisions with walls, fences, light poles, and so on. Because these incidents can have such serious consequences, NHTSA passed legislation requiring rearview cameras to be standard equipment on all new cars and light trucks sold as of May 2018.

AAA, in conjunction with the ARC, tested 17 vehicles from 11 manufacturers with both factory-installed and aftermarket rearview camera systems to measure any improvements in rear visibility.

The study showed that:

- Generally, both factory-installed and aftermarket cameras worked well, producing extremely clear images even at night and in low-light conditions, improving visibility in the blind zone behind cars by an average of 46 percent. This ranged from a 36 percent improvement in smaller sedans to a 75 percent improvement in hatchbacks.
- These systems dramatically improve rearview visibility, but they don’t show 100 percent of the space behind the vehicle. They also have limitations. For example, they don’t capture the scene much below a car’s bumper, and rain, snow, or slush can cloud the camera lens, which results in blurry images.
- “Rearview cameras are a great supplement for drivers,” says John Nielsen, AAA’s managing director of automotive engineering. “They dramatically improve rear visibility. They’re especially helpful for viewing the first 10 feet behind the vehicle, which are the most hazardous in terms of back-over risk for young children. But they don’t replace the need to check around your vehicle for obstacles before getting in or back up.”

AAA recommends that drivers always walk behind their vehicle to visually confirm that there are no obstacles, and use the rearview camera to check that nothing has entered the area since the driver’s walk-through inspection. Rearview cameras are not a substitute for safe-driving practices.

**FUEL-ECONOMY TESTING**

The media has documented many motorists’ complaints that they don’t get the mileage stated on the EPA Fuel Economy and Environment window sticker. However, a data search on EPA’s website, fueleconomy.gov, found that most motorists who reported their own fuel economy were able to obtain fuel economy within the range of EPA predictions. So AAA and ARC staff sought out cars with specific combinations of year, make, model, and powertrain that EPA data show were getting worse mileage than indicated on the EPA window sticker.

The staff then located examples of some of these vehicles—a 2014 Ford F-150, a 2014 Hyundai Sonata, and a 2012 Nissan Altima—and tested them to see if they got worse mileage than predicted.

Two kinds of tests were conducted: three EPA dynamometer tests (read about EPA testing on page 15) and four weeklong road tests involving four test drivers engaged in a variety of types of driving.

VEHICLES were able to repeat the EPA certification results when tested on the dynamometer, and on-road mpg measurements were within the range of EPA window-sticker values. Each vehicle showed a significant variation between its lowest and highest recorded fuel economy on the road.

Not surprisingly, driving that featured many cold starts (e.g., use the most fuel when cold started) and in-town or congested driving conditions tended to have low mpg numbers. Free-flowing freeway driving and driving with long distances between stops tended to have high mpg numbers.

**ACTIVE PARKING-ASSIST SYSTEMS**

Introduced in the U.S. in 2006, active parking-assist systems use cameras and sensors to identify a correctly sized parallel-parking spot and automatically back the vehicle into it. (Some systems can also park in perpendicular parking spots.) The vehicle does all the steering; the driver operates the accelerator and brake pedal.

AAA evaluated how well active parking-assist systems worked compared with nonassisted drivers performing the same task. It found that:

- Drivers using parking-assist systems had 81 percent fewer curb strikes than drivers parking without assistance.
- Parking-assist systems were more efficient and used 47 percent fewer maneuvers.
- Parking-assist systems were 10 percent faster than those who parked manually.
- The single criticism of the various systems was that the systems tended to park vehicles very close to the curb, potentially risking wheel or tire damage.

AAA concluded that automated parking-assist systems can make parallel parking easier and less stressful, especially for people with restricted mobility. Despite such findings, 72 percent of adult drivers surveyed said they wouldn’t trust self-parking vehicle technology to park their vehicle.

As today’s automobiles keep advancing technologically, consumers will continue to need a source of objective, honest, reliable automotive information. AAA remains dedicated to providing this type of independent, trusted automotive research.

The findings will help our members and other motorists better understand the implications of new automotive technology and trends in the auto industry, and continue to use and enjoy their vehicles for many years.
## OVERALL GREEN CAR SCORES

### Test Results and Rankings

The green cars tested by the ARC are evaluated on the basis of 13 categories: emissions, fuel economy, crashworthiness, braking, acceleration, handling, cargo-carrying capacity, ride quality, interior noise, ease of entry and exit, maneuverability, roominess, and visibility. The scores for the categories are totaled, and the cars are ranked from high to low.

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### Ranking and Year

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<td>2016</td>
<td>Hyundai</td>
<td>Accent SE</td>
<td></td>
<td>58.89</td>
</tr>
</tbody>
</table>
RANKING BY PRICE

For the car buyer, there’s more to what makes a green car desirable than just performance data. When it comes to purchase price, green cars run the gamut.

Here’s a breakdown of the 81 cars from this year’s Guide listed in ranking order in three price categories. To see how a particular vehicle measured up against all other vehicles regardless of price, refer to the Overall Scores chart on page 72.

UNDER $30,000

<table>
<thead>
<tr>
<th>YEAR</th>
<th>MAKE</th>
<th>MODEL</th>
<th>CATEGORY</th>
<th>SCORE</th>
<th>PRICE AS TESTED</th>
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<td>Dodge</td>
<td>Dart SE Aero</td>
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<tr>
<td>2016</td>
<td>Hyundai</td>
<td>Accent SE</td>
<td>58.89</td>
<td>$16,580</td>
<td></td>
</tr>
</tbody>
</table>
Subcompact
American car buyers tend to think bigger is better, so subcompact cars don’t get the respect they deserve. In fact, they have a lot to offer. For one, they cost less, so they’re easier for first-time car owners or folks on a budget to afford. They’re smaller and lighter, so they get better gas mileage and cost less to operate. Plus they’re easier to maneuver, often are fun to drive, and fit in parking spaces bigger cars have to bypass. Many are hatchbacks and fit in parking spaces bigger cars can’t fit in. Some are fun to drive, require less to operate. Plus they’re easier to maneuver, often are fun to drive, and fit in parking spaces bigger cars can’t fit in.

BMW i3

The i3 is BMW’s first all-electric vehicle. Lightweight materials and sophisticated electronics make it the most efficient vehicle on the market (124 MPGe combined). It’s also fast, requiring just 7 seconds to go from 0 to 60 mph. And, like most EVs, the i3 is quiet. But in many respects, it’s an odd car. You must first open the front doors to access the reverse-facing rear doors, and no one larger than a child would want to sit in the tiny backseat. The i3’s aggressive regenerative braking system engages as soon as you lift your foot from the accelerator, which takes some getting used to. The i3 is available with a small range-extender gasoline motor, which adds about 70 miles to the i3’s range and decreases its all-electric range somewhat. But if you want efficient, fast, and quirky, the i3 should be near the top of your list. Neither NHTSA nor the IIHS has yet crash-tested the BMW i3. For 2016, the i3 is essentially a carryover. The 2015 BMW i3 is BMW’s first all-electric vehicle. Lightweight materials and sophisticated electronics make it the most efficient vehicle on the market (124 MPGe combined). It’s also fast, requiring just 7 seconds to go from 0 to 60 mph. And, like most EVs, the i3 is quiet. But in many respects, it’s an odd car. You must first open the front doors to access the reverse-facing rear doors, and no one larger than a child would want to sit in the tiny backseat. The i3’s aggressive regenerative braking system engages as soon as you lift your foot from the accelerator, which takes some getting used to. The i3 is available with a small range-extender gasoline motor, which adds about 70 miles to the i3’s range and decreases its all-electric range somewhat. But if you want efficient, fast, and quirky, the i3 should be near the top of your list. Neither NHTSA nor the IIHS has yet crash-tested the BMW i3. For 2016, the i3 is essentially a carryover.

NHTSA SAFETY RATINGS (2016 MODEL): N/A

<table>
<thead>
<tr>
<th>Overall Observations</th>
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<tbody>
<tr>
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</table>

<table>
<thead>
<tr>
<th>Weak Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limited range (81 miles)</td>
</tr>
<tr>
<td>Overly aggressive regenerative braking won’t let you coast downhill</td>
</tr>
<tr>
<td>Charger display tells what time it will be finished</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Strong Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Responsive, powerful motor</td>
</tr>
<tr>
<td>Most efficient EV available</td>
</tr>
<tr>
<td>ESV emissions rating</td>
</tr>
<tr>
<td>Satellite radio display identifies what’s playing on each channel</td>
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<table>
<thead>
<tr>
<th>FUEL INFORMATION</th>
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<tbody>
<tr>
<td>Fuel type: Electricity</td>
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<tr>
<td>Battery capacity (kWh): 22</td>
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<tr>
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<td>EPA combined MPGe: 124</td>
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<table>
<thead>
<tr>
<th>BATTERY CHARGE TIME</th>
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<tr>
<td>120V</td>
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<tr>
<td>20 HRs</td>
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<tr>
<td>240V</td>
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<tr>
<td>4 HRs</td>
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<table>
<thead>
<tr>
<th>TEST DATA TEST VEHICLE SCORES (0 TO 10 POINTS)</th>
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<tbody>
<tr>
<td>EPA emissions score: 15.50</td>
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<tr>
<td>Braking: 4.78</td>
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<tr>
<td>Crashworthiness: 5.67</td>
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<tr>
<td>Visibility: 6.50</td>
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<tr>
<td>Slalom handling: 4.47</td>
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<tr>
<td>Ride quality: 6.13</td>
</tr>
<tr>
<td>Fuel economy: 9.86</td>
</tr>
<tr>
<td>Interior noise: 5.92</td>
</tr>
<tr>
<td>Acceleration: 8.81</td>
</tr>
<tr>
<td>Ease of entry and exit: 4.47</td>
</tr>
<tr>
<td>Interior size: 1.92</td>
</tr>
<tr>
<td>Turning circle: 7.93</td>
</tr>
<tr>
<td>Cargo capacity: 4.96</td>
</tr>
</tbody>
</table>

AAA.com/greencar
### Chevrolet Spark EV 2LT

**OVERALL OBSERVATIONS**
The Chevrolet Spark EV is an all-electric version of the subcompact Spark hatchback. Like most other EVs, it's easy to drive and produces zero emissions, but with an estimated range of 82 miles, it's not practical for long trips. The 140-hp electric motor provides quick acceleration (0–60 mph in 8 seconds). Our test vehicle was well equipped, including Bluetooth, XM radio, heated seats, and a DC fast-charging port. Because of the low cost of electricity and its EPA-combined 119 MPGe fuel-economy rating, the Spark EV has low operating costs. And with a base MSRP under $28,000 before federal and state incentives, it's also one of the most economical EVs on the market. The Spark's battery can be 80 percent recharged for a full recharge at 240 volts. The Spark EV hasn't been crash-tested by either NHTSA or IIHS. For 2016, the gasoline-powered Spark was redesigned, but the Spark EV carries over unchanged. It's available only in California and Oregon. For 2016, the gasoline-powered Spark was redesigned, but the Spark EV carries over unchanged. It's available only in California and Oregon. Currently, it's available for sale only in California, Maryland, and Oregon.

### Fiat 500e

**OVERALL OBSERVATIONS**
The Fiat 500e, an all-electric version of the Fiat 500, is reputed to be a “compliance car”—built mainly to satisfy California’s ZEV requirements. It’s equipped with a 111-hp motor, is easy to drive, and produces zero emissions, but because of its limited range (84 miles) it’s not practical for long trips. It takes only four hours to completely recharge the 500e’s battery pack with a Level 2 (240 volt) charger; but as long as 24 hours with a Level 1 (120 volt) charging system. Many consider the 500e cute, but its looks don't compensate for its drawbacks. Its steering is responsive, and it's very maneuverable and fun to drive, but it handled poorly at its limits on our slalom course. The 500e is really a two-person car: Its backseat is cramped and its trunk is microlite. Neither NHTSA nor NHTS has crash-tested the Fiat 500e. For 2016, the 500e gets an updated infotainment and navigation system but is otherwise unchanged. It’s available only in California and Oregon.

### Chevrolet Spark EV 2LT

**LEAF RATING:**
- **OVERALL SCORE**: 83.99 (HIGHEST: 92.49)
- **OVERALL RANKING**: 14
- **OVERALL OBSERVATIONS**
- **STRONG POINTS**
  - Efficient energy use (119 MPGe)
  - Zero tailpipe emissions
  - Good power, especially at low speeds
  - Quiet powertrain
  - Easy to drive and park
- **WEAK POINTS**
  - Long recharging time
  - Range anxiety
  - N/A Small trunk
  - Cramped rear seat
  - Lack of rear center armrest

**TEST DATA**
- **TEST VEHICLE SCORES (8 TO 10 POINTS)**
  - EPA emissions score: 10.00
  - Braking: 3.95
  - Crashworthiness: 5.65
  - Visibility: 6.40
  - Slalom handling: 6.19
  - Ride quality: 6.50
  - Fuel economy: 8.59
  - Interior noise: 4.96
  - Acceleration: 5.95
  - Ease of entry and exit: 4.88
  - Interior size: 6.98
  - Turning circle: 4.92
  - Cargo capacity: 7.92

**VEHICLE SPECIFICATIONS**
- Model year tested: 2014
- Number of passengers (F/R): 2/2
- Curb weight (lbs): 2940
- Exterior length (in): 146.5
- Exterior width (in): 64.0
- Exterior height (in): 62.6
- Wheelbase (in): 93.5
- Warriors (months/miles): 36,360/36,000
- Tire manufacturer and size: Bridgestone 185/55R15
- Towing cap (lbs): N/A
- Transmission type: Manual
- Drivetrain type: Engine size: 1.0-liter
- Horsepower @ rpm: 98 hp (133 kW)
- Electric motor horsepower: 140 hp (104 kW)

**FUEL INFORMATION**
- Fuel type: Electricity
- EPA urban MPGe: 128
- EPA highway MPGe: 109
- EPA combined MPGe: 119
- EPA estimated range (mi): 82

**BATTERY CHARGE TIME**
- 120-volt charger: 17 hours
- 240-volt charger: 4 hours

**PRICE AS TESTED**
- $27,820

### Fiat 500e

**LEAF RATING:**
- **OVERALL SCORE**: 58.99 (LOWEST: 92.49)
- **OVERALL RANKING**: 24
- **OVERALL OBSERVATIONS**
- **STRONG POINTS**
  - Easy to park
  - Charges quickly on a 240-Volt charger
  - Eco drive
  - Low emissions
  - Hammock seat in the back
  - No navigation system

**TEST DATA**
- **TEST VEHICLE SCORES (8 TO 10 POINTS)**
  - EPA emissions score: 5.00
  - Braking: 4.32
  - Crashworthiness: 5.26
  - Visibility: 6.26
  - Slalom handling: 6.65
  - Ride quality: 6.95
  - Fuel economy: 6.65
  - Interior noise: 4.96
  - Acceleration: 5.18
  - Ease of entry and exit: 5.18
  - Interior size: 4.96
  - Turning circle: 6.98
  - Cargo capacity: 6.97

**VEHICLE SPECIFICATIONS**
- Model year tested: 2015
- Number of passengers (F/R): 2/2
- Curb weight (lbs): 2940
- Exterior length (in): 142.4
- Exterior width (in): 64.1
- Exterior height (in): 60.1
- Wheelbase (in): 90.8
- Warriors (months/miles): 36,000
- Tire manufacturer and size: Bridgestone 185/55R15
- Towing cap (lbs): N/A
- Transmission type: Manual
- Drivetrain type: Engine size: 1.0-liter
- Horsepower @ rpm: 98 hp (133 kW)
- Electric motor horsepower: 111 hp (83 kW)

**PRICE AS TESTED**
- $31,800
## Honda CR-Z EX NAVI

**BASE PRICE:** $24,995; **PRICE AS TESTED:** $24,995

### OVERALL OBSERVATIONS
Honda’s CR-Z is the camry’s second attempt at a small, two-seat sporty hybrid. Its first was the original Insight (the first hybrid in the U.S. market). The CR-Z looks and feels sporty, gets 37 mpg, has above-average acceleration, is loaded with safety and convenience features, and has an AT-PZEV emissions ranking, and is a well-executed car. However, it’s still a small two-seater, which limits its utility. NHTSA awarded the CR-Z 4 stars (out of 5) overall in its crash tests. For 2016, the CR-Z receives restyled front and rear ends, plus an increase in standard features.

### NHSTA SAFETY RATINGS (2016 MODEL): ★★★★★

#### AVAILABLE ADVANCED SAFETY FEATURES
- Rearview camera
- Blind-spot monitoring

#### STRONG POINTS
- Fuel economy
- Certified as an AT-PZEV
- Easy to drive and park
- Sporty/modernistic styling
- Priced lower than many hybrids ($25,000)
- Loaded with useful features including navigation, Bluetooth, HID headlights

#### WEAK POINTS
- High levels of road and engine noise when accelerating
- Difficult to enter and exit
- Choppy ride
- Poor rear visibility
- Lacks center armrest

### FUEL INFORMATION

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<th>Regular</th>
<th>Average MPG as Tested by Auto Club</th>
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<tr>
<td>Fuel Capacity (gal)</td>
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<tr>
<td>EPA Highway mpg</td>
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<tr>
<td>EPA Combined mpg</td>
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### TEST DATA TEST VEHICLE SCORES (0 TO 10 POINTS)

- **EPA emissions score:** 3.98
- **Braking:** 4.94
- **Crashworthiness:** 4.62
- **Visibility:** 5.50
- **Slalom handling:** 5.37
- **Ride quality:** 6.93
- **Fuel economy:** 5.69
- **Interior noise:** 5.29
- **Acceleration:** 6.90
- **Ease of entry and exit:** 5.50
- **Interior size:** 5.79
- **Turning circle:** 5.77
- **Cargo capacity:** 4.74

### VEHICLE SPECIFICATIONS

- **Model year tested:** 2013
- **Number of passengers (F/R):** 2
- **Curb weight (lbs):** 2920
- **Exterior length (in):** 160.5
- **Exterior width (in):** 68.5
- **Exterior height (in):** 54.9
- **Wheelbase (in):** 95.8
- **6 air bags:**
- **Warranty (months/miles):** 36/36,000
- **Tire manufacturer and size:** Dunlop P195/55R14
- **Transmission type:** CVT
- **Engine size:** 1.5L SOHC I4
- **Horsepower @ rpm:** 130 @ 6000

### LEAF RATING:

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<th>Overall Ranking</th>
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<td>Strong Points</td>
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<tr>
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### AVERAGE MPG AS TESTED BY AUTO CLUB

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<td>80</td>
<td>39</td>
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## Toyota Prius c Three

**BASE PRICE:** $21,765; **PRICE AS TESTED:** $23,815

### OVERALL OBSERVATIONS
The Toyota Prius c is a subcompact hatchback variant on the Prius theme. It has a smaller, 1.5-liter engine (versus the 1.8-liter engine in the standard Prius) and a lower-output electric motor (60 hp versus 71), good for 99 hp total. The Prius c gets an EPA-estimated 50 mpg combined. All in all, the Prius c has a lot going for it, like economy, reliability, and maneuverability. But some of its negatives are hard to ignore: a buzzy, underpowered engine, a stiff ride, and an unrefined, noisy cabin. For 2015, the Prius c got refreshed front and rear styling, interior upgrades, and new exterior color choices. For 2016, the Prius c carries over essentially unchanged.

### NHSTA SAFETY RATINGS (2016 MODEL): N/A

#### AVAILABLE ADVANCED SAFETY FEATURES
- Rearview camera
- Lane-departure warning
- Forward-collision warning
- Forward-collision avoidance

#### STRONG POINTS
- Excellent fuel economy
- Fits easily in small parking places
- Equipped with satellite radio and Bluetooth
- Nimble handling, easy to drive
- Low emissions (SULEV II)

#### WEAK POINTS
- Underpowered
- Engine sounds buzzy when pushed
- Poor rear visibility
- Cramped rear seat
- Entry and exit are difficult due to limited headroom, especially in the rear
- Limited interior storage

### FUEL INFORMATION

<table>
<thead>
<tr>
<th>Component</th>
<th>Fuel Type</th>
<th>Fuel Capacity (gal)</th>
<th>Fuel Type</th>
<th>Fuel Capacity (gal)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Regular</td>
<td>39</td>
<td>Regular</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

### TEST DATA TEST VEHICLE SCORES (0 TO 10 POINTS)

<table>
<thead>
<tr>
<th>Component</th>
<th>Overall Score</th>
<th>Overall Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overal Observations</td>
<td>58.89</td>
<td>39</td>
</tr>
<tr>
<td>Strong Points</td>
<td>72.40</td>
<td></td>
</tr>
<tr>
<td>Weak Points</td>
<td>58.89</td>
<td></td>
</tr>
</tbody>
</table>

### VEHICLE SPECIFICATIONS

- **Model year tested:** 2014
- **Number of passengers (F/R):** 3/4
- **Curb weight (lbs):** 2560
- **Exterior length (in):** 157.3
- **Exterior width (in):** 66.7
- **Exterior height (in):** 57.7
- **Wheelbase (in):** 90.4
- **6 air bags:**
- **Warranty (months/miles):** 36/36,000
- **Tire manufacturer and size:** Bridgestone P175/65R15
- **Transmission type:** CVT
- **Engine size:** 1.5L 16V DOHC I4
- **Horsepower @ rpm:** 73 @ 4800 (99 total)
- **Electric motor horsepower:**

### LEAF RATING:

<table>
<thead>
<tr>
<th>Component</th>
<th>Overall Score</th>
<th>Overall Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overal Observations</td>
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<td></td>
</tr>
<tr>
<td>Weak Points</td>
<td>58.89</td>
<td></td>
</tr>
</tbody>
</table>

### AVERAGE MPG AS TESTED BY AUTO CLUB

<table>
<thead>
<tr>
<th>Component</th>
<th>EPA Combined MPG</th>
<th>EPA Highway mpg</th>
<th>EPA Urban mpg</th>
<th>EPA Combined mpg</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>92.49</td>
<td>53</td>
<td>53</td>
<td>50</td>
</tr>
</tbody>
</table>

### AAA GREEN CAR GUIDE 2016

AAA.com/greencar
**OVERALL OBSERVATIONS**

The 2016 Mitsubishi i-MiEV ES is a small electric vehicle with a combined range of 62 miles. With its spacious front seating area, excellent front visibility, and nimble handling, the i-MiEV is best suited to urban settings. Its as-tested price of $25,845 (before incentives) makes it one of the least expensive EVs on the market. However, that low price is reflected in the low-quality interior materials and wind and road noise that permeate the cabin. The ride quality is choppy, in part due to its small size, short wheelbase, and skinny tires. Its 66-hp electric motor generates 47 horsepower, and it has a “burst mode” that briefly increases that to 70 for passing situations. The EPA-estimated range is 68 miles; top speed is 78 mph. Recharging at 240 volts takes about 6 hours. On the downside, the smart electric drive has a rough ride, slow acceleration, and a noisy cabin. The gas model smart got a redesign for 2016, but the electric drive carries over from 2015. A redesigned 2017 smart EV is slated to arrive at the end of 2016 or the beginning of 2017.

**TEST DATA TEST VEHICLE SCORES (0 TO 10 POINTS)**

<table>
<thead>
<tr>
<th>Vehicle</th>
<th>Test Data</th>
<th>Leaf Rating:</th>
<th>Overall Score</th>
<th>Overall Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mitsubishi i-MiEV ES</td>
<td></td>
<td></td>
<td>58.89</td>
<td>71.71</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>59.81</td>
<td>68.81</td>
</tr>
</tbody>
</table>

**FUEL INFORMATION**

- **Fuel type:** Electricity
- **Battery capacity (kWh):** 16
- **EPA urban MPGe:** 126
- **EPA highway MPGe:** 99
- **EPA combined MPGe:** 112
- **EPA estimated range (mi.):** 62

**BATTERY CHARGE TIME**

- **Charger 1 Input (VAC):** 14
d- **Charger 2 Input (VAC):** 340V

**SPEED AND PERFORMANCE**

- **Acceleration (0-60 mph):** 13.00
- **Braking: 2.00**

**VEHICLE SPECIFICATIONS**

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>2/2</td>
<td>2579</td>
<td>144.7</td>
<td>62.4</td>
<td>63.3</td>
<td>100.4</td>
<td>8 air bags</td>
<td>36/36,000</td>
</tr>
</tbody>
</table>

**TEST DATA TEST VEHICLE SCORES (0 TO 10 POINTS)**

<table>
<thead>
<tr>
<th>Vehicle</th>
<th>Leaf Rating:</th>
<th>Overall Score</th>
<th>Overall Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>smart electric drive</td>
<td></td>
<td></td>
<td>59.81</td>
</tr>
</tbody>
</table>

**FUEL INFORMATION**

- **Fuel type:** Electricity
- **Battery capacity (kWh):** 17.6
- **EPA urban MPGe:** 122
- **EPA highway MPGe:** 93
- **EPA combined MPGe:** 107
- **EPA estimated range (mi.):** 68

**BATTERY CHARGE TIME**

- **Charger 1 Input (VAC):** 14
d- **Charger 2 Input (VAC):** 340V

**SPEED AND PERFORMANCE**

- **Acceleration: 10.00**
- **Braking: 2.96**

**VEHICLE SPECIFICATIONS**

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>2</td>
<td>2180</td>
<td>197.4</td>
<td>69.0</td>
<td>62.1</td>
<td>73.5</td>
<td>4 air bags</td>
<td>48/50,000</td>
</tr>
</tbody>
</table>
Honda Fit EX-L

**OVERALL OBSERVATIONS**
After a year’s hiatus, the Honda Fit, a compact 4-door hatchback, was completely redesigned for 2015. The 1.5-liter 4-cylinder engine with CVT transmission (both new) averaged 33 mpg overall in our testing. The Fit has good ABS brakes, nimble handling, and can fit easily into most parking spots. As with many other small cars, the rear seat has no center armrest and no cup holders. And like most Honda models, the Fit comes with few options, but the EX-L model we tested was well equipped (including Bluetooth, rear and side cameras, and leather), all for just over $20,000. The Fit does a superior job utilizing interior space for such a small car. As long as the driver or passengers aren’t tall, all four seats provide adequate room. The Fit received an overall crash-test rating of 5 stars (out of 5) overall crash-test rating from NHTSA. For 2015, the Fit was essentially unchanged.

<table>
<thead>
<tr>
<th>AVAILABLE ADVANCED SAFETY FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Reverse view camera</td>
</tr>
<tr>
<td>• Blind-spot monitoring</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STRONG POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Very good fuel economy</td>
</tr>
<tr>
<td>2. Nimble handling—easy to drive and park</td>
</tr>
<tr>
<td>3. Good value (well equipped for about $20,000)</td>
</tr>
<tr>
<td>4. Excellent, flexible use of interior space</td>
</tr>
<tr>
<td>5. Rear seat folds flat</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WEAK POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Bouncy ride</td>
</tr>
<tr>
<td>2. Lots of road, engine, and tire noise</td>
</tr>
<tr>
<td>3. Sound system controls are all on the touch screen (no knobs)</td>
</tr>
<tr>
<td>4. Exposed trunk</td>
</tr>
<tr>
<td>5. Lacks rear center armrest and cup holders</td>
</tr>
</tbody>
</table>

**TEST DATA**

<table>
<thead>
<tr>
<th>EPA emissions score</th>
<th>Braking</th>
<th>Crashworthiness</th>
<th>Visibility</th>
<th>Slalom handling</th>
<th>Ride quality</th>
<th>Fuel economy</th>
<th>Interior noise</th>
<th>Acceleration</th>
<th>Ease of entry and exit</th>
<th>Interior size</th>
<th>Turning circle</th>
<th>Cargo capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.50</td>
<td>2.83</td>
<td>3.56</td>
<td>2.70</td>
<td>2.80</td>
<td>2.64</td>
<td>2.88</td>
<td>3.39</td>
<td>2.82</td>
<td>2.90</td>
<td>2.85</td>
<td>2.90</td>
<td>2.87</td>
</tr>
</tbody>
</table>

**VEHICLE SPECIFICATIONS**

- Model year tested: 2015
- Number of passengers (F/R): 2/3
- Curb weight (lbs): 2620
- Exterior length (in): 180.0
- Exterior width (in): 67.0
- Exterior height (in): 60.0
- Wheelbase (in): 99.6
- Restraint type: 8 air bags
- Warranty (months/miles): 36/36,000
- Tire manufacturer and size: Bridgestone 185/55R16
- Towing cap. (lbs) w/o brakes: Not recommended
- Transmission type: CVT
- Front wheel: 1.5L, DOHC 16V i-VTEC 14 |
  - Engine size: 1.5L
  - Horsepower @ rpm: 130 @ 6600

**FUEL INFORMATION**

- Fuel type: Regular
- Fuel capacity (gal): 10.6
- EPA urban mpg: 32
- EPA highway mpg: 38
- EPA combined mpg: 36

**AVERAGE MPG AS TESTED BY AUTO CLUB**

| 0 3 3 |

**PRICE AS TESTED:** $19,800; **BASE PRICE:** $18,590

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Ford Fiesta SE

**OVERALL OBSERVATIONS**
Ford's Fiesta, which has been available in the U.S. since 2011, is a perennial favorite in Europe. The Fiesta raises the bar for the subcompact category, and comes equipped with seven air bags, Ford's SYNC infotainment system, satellite radio, heated seats, side mirrors, and a host of other comfort and convenience features for just under $19,000. Our test car had the 1.0-liter, 3-cylinder Ecoboost engine, which gets an EPA-rated 36 mpg combined. It’s turbocharged engine, though small, has decent power once you get the revs up. The Fiesta is fun and easy to drive. Unfortunately, it also suffers from a subcompact’s limitations—for example, the backseat is both cramped and hard to get in and out of. The Fiesta earned a 4-star (out of 5) overall crash-test rating from NHTSA. For 2015, the Fiesta was essentially unchanged; for 2016, it gets Ford’s new optional infotainment system, SYNC 3, with a simplified touch screen, and the base 5 trim level receives a standard keyless entry feature.

<table>
<thead>
<tr>
<th>AVAILABLE ADVANCED SAFETY FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Reverse view camera</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STRONG POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fun and easy to drive</td>
</tr>
<tr>
<td>2. Good fuel economy</td>
</tr>
<tr>
<td>3. Responsive steering</td>
</tr>
<tr>
<td>4. Well equipped for the price, including Sync, Sirius radio, and heated seats and mirrors</td>
</tr>
<tr>
<td>5. Easy-to-operate manual transmission</td>
</tr>
<tr>
<td>6. Equipped with blind-spot mirrors on both sides</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WEAK POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Cramped rear seat, hard to enter/exit</td>
</tr>
<tr>
<td>2. Restricted visibility, especially to the rear</td>
</tr>
<tr>
<td>3. Ecoboost engine is available only with a manual transmission</td>
</tr>
<tr>
<td>4. Lacks rear center armrest</td>
</tr>
</tbody>
</table>

**TEST DATA**

<table>
<thead>
<tr>
<th>EPA emissions score</th>
<th>Braking</th>
<th>Crashworthiness</th>
<th>Visibility</th>
<th>Slalom handling</th>
<th>Ride quality</th>
<th>Fuel economy</th>
<th>Interior noise</th>
<th>Acceleration</th>
<th>Ease of entry and exit</th>
<th>Interior size</th>
<th>Turning circle</th>
<th>Cargo capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.00</td>
<td>4.03</td>
<td>5.67</td>
<td>4.97</td>
<td>4.75</td>
<td>4.68</td>
<td>5.28</td>
<td>5.24</td>
<td>5.54</td>
<td>5.95</td>
<td>1.56</td>
<td>2.51</td>
<td>2.36</td>
</tr>
</tbody>
</table>

**VEHICLE SPECIFICATIONS**

- Model year tested: 2014
- Number of passengers (F/R): 2/3
- Curb weight (lbs): 2600
- Exterior length (in): 159.7
- Exterior width (in): 62.8
- Exterior height (in): 58.1
- Wheelbase (in): 98.0
- Restraint type: 9 air bags or more
- Warranty (months/miles): 36/36,000
- Tire manufacturer and size: Hankook 185/60R15
- Towing cap. (lbs) w/o brakes: Not recommended
- Transmission type: Manual 5 speed
- Front wheel: 1.0L Ecoboost I3
  - Engine size: 1.0L
  - Horsepower @ rpm: 123 @ 6000

**FUEL INFORMATION**

- Fuel type: Regular
- Fuel capacity (gal): 12.4
- EPA urban mpg: 31
- EPA highway mpg: 43
- EPA combined mpg: 36

**AVERAGE MPG AS TESTED BY AUTO CLUB**

| 0 3 1 |

**PRICE AS TESTED:** $16,080; **BASE PRICE:** $15,800

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AAA GREEN CAR GUIDE 2016

AAA.com/greencar
### Toyota Yaris LE

**Overall Observations**

The Yaris is Toyota’s entry in the current crop of subcompacts for the U.S. market. We tested an LE 4-door hatchback with a 1.5-liter, 4-cylinder engine, good for 106 hp, and a 4-speed automatic transmission (a kind of throwback, given that 6-speeds and CVTs are fairly common in this segment). The EPA rates its powertrain combination at 32 MPG overall.

The Yaris suffers from a small trunk, excessive road noise, and cramped rear seats. But with an MSRP of $17,705 (fairly loaded) and Toyota’s reputation for reliability, it should prove to be, if not an exciting car to drive, a quality commuter car and a very good value. For 2015, the Versa received refreshed exterior styling and cabin upgrades, including standard Bluetooth connectivity. The 2016 model carries over from 2015 largely unchanged. The Versa scored 4 stars (out of 5) overall in NHTSA’s crash tests.

#### NHTSA Safety Ratings (2016 Model)

- Overall: 4 stars
- Frontal: 5 stars
- Side: 5 stars
- Roof: 4 stars

#### Vehicle Specifications

- Engine: 1.5-liter 4-cylinder engine, good for 106 horsepower
- Transmission: 4-speed automatic
- Fuel type: Regular
- Fuel capacity: 11.1 gal

#### Test Data

- EPA urban mpg: 30
- EPA highway mpg: 36
- EPA combined mpg: 32

### Nissan Versa SV

**Overall Observations**

Nissan’s subcompact offering for the U.S. market is the Versa, a small sedan that provides an excellent 35 mpg overall. The 1.6-liter engine makes just 109 hp, and even with the car’s light weight, acceleration is underwhelming (and noisy to boot). However, our test car featured excellent ABS brakes and, with an MSRP of just $16,000, provides excellent value. For 2015, the Versa received refreshed exterior styling and cabin upgrades, including standard Bluetooth connectivity. The 2016 model carries over from 2015 largely unchanged. The Versa scored 4 stars (out of 5) overall in NHTSA’s crash tests.

#### NHTSA Safety Ratings (2016 Model)

- Overall: 4 stars
- Frontal: 5 stars
- Side: 4 stars
- Roof: 4 stars

#### Vehicle Specifications

- Engine: 1.6L DOHC 16V I4
- Transmission type: CVT
- Drivetrain type: Front wheel
- Fuel type: Unleaded Regular
- Fuel capacity: 35 gal

#### Test Data

- EPA urban mpg: 31
- EPA highway mpg: 40
- EPA combined mpg: 35

---

### Summary

- **Toyota Yaris LE**
  - Overall score: 69
  - Test vehicle price: $16,880
  - Fuel type: Regular
  - Fuel capacity: 11.1 gal

- **Nissan Versa SV**
  - Overall score: 71
  - Test vehicle price: $16,050
  - Fuel type: Unleaded Regular
  - Fuel capacity: 35 gal

---

### Additional Information

- **Availability of Advanced Safety Features**
  - Toyota Yaris LE: None available
  - Nissan Versa SV: Rearview camera
**Nissan Versa Note SV**

**Overall Observations**
The Versa Note is similar to the Versa sedan in many ways, but its hatchback body style provides more luggage space and improved rear visibility. Both Versas are rated at 35 mpg combined city/highway driving by the EPA. But the trade-off to improved rear visibility. Both Versas are rated at 35 mpg combined city/highway driving by the EPA. But the trade-off to get such good fuel economy is weak performance, largely because of a 1.6-liter, turbocharged engine produces just 98 hp. It's easy to drive and get around in; it's also nimble and easy to park. The new 2016 LT model we tested had a lot of the amenities we've seen on more expensive vehicles, such as a leather-wrapped steering wheel, leatherette upholstery, satellite radio, rearview camera, heated front seats, and several advanced safety features. However, adults will be unhappy in the cramped backseat, and the trunk is tiny. Neither NHTSA nor IIHS had crash-tested the 2016 Spark at press time.

**Leaf Rating:**
- Overall score: 65.35
- Highest ranking: 72

**Fuel Information**
- Regular
- Fuel capacity (gal): 10.8
- EPA urban mpg: 31
- EPA highway mpg: 40
- EPA combined mpg: 35

**Average MPG as Tested by AAA Club**
- Regular: 029

**Strong Points**
- Very good fuel economy
- Easy to drive and park
- Easy to park in small spots
- Rear windows open fully

**Weak Points**
- Underpowered
- Engine buzzes during acceleration
- Rattles at idle
- Limited interior storage
- Lacks rear center armrest

**Test Data**
- Test vehicle scores (0 to 10 points)
- Braking: 4.91
- Crashworthiness: 5.25
- Visibility: 5.80
- Slalom handling: 5.50
- Ride quality: 5.68
- Fuel economy: 5.94
- Interior noise: 6.24
- Acceleration: 5.28
- Ease of entry/exit: 5.92
- Interior size: 5.22
- Turning circle: 5.73
- Cargo capacity: 3.30

**EPA Emissions Score**
- 2/2

**Vehicle Specifications**
- Model year tested: 2014
- Number of passengers (F/R): 2/3
- Curb weight (lbs): 2480
- Exterior length (in): 163.7
- Exterior width (in): 66.7
- Exterior height (in): 60.5
- Wheelbase (in): 102.4
- Air bags: 8
- Stability control: Yes
- Tires: P195/65R15
- Engine type: 1.6L 16V DOHC I4
- Engine manufacturer: Bridgestone

**Test Data**
- Test vehicle scores (0 to 10 points)
- Braking: 4.49
- Crashworthiness: 4.99
- Visibility: 5.86
- Slalom handling: 4.86
- Ride quality: 5.68
- Fuel economy: 5.94
- Interior noise: 6.72
- Acceleration: 5.79
- Ease of entry/exit: 5.90
- Interior size: 5.30
- Turning circle: 5.73
- Cargo capacity: 3.30

**Vehicle Price**
- Base price: $16,800
- Price as tested: $16,800

---

**Chevrolet Spark 2LT**

**Overall Observations**
The Chevy Spark, completely redesigned for 2016, is priced around $18,000 and averages 35 mpg, making it a very affordable green vehicle. The Spark lacks power (its turbocharged, 1.4-liter engine produces just 98 hp). But it's easy to drive and get around in; it's also nimble and easy to park. The new 2016 LT model we tested had a lot of the amenities we've seen on more expensive vehicles, such as a leather-wrapped steering wheel, leatherette upholstery, satellite radio, rearview camera, heated front seats, and several advanced safety features. However, adults will be unhappy in the cramped backseat, and the trunk is tiny. Neither NHTSA nor IIHS had crash-tested the 2016 Spark at press time.

**Leaf Rating:**
- Overall score: 64.79
- Highest ranking: 73

**Fuel Information**
- Regular
- Fuel capacity (gal): 9
- EPA urban mpg: 31
- EPA highway mpg: 41
- EPA combined mpg: 35

**Average MPG as Tested by AAA Club**
- Regular: 032

**Strong Points**
- Purchase price
- Easy to drive and park
- Nimble handling
- Surprisingly well equipped, including satellite radio, heated seats, and several advanced safety features

**Weak Points**
- Underpowered
- High powertrain noise
- Cramped rear seat
- Small trunk
- Small sun visors
- Lacks rear center armrest and passenger airbags

**Test Data**
- Test vehicle scores (0 to 10 points)
- Braking: 4.91
- Crashworthiness: 5.25
- Visibility: 5.80
- Slalom handling: 5.50
- Ride quality: 5.68
- Fuel economy: 5.94
- Interior noise: 6.24
- Acceleration: 5.28
- Ease of entry/exit: 5.92
- Interior size: 5.22
- Turning circle: 5.73
- Cargo capacity: 3.30

**EPA Emissions Score**
- 2/2

**Vehicle Specifications**
- Model year tested: 2016
- Number of passengers (F/R): 2/3
- Curb weight (lbs): 3200
- Exterior length (in): 143.1
- Exterior width (in): 62.8
- Exterior height (in): 58.4
- Wheelbase (in): 93.9
- Air bags: 9
- Stability control: Yes
- Tires: P195/55R15
- Engine type: 1.4L Ecotec DOHC 16V I4

**Test Data**
- Test vehicle scores (0 to 10 points)
- Braking: 4.49
- Crashworthiness: 4.99
- Visibility: 5.86
- Slalom handling: 4.86
- Ride quality: 5.68
- Fuel economy: 5.94
- Interior noise: 6.72
- Acceleration: 5.79
- Ease of entry/exit: 5.90
- Interior size: 5.30
- Turning circle: 5.73
- Cargo capacity: 3.30

**Vehicle Price**
- Base price: $17,285
- Price as tested: $18,355

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*AAA.com/greencar*
OVERALL OBSERVATIONS

What is the BMW i8? Is it the automaker's supercar, or is it a high-tech green hybrid? Well, it's both. Introduced in 2014, the i8 is a $136,000 carbon-fiber gullwinged exercise in technology powered by a 3-cylinder gas engine and an electric motor that produce 357 total hp. It looks, sounds, and performs like a sports car, but it's also a PHEV that can travel for more than 15 miles on electricity alone and get 76 MPGe. The i8 is a sports car, combined. Its styling is like no other car we've ever tested. It handles well and has a composed ride and good acceleration. But the interior is small, entry and exit is extremely difficult, the rear seat is useless, and the trunk has less than 5 cubic feet of capacity. Neither NHTSA nor IIHS has crash-tested the BMW i8. It's essentially unchanged since 2014.

NHTSA SAFETY RATINGS (2016 MODEL): N/A

AVAILABLE ADVANCED SAFETY FEATURES

• Reversing camera
• Adaptive cruise control
• Forward-collision warning
• Forward-collision avoidance

TEST DATA

Vehicle Price
Base Price: $135,269; Price as Tested: $136,219

OVERALL SCORE

OVERALL SCORE: 58.89

PRICE AS TESTED: $136,219

OVERALL SCORE

OVERALL RANKING: 76

FUEL INFORMATION
Fuel type: Electricity/Premium
Battery capacity (kWh): 11.1
EPA urban mpg: 29
EPA highway mpg: 29
EPA combined mpg: 28
EPA combined MPGe: 76

BATTERY CHARGE TIME

120V HRs: 3.5
240V HRs: 1.5

AVERAGE MPG (GASOLINE AND ELECTRICITY) AS TESTED BY AUTO CLUB
0 0 3 2

TEST DATA

TEST VEHICLE SCORES (0 TO 10 POINTS)

EPA emissions score: 4.69
Braking: 4.99
Crashworthiness: 5.45
Visibility: 5.90
Slalom handling: 5.84
Ride quality: 5.86
Fuel economy: 5.40
Acceleration: 6.27
Ease of entry and exit: 5.60
Interior size: 4.94
Turning circle: 4.73
Cargo capacity: 5.00

AAA Green Car Guide 2016
AAA.com/greencar

AAA Green Car Guide 2016
AAA.com/greencar
The differences between a subcompact and a compact car? Mainly, three things: Compact cars typically cost $2,000 to $3,000 more than subcompacts. Compacts offer more headroom, legroom, and cargo space. Compacts have a greater number of standard or available features than subcompacts offer—some of which have recently been available only on luxury cars. For example, the Toyota Corolla has LED headlights as standard equipment; they’re not even an option on the brand’s subcompact Yaris.

**VOLKSWAGEN e-Golf SEL Premium**

The VW e-Golf, new in 2015, is part of a complete lineup of new Golfs. Our SEL trim-level test car included an abundance of features, such as dual-zone automatic climate control, keyless entry and ignition, rearview camera, navigation, and satellite radio. The e-Golf’s 115-hp electric motor propels it from 0–60 mph in under 10 seconds, and it handles well enough to be considered fun to drive as well as comfortable. It benefits from the low cost of electricity and the reduced maintenance of an EV, resulting in lower operating costs. Like most EVs, it has a limited range (83 miles) and thus is best used as an around-town car. However, the e-Golf also offers the new SAE “combo” charging connector with Level 2 and 3 capabilities, and it charges faster than most with Level 2 charging. At press time, neither NHTSA nor IIHS had crash-tested an e-Golf. For 2016, the SE, a lower-priced trim level with less content (including real-time traffic, Bluetooth, navigation with rearview camera, Quiet powertrain, Well equipped satellite radio, Bluetooth, navigation with real-time traffic, Economical to run, Has a high-speed 240-volt charger (7.2-kw) and an SAE DC fast-charge port.

**TEST DATA**

<table>
<thead>
<tr>
<th>EPA emissions score</th>
<th>Braking 65 mph</th>
<th>Crashworthiness</th>
<th>Visibility</th>
<th>Slam on handling</th>
<th>Ride quality</th>
<th>Fuel economy</th>
<th>Interior noise</th>
<th>Acceleration</th>
<th>Ease of entry and exit</th>
<th>Interior size</th>
<th>Turning circle</th>
<th>Cargo capacity</th>
</tr>
</thead>
</table>

**FUEL INFORMATION**

- **Electricity**: 219 kWh
- **Battery capacity (KWH)**: 24 kWh
- **Fuel type**: Electricity
- **EPA combined MPGe**: 126 MPGe
- **EPA urban MPGe**: 105 MPGe
- **EPA highway MPGe**: 116 MPGe
- **EPA estimated range (mi.)**: 83 miles

**WEAK POINTS**

- Limited range (83 miles)
- Rear seat is difficult to enter and exit
- Small cup holders

**STRONG POINTS**

- Fun to drive
- Quiet powertrain
- Well equipped satellite radio, Bluetooth, navigation with real-time traffic
- Economical to run
- Has a high-speed 240-volt charger (7.2-kw) and an SAE DC fast-charge port

**BATTERY CHARGE TIME**

- **120V**
  - 20 hours
- **240V**
  - 4 hours

**VEHICLE SPECIFICATIONS**

- **Model year tested**: 2015
- **Number of passengers (F/R)**: 2/3
- **Curb weight (lbs)**: 3600 lbs
- **Exterior length (in.)**: 186.1 in.
- **Exterior width (in.)**: 70.8 in.
- **Exterior height (in.)**: 57.1 in.
- **Wheelbase (in.)**: 103.6 in.
- **Restraint type**: 8 air bags
- **Warranty (months/miles)**: 36/36,000
- **Tire manufacturer and size**: Continental 205/55R16
- **Transmission type**: Automatic
- **Auto 1 speed**: N/A
- **Front wheel drive**: N/A
- **N/A**
- **Engine size**: N/A
- **Horsepower (@ rpm)**: 115 hp (85 kW)
- **Electric motor horsepower**: N/A

**OVERALL RATING**

- **Overall score**: 58.89
- **Highest**: 92.49
- **Overall Ranking**: 3

**TEST VEHICLE SCORES (0 TO 10 POINTS)**

<table>
<thead>
<tr>
<th>Test Vehicle Scores (0 to 10 Points)</th>
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</thead>
<tbody>
<tr>
<td>EPA emissions score</td>
</tr>
<tr>
<td>Braking 65 mph</td>
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<tr>
<td>Turning circle</td>
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<tr>
<td>Cargo capacity</td>
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</tbody>
</table>

**NHTSA SAFETY RATINGS (2016 MODEL)**: N/A

- **Overall Observations**
  - VW e-Golf, new in 2015, is part of a complete lineup of new Golfs. Our test car included an abundance of features, such as dual-zone automatic climate control, keyless entry and ignition, rearview camera, navigation, and satellite radio.

- **Conclusion**
  - The e-Golf offers an abundance of features, but its limited range makes it best used as an around-town car. It benefits from the low cost of electricity and the reduced maintenance of an EV, resulting in lower operating costs. It handles well enough to be considered fun to drive.
**Audi A3 Sportback e-tron Premium**

**OVERALL OBSERVATIONS**
For 2016, Audi enters the world of plug-in hybrids with its A3 e-tron hatchback, which features a turbocharged, 1.4-liter, 4-cylinder engine and electric motor (204 hp total) and a 6-speed automatic transmission. Its 8.8-kWh battery pack is large enough for about 17 miles of electric-only operation. Our test car was well-equipped with optional safety and convenience features. Overall, the A3 is a nice car with a good ride and nimble handling, although the trunk is small (14 cubic feet) and the rear seat is hard to get in and out of. Unlike most Audis, only FWD is available. Neither NHTSA nor IIHS has crash-tested the A3 e-tron.

**NHTSA SAFETY RATINGS (2016 MODEL): N/A**

**AVAILABLE ADVANCED SAFETY FEATURES**
- Rearend camera
- Blind-spot monitoring
- Lane-departure warning
- Lane-keeping assist
- Adaptive cruise control

**FUEL INFORMATION**
- Fuel type: Electricity/Premium
- Fuel capacity (gal): 10.6
- EPA urban mpg: 35
- EPA highway mpg: 35
- EPA combined mpg: 35
- EPA combined MPGe: 83

**BATTERY CHARGE TIME**
- 120V: 8 hrs
- 240V: 4.3 hrs

**AVG. MPG AS TESTED BY AUTO CLUB**
- 120V: 10.00
- 240V: 8.49

**VEHICLE SPECIFICATIONS**
- Model year tested: 2016
- Number of passengers (F/R): 2/3
- Curb weight (lbs): 3660
- Exterior length (in): 169.8
- Exterior width (in): 77.4
- Exterior height (in): 56.1
- Wheelbase (in): 103.5
- Restraint type: 9 air bags or more
- Warranty (months/miles): 48/50,000
- Tire manufacturer and size: Tire
- Towing cap. (lbs) w/o brakes: 150 @ 5000
- Transmission type: Auto 6 speed
- Drivetrain type: Engine size: 102 (204 hp total)
- Horsepower @ rpm: Electric motor horsepower:

**TEST DATA**
- EPA emissions score: 5.62
- Braking: 2.36
- Crashworthiness: 8.00
- Visibility: 5.62
- Solid handling: 5.62
- Ride quality: 5.62
- Fuel economy: 5.62
- Interior noise: 5.62
- Acceleration: 5.62
- Ease of entry and exit: 5.62
- Interior size: 5.62
- Turning circle: 5.62
- Cargo capacity: 5.62

**PRICE AS TESTED:** $36,025

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**Kia Soul EV+**

**OVERALL OBSERVATIONS**
The Kia Soul EV is an all-electric version of the company's popular Soul hatchback. Powered by a 109-hp electric motor, it's easy to drive and produces zero emissions. Bluetooth, navigation, and a rearview camera are standard on the EV+ trim level. But because of its estimated 92-mile range, it's not practical for long trips. On a Level 2 charging system, the Soul EV can be completely charged in as little as 4-5 hours, on 120-volts, it could take up to 24 hours. It's also equipped with a CHAdeMO fast-charging port, so it can be charged to 80 percent of capacity in 30 minutes. The Soul EV is pleasant to drive around town and is economical because of the low cost of electricity and minimal required maintenance. At a base price of about $36,000, the Soul EV isn’t cheap—but though federal and state tax credits will reduce the final cost. Neither NHTSA nor IIHS has crash-tested the Soul EV. Initially, it was for sale only in California, in 2016, Kia plans to sell it in Georgia, Texas, Hawaii, Washington, and Oregon. For 2016, the Soul EV is essentially unchanged.

**NHTSA SAFETY RATINGS (2016 MODEL): N/A**

**AVAILABLE ADVANCED SAFETY FEATURES**
- Rearend camera

**FUEL INFORMATION**
- Fuel type: Electricity
- Battery capacity (kWh): 27
- EPA urban MPGe: 120
- EPA highway MPGe: 92
- EPA combined MPGe: 105
- EPA estimated range (mi.):

**BATTERY CHARGE TIME**
- 120V: 24 hrs
- 240V: 4-5 hrs

**AVG. MPG AS TESTED BY AUTO CLUB**
- 120V: 58.89
- 240V: 83.49

**VEHICLE SPECIFICATIONS**
- Model year tested: 2016
- Number of passengers (F/R): 2/3
- Curb weight (lbs): 3580
- Exterior length (in): 163.0
- Exterior width (in): 70.9
- Exterior height (in): 63.0
- Wheelbase (in): 101.2
- Restraint type: 8 air bags
- Warranty (months/miles): 60/60,000
- Tire manufacturer and size: Nexen
- Towing cap. (lbs) w/o brakes: 205/60R16
- Transmission type: Auto 1 speed
- Front wheel drive: N/A
- Horsepower @ rpm: 109 hp (81 kW)
- Electric motor horsepower:
BMW 328d M Sport

OVERALL OBSERVATIONS
A sport sedan that’s a green machine and a diesel to boot? BMW has come up with one: the 328d. Our 2015 test car was good looking and very sporty, with responsive handling and great brakes. Its twin-turbo, 180-hp, 4-cylinder diesel engine took the car from 0–60 mph in under 8 seconds. And not only is the 328d a great-performing car, it also gets 37 mpg combined.

Strong Points
- Excellent handling
- Good fuel economy
- Powerful engine, brakes
- Sporty styling
- Fuel-saving stop-start engine technology

Weak Points
- Hard to enter and exit backseat
- Narrow front seats don’t fit large drivers
- Mirrors controls aren’t marked
- It’s easy to spin the rear wheels when making a turn from a stop on wet roads

Test Data
- EPA emissions score: 90
- Braking: 5.64
- Crashworthiness: 2/3
- Visibility: 8.00
- Stance handling: 7.30
- Ride quality: 9.00
- Fuel economy: 8.00
- Interior noise: 8.00
- Acceleration: 6.83
- Ease of entry and exit: 6.88
- Interior size: 8.90
- Turning circle: 6.40
- Cargo capacity: 5.95

Vehicle Specifications
- Model year tested: 2015
- Number of passengers (F/R): 2/3
- Curb weight (lbs): 3790
- Exterior length (in): 182.2
- Exterior width (in): 71.3
- Exterior height (in): 56.7
- Wheelbase (in): 110.6
- 8 air bags
- Warranty (months/miles): 48/50,000
- Tire manufacturer and size: Bridgestone 255/40R18
- Towing cap. (lbs) w/o brakes: 0
- Transmission type: Auto 8 speed
- Drivetrain type: Rear wheel
- Engine size: 2.0L 14 Twin Turbo
- Horsepower @ rpm: 240/4000

Nissan Leaf SL

OVERALL OBSERVATIONS
The Nissan Leaf has some surprising qualities, not just for an EV but for a small car. Its body structure is solid and tight, and it provides a very good ride, with excellent bump absorption. Its steering exhibits excellent effort and feedback, and although there’s some understeer, handling is even a bit sporty, with minimal body roll. Track testing produced a slow 0-60 mph time of 10.3 seconds, but in normal driving, acceleration is fine, with the electric motor pulling well from low speeds. The Leaf’s reasonable size makes it easy to maneuver and park.

Strong Points
- Excellent steering ratio, effort, and feedback
- Great body structure and capacity to absorb bumps
- Good handling
- Good low-end power and acceleration
- Easy to maneuver and park

Test Data
- EPA emissions score: 82
- Braking: 6.64
- Crashworthiness: 0/3
- Visibility: 9.00
- Stance handling: 6.80
- Ride quality: 9.00
- Fuel economy: 8.00
- Interior noise: 6.92
- Acceleration: 8.90
- Ease of entry and exit: 9.00
- Interior size: 8.00
- Turning circle: 7.95
- Cargo capacity: 6.48

Vehicle Specifications
- Model year tested: 2016
- Number of passengers (F/R): 2/3
- Curb weight (lbs): 3400
- Exterior length (in): 173.0
- Exterior width (in): 69.7
- Exterior height (in): 61.0
- Wheelbase (in): 106.3
- 8 air bags
- Warranty (months/miles): 36/36,000
- Tire manufacturer and size: Michelin P215/55R17
- Towing cap. (lbs) w/o brakes: 0
- Transmission type: Auto 1 speed
- Drivetrain type: Front wheel
- Electric motor capacity: 80 kW AC Synchronous
- Electric motor horsepower: 107 (80 kW)
Mazda Mazda3 s Grand Touring

**OVERALL OBSERVATIONS**

Mazda’s Mazda3 is the automaker’s best-selling model worldwide and the first to incorporate Mazda’s Skyactiv powertrain. This system is reputed to maximize the efficiency of conventional gasoline engines while maintaining excellent performance. Our test car, the Mazda3’s Grand Touring, exemplified this well, with good acceleration, excellent handling, and an EPA combined rating of 32 mpg. It also meets stringent PZEV emission standards. The Mazda3 is sporty and fun to drive, although the interior is noisy and, like many compacts, the rear seat is small. It received a 5-star (out of 5) crush-test rating from NHTSA and a Top Safety Pick+ rating from IIHS (with optional front-crash prevention) in 2015 and 2016. It received additional standard features in both years, too, including a rearview camera in 2016.

**LEAF RATING:**

- **OVERALL SCORE:** 58.89; **LOWEST**
- **HIGHEST RANKING:** 78.26

**FUEL INFORMATION**

- Fuel type: Regular
- Fuel capacity (gal): 13.2
- EPA urban mpg: 28
- EPA highway mpg: 38
- EPA combined mpg: 32

**AVERAGE MPG AS TESTED BY AUTO CLUB**

- **0.88**

**TEST DATA**

- EPA emissions score: 12
- Braking: 0.88
- Crashworthiness: 0.88
- Visibility: 0.88
- Stabilization: 4.48
- Ride quality: 0.88
- Interior noise: 0.88
- Acceleration: 0.88
- Ease of entry/exit: 0.95
- Interior size: 0.95
- Turning circle: 0.92
- Cargo capacity: 0.91

**OVERALL OBSERVATIONS**

Honda Civic Touring

The Honda Civic has been one of the most popular small cars in the U.S. for years. We tested the top-of-the-line 2016 Civic Touring, which came with Bluetooth, heated seats (front and rear) and side mirrors, adaptive cruise control, lane-keeping assist, forward-collision warning, and more. That qualifies as a lot of car for just over $27,000, and it gets an average of 35 mpg in combined driving. The Civic comes with a turbocharged, 1.5-liter engine and a CVT transmission. It drives well, with a comfortable ride befitting a larger car, but it still has nimble handling. However, the center infotainment control screen is awkward to use and can be a distraction. At press time, NHTSA hadn’t crash-tested the new Civic, but IIHS had awarded it a Top Safety Pick+ rating (with optional front-crash prevention). All in all, the 2016 Civic is a clear improvement over the previous iteration (itself a very good car).

**LEAF RATING:**

- **OVERALL SCORE:** 58.89; **LOWEST**
- **HIGHEST RANKING:** 77.88

**FUEL INFORMATION**

- Fuel type: Regular
- Fuel capacity (gal): 12.4
- EPA urban mpg: 31
- EPA highway mpg: 42
- EPA combined mpg: 35

**AVERAGE MPG AS TESTED BY AUTO CLUB**

- **0.32**

**TEST DATA**

- EPA emissions score: 0.99
- Braking: 3.92
- Crashworthiness: 3.99
- Visibility: 3.99
- Stabilization: 9.82
- Ride quality: 3.99
- Interior noise: 3.99
- Acceleration: 3.99
- Ease of entry/exit: 3.99
- Interior size: 3.99
- Turning circle: 3.99
- Cargo capacity: 3.99

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- Ease of entry/exit: 3.99
- Interior size: 3.99
- Turning circle: 3.99
- Cargo capacity: 3.99

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**FUEL INFORMATION**

- Fuel type: Regular
- Fuel capacity (gal): 12.4
- EPA urban mpg: 31
- EPA highway mpg: 42
- EPA combined mpg: 35

**AVERAGE MPG AS TESTED BY AUTO CLUB**

- **0.32**

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- EPA emissions score: 0.99
- Braking: 3.92
- Crashworthiness: 3.99
- Visibility: 3.99
- Stabilization: 9.82
- Ride quality: 3.99
- Interior noise: 3.99
- Acceleration: 3.99
- Ease of entry/exit: 3.99
- Interior size: 3.99
- Turning circle: 3.99
- Cargo capacity: 3.99
**Overall Observations**

The fourth-generation Toyota Prius has arrived. It’s similar to the previous generations: excellent hybrid fuel economy, compact size, and functional and interior styling. But you get more of everything in the new Prius. Fuel economy for the Eco version is now an EPA-combined 56 mpg. The new exterior is bold and anime-like in character. Inside, the styling is similar to the previous Chevrolet Volt, with white plastics that evoke the look and feel of Apple’s iPhone. The biggest surprise, however, is its vehicle dynamics. Steering and handling are now much better and, compared with the previous Prius, downright sporty. The brakes are also more natural feeling, without as much regenerative effect, and the transition from EV operation to the gas engine is smoother than before. A variety of advanced safety features—a pre-collision system, adaptive cruise control, and lane-departure warning—are available. The Prius received 5 stars (out of 5) in NHTSA’s crash tests and a Top Safety Pick+ rating from IHS.

**NHTSA Safety Ratings (2016 Model):**

- **Overall:** 5/5 stars
- **Frontal:** 5/5 stars
- **Rollover:** 5/5 stars
- **Side Impact:** 5/5 stars

**Available Advanced Safety Features:**

- Reversing camera
- Blind-spot monitoring
- Rear cross-traffic alert
- Lane-departure warning
- Lane-keeping assist
- Adaptive cruise control
- Forward-collision warning
- Forward-collision avoidance

**Strong Points**

- Excellent fuel economy
- Surprisingly sporting handling
- Very good steering feel and accuracy, especially for an economy car
- Natural-feeling brakes
- High-tech interior appearance
- High-tech displays and gauges
- Smooth hybrid power, with a nearly transparent transition from EV to ICE power

**Weak Points**

- Polarizing anime-like styling
- Seats are a bit hard, with slightly narrow seatbacks
- Rear visibility is hampered by a horizontally split window
- Difficult to understand hybrid system displays
- Annoying creeping behavior when driving in reverse

**EPA highway mpg:** 56

**Fuel type:** Regular

**Average MPG as Tested by AUTO CLUB:** 56

**Price as Tested:** $25,535

**Base Price:** $24,700

**Test Data**

- **Acceleration:** 9.69
- **Braking:** 17.79
- **Crashworthiness:** 5.00
- **Visibility:** 6.90
- **Stallion handling:** 5.89
- **Ride quality:** 6.96
- **Fuel economy:** 11.3
- **Interior noise:** 6.83
- **Acceleration:** 16.22
- **Ease of entry and exit:** 5.41
- **Cargo capacity:** 5.19

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**Lexus CT 200h**

A few years ago, you’d never have imagined a 40 mpg Lexus sporty compact, but that changed in model year 2011. The CT 200h has been billed as the “highest mpg luxury car,” although it’s nowhere near as luxurious as other Lexus models. Using a powertrain similar to that of a Prius, it has a controller that lets you set the driving mode (Eco, Normal, or Sport) that suits you. The CT 200h’s styling is sporty, its handling is nimble, and its brakes provide short, straight stops. It’s also developed a reputation for high reliability. But it’s underpowered, the interior is noisier than a Lexus should be, and the backseat and trunk are small. NHTSA hasn’t crash-tested the CT 200h, but IIHS awarded it a Top Safety Pick+ rating (with optional front-crash prevention) for 2015 and 2016. Changes for 2015 and 2016 have been mostly cosmetic, a wide-mouth grille is the most obvious.

**NHTSA Safety Ratings (2016 Model):**

- **Overall:** 4/5 stars
- **Frontal:** 5/5 stars
- **Rollover:** 5/5 stars
- **Side Impact:** 5/5 stars

**Available Advanced Safety Features:**

- Reversing camera
- Forward-collision warning
- Forward-collision avoidance

**Strong Points**

- Excellent fuel economy
- Nimble, sporting handling
- Equipped with lots of luxury features
- Powerful brakes

**Weak Points**

- Slightly underpowered
- Noisy cabin for an entry-level luxury vehicle
- Mushy brake pedal feel
- Backseat cramped, hard to enter/exit
- Sound system and other controls are operated by a joystick

**EPA Highway MPG:** 58

**Fuel type:** Regular

**Average MPG as Tested by AUTO CLUB:** 58

**Price as Tested:** $32,960

**Base Price:** $32,560

**Test Data**

- **Acceleration:** 9.66
- **Braking:** 16.38
- **Crashworthiness:** 5.00
- **Visibility:** 6.90
- **Stallion handling:** 5.89
- **Ride quality:** 6.96
- **Fuel economy:** 11.9
- **Interior noise:** 6.83
- **Acceleration:** 16.22
- **Ease of entry and exit:** 5.41
- **Cargo capacity:** 5.19

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**Toyota Prius Two Eco**

**LEAF RATING:**

- **Overall Score:** 58.90 (Lowest)
- **Overall Ranking:** 77.35
- **Highest:** 92.49

**Vehicle Specifications**

- Model year tested: 2016
- Number of passengers (F/R): 2/3
- Curb weight (lbs): 3200
- Exterior length (in): 178.7
- Exterior width (in): 69.3
- Exterior height (in): 58.1
- Wheelbase (in): 106.3
- Restraint type: 9 air bags or more
- Warranty (months/miles): 36/36,000
- Tire manufacturer and size: Bridgestone P195/65R15
- Towing cap. (lbs): 1800
- Brake pedal type: Electric motor horsepower: 113 (53 kW)

**LEAF RATING:**

- **Overall Score:** 58.90 (Lowest)
- **Overall Ranking:** 77.35
- **Highest:** 92.49

**Vehicle Specifications**

- Model year tested: 2014
- Number of passengers (F/R): 2/3
- Curb weight (lbs): 3150
- Exterior length (in): 171.2
- Exterior width (in): 69.5
- Exterior height (in): 57.3
- Wheelbase (in): 102.4
- Restraint type: 9 air bags or more
- Warranty (months/miles): 48/50,000
- Tire manufacturer and size: Michelin P215/45R17
- Towing cap. (lbs): 1800
- Brake pedal type: Electric motor horsepower: 113 (53 kW)
Toyota Prius v Three

OVERALL OBSERVATIONS
In 2012, Toyota literally raised the roof to turn its Prius sedan into the Prius v (for versatile), a compact station wagon with the extra room and flexibility to compete with small SUVs. The v uses the sedan’s sophisticated hybrid powertrain, which mates a 1.8-liter 4-cylinder engine with an 80-hp electric motor (134 total hp) and a CVT transmission to deliver an estimated 42 mpg in combined city/highway driving. The Prius v is certified as a SULEV II. It’s equipped with many advanced convenience and safety technologies, such as standard automatic climate control and keyless ignition/entry, and an optional precollision safety system. For 2015, the v received updated front and rear styling, new upholstery fabric, and a new trim level. For 2016, the 2015 model carried over.

LEAF RATING:

FUEL INFORMATION:
- Fuel type: Regular
- Fuel capacity (gal): 11.9
- EPA urban mpg: 44
- EPA highway mpg: 40
- EPA combined mpg: 42
- AVERAGE MPG AS TESTED BY AUTO CLUB: 40

GREEN CAR GUIDE 2016
5.11
GREEN CAR GUIDE 2016
7.00

Toyota Prius v Three

BASE PRICE: $27,515; PRICE AS TESTED: $28,550

LEAF RATING:

FUEL INFORMATION:
- Fuel type: Regular
- Fuel capacity (gal): 14.5
- EPA urban mpg: 27
- EPA highway mpg: 36
- EPA combined mpg: 31
- AVERAGE MPG AS TESTED BY AUTO CLUB: 31

GREEN CAR GUIDE 2016
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7.00

Subaru Impreza 2.0i Sport Limited

OVERALL OBSERVATIONS
Subaru’s Impreza went through a minor refresh in 2015. We tested the top-of-the-line 2.0i Sport Limited, which was loaded with features, especially for a compact car. Powered by a 148-hp “boxer” 4-cylinder engine and CVT, it included Subaru’s excellent EyeSight crash-prevention system, Bluetooth, navigation, leather seating, and satellite radio. It also had steering-responsive fog lights, which come on automatically when you turn the car to shine light around a corner. Like all Subarus except the BRZ, the Impreza has AWD, but it’s still rated at 31 mpg in combined driving. The interior is quieter than previous models, but engine noise is intrusive. The hatchback design, with individual folding rear seats, gives it almost the versatility of a small SUV. The Impreza received a 5 star (out of 5) overall crash-test rating from NHTSA, and, for 2015 and 2016, a Top Safety Pick+ rating from IIHS with optional front-crash prevention. Long on the cake, the Impreza can be ordered as a PZEV.

LEAF RATING:

FUEL INFORMATION:
- Fuel type: Regular
- Fuel capacity (gal): 14.5
- EPA urban mpg: 27
- EPA highway mpg: 36
- EPA combined mpg: 31
- AVERAGE MPG AS TESTED BY AUTO CLUB: 31

GREEN CAR GUIDE 2016
5.11
GREEN CAR GUIDE 2016
7.00

Subaru Impreza 2.0i Sport Limited

BASE PRICE: $23,295; PRICE AS TESTED: $26,885

LEAF RATING:

FUEL INFORMATION:
- Fuel type: Regular
- Fuel capacity (gal): 11.9
- EPA urban mpg: 44
- EPA highway mpg: 40
- EPA combined mpg: 42
- AVERAGE MPG AS TESTED BY AUTO CLUB: 40

GREEN CAR GUIDE 2016
5.11
GREEN CAR GUIDE 2016
7.00

Toyota Prius v Three
**Volkswagen Jetta Hybrid SEL Premium**

**OVERALL OBSERVATIONS**

The Jetta Hybrid combines European styling and responsive handling with great gas mileage. Its turbocharged, 1.4-liter, 4-cylinder engine and 27-HP electric motor produce 170 HP total. We tested the top-of-the-line SEL Premium trim level. At $31,180, it's both well priced and well equipped. Amenities include heated front seats, a rearview camera, and a Fender sound system. The EPA's combined mileage estimate for the Jetta Hybrid is 45 mpg; our test vehicle averaged 40 mpg. The downside is that the Jetta Hybrid requires premium fuel, minimizing the savings achieved by high fuel economy. The 2016 Jetta received 5 stars (out of 5) overall crash-test rating from IIHS. For 2016, a rearview camera is standard. It has a turbocharged engine but still meets PZEV emissions standards with a turbocharged sporty car. NHTSA gave the A3 an overall crash-test rating of 5 stars (out of 5). IIHS awarded it a 2015 and 2016 Top Safety Pick+ rating (with optional front-crash prevention). For 2016, a rearview camera is standard.

**STRONG POINTS**
- Good power
- Attractive styling
- Heated seats
- Certified PZEV

**WEAK POINTS**
- Requires premium fuel
- Compromised visibility
- Small trunk
- Awkward radio controls
- Not enough gauges/ instrumentation

**VEHICLE SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Model year tested</th>
<th>2013</th>
</tr>
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<td>Exterior length (in)</td>
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<td>Warranty (months/miles)</td>
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<td>Tire manufacturer and size</td>
<td>Continental P205/55R16</td>
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<td>Towing cap. (lbs) w/reces. brakes</td>
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<td>Transmission type</td>
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<td>Drivetrain type</td>
<td>Front wheel</td>
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<tr>
<td>Engine size</td>
<td>1.4L DOHC 16 Turbo</td>
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<td>Horsepower @ rpm</td>
<td>150 @ 5000 (170 total)</td>
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<tr>
<td>Electric motor horsepower</td>
<td>27 hp (20 kW)</td>
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**FUEL INFORMATION**

- Fuel type: Hybrid
- Fuel capacity (gal): 11.8
- EPA urban mpg: 42
- EPA highway mpg: 48
- EPA combined mpg: 45

**AVERAGE MPG AS TESTED BY AUTO CLUB**

- 0040

**TEST DATA**

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<th>EPA emissions score</th>
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<td>Visibility</td>
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<td>Slalom handling</td>
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<tr>
<td>Ride quality</td>
<td>8.65</td>
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<tr>
<td>Fuel economy</td>
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<td>Interior noise</td>
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<td>Acceleration</td>
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<td>Ease of entry and exit</td>
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<td>Turning circle</td>
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<tr>
<td>Cargo capacity</td>
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**LEAF RATING:**

- OVERALL SCORE: 58.89
- LOWEST: 58.89
- HIGHEST: 92.49
- OVERALL RANKING: 26

**Audi A3 Premium**

**OVERALL OBSERVATIONS**

With its 2015 redesign, the Audi A3 has morphed from a small station wagon into a compact entry-level luxury sedan. Our test car was powered by a turbocharged, 1.8-liter, 4-cylinder engine that produces 170 hp, matched with a 6-speed automated manual transmission. The A3 excelled on our slalom course, and it rides well, accelerates responsively, and has extremely short stopping distances. Typical for Audi, the A3's cabin is luxurious, but the backseat is cramped and hard to get in and out of. The trunk is small, too, but the rear seats fold down. Nevertheless, Audi still meets stringent PZEV emission standards with a turbocharged sporty car. NHTSA gave the A3 an overall crash-test rating of 5 stars (out of 5). IIHS awarded it a 2015 and 2016 Top Safety Pick+ rating (with optional front-crash prevention). For 2016, a rearview camera is standard.

**STRONG POINTS**
- Powerful brakes
- Quality ride and handling
- Blind-spot monitoring
- Lane-departure warning
- Adaptive cruise control

**WEAK POINTS**
- Poor rear visibility
- Difficult to enter and exit
- Requires premium fuel

**VEHICLE SPECIFICATIONS**

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<th>Model year tested</th>
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<td>Warranty (months/miles)</td>
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<td>Tire manufacturer and size</td>
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<td>Towing cap. (lbs) w/reces. brakes</td>
<td>Not recommended</td>
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<td>Transmission type</td>
<td>Auto 6 speed</td>
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<td>Drivetrain type</td>
<td>Front wheel</td>
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<tr>
<td>Engine size</td>
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<td>Horsepower @ rpm</td>
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**FUEL INFORMATION**

- Fuel type: Premium
- Fuel capacity (gal): 13.2
- EPA urban mpg: 23
- EPA highway mpg: 33
- EPA combined mpg: 27

**AVERAGE MPG AS TESTED BY AUTO CLUB**

- 0025

**TEST DATA**

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<td>Visibility</td>
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<td>Slalom handling</td>
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<td>Ride quality</td>
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<td>Fuel economy</td>
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<td>Interior noise</td>
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<td>Acceleration</td>
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<td>Ease of entry and exit</td>
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<td>Turning circle</td>
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**LEAF RATING:**

- OVERALL SCORE: 58.89
- LOWEST: 59.89
- HIGHEST: 92.49
- OVERALL RANKING: 27

---

AAA GREEN CAR GUIDE 2016

AAA.com/greencar
## Overall Observations
The second-generation Chevrolet Volt plug-in hybrid is a big improvement over the first version, which already was a pretty good car. The new Volt’s exterior is sleeker, and the interior design is more mainstream and less futuristic. The powertrain has a more powerful gasoline engine (101 hp), two electric motors (149 hp), and a bigger battery (18.4 kWh versus 16 kWh). As a result, the all-electric range jumps from 38 miles to 53, and from 98 to 106 MPGe. Also, premium gas is no longer required. As a result, the all-electric range jumps from 38 miles to 53, and the combined fuel-economy rating improves from 37 to 42 mpg and from 98 to 106 MPGe. Also, premium gas is no longer required.

### Vehicle Specifications

<table>
<thead>
<tr>
<th>Model Year</th>
<th>Number of Passengers</th>
<th>Curb Weight</th>
<th>Exterior Length (in)</th>
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<th>Exterior Height (in)</th>
<th>Wheelbase (in)</th>
<th>Restraint Type</th>
<th>Warranty (months/miles)</th>
<th>Tire Manufacturer and Size</th>
<th>Towing Capacity (lbs)</th>
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<td>3300</td>
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<td>56.4</td>
<td>106.1</td>
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<td>Electric motor horsepower:  (2) 111 kW (149)</td>
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<table>
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<th>Tire Manufacturer and Size</th>
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### Overall Score

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<td>4.51</td>
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### VEHICLE SPECIFICATIONS

<table>
<thead>
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<th>Model year tested</th>
<th>Number of Passengers (F/R)</th>
<th>Curb weight (lbs)</th>
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<th>Exterior height (in)</th>
<th>Wheelbase (in)</th>
<th>Restraint type</th>
<th>Warranty (months/miles)</th>
<th>Tire manufacturer and size</th>
<th>Towing capacity (lbs)</th>
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<tbody>
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### EPA Emissions Score

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<th>Wheelbase (in)</th>
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<tr>
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<td>Engine size: 2.0L DOHC GDI I4</td>
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<td>Horserpower: 264 @ 6200</td>
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### FUEL INFORMATION

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<tr>
<th>Fuel type:</th>
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### Battery Charge Time

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<td>1207</td>
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<td>6</td>
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</table>

### Performance

- **Model year tested:** 2016
- **Number of passengers:** 5
- **Curb weight:** 3300 lbs
- **Exterior length:** 180.4 in
- **Exterior width:** 71.2 in
- **Exterior height:** 56.4 in
- **Wheelbase:** 106.1 in
- **Restraint type:** 9 air bags or more
- **Warranty (months/miles):** 36/36,000
- **Tire manufacturer and size:** Michelin 215/55R17
- **Towing capacity:** 1,500 lbs
- **Transmission type:** Auto 1 speed
- **Engine size:** 1.5L DOHC I4 Ecotec
- **Horsepower:** 164 @ 6200
- **Electric motor horsepower:** (2) 111 kW (149)

### Crashworthiness

- **Model year tested:** 2016
- **Number of passengers:** 5
- **Curb weight:** 3260 lbs
- **Exterior length:** 180.0 in
- **Exterior width:** 70.9 in
- **Exterior height:** 63.0 in
- **Wheelbase:** 101.2 in
- **Restraint type:** 8 air bags
- **Warranty (months/miles):** 60/60,000
- **Tire manufacturer and size:** Kumho 215/55R17
- **Towing capacity:** 2,000 lbs
- **Transmission type:** Auto 6 speed
- **Engine size:** 2.0L DOHC GDI I4
- **Horsepower:** 264 @ 6200
## CHERRY HILL

### VEHICLE SPECIFICATIONS

<table>
<thead>
<tr>
<th>Feature</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model year</td>
<td>2016</td>
</tr>
<tr>
<td>Number of passengers (F/R)</td>
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</tr>
<tr>
<td>Curb weight (lbs)</td>
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<tr>
<td>Exterior length (in)</td>
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<td>Tire manufacturer and size</td>
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<td>Towing cap. (lbs) when brakes</td>
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<td>Drivetrain type</td>
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<tr>
<td>Engine size</td>
<td>1.4L DOHC 16V I4</td>
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<tr>
<td>Horsepower @ rpm</td>
<td>84 @ 4800 (48 kW)</td>
</tr>
<tr>
<td>Electric motor horsepower</td>
<td>137 hp (174 kW)</td>
</tr>
</tbody>
</table>

### OVERALL OBSERVATIONS

The Cadillac ELR is a beautifully finished interior, with luxury styling and appointments that extend to a power cupholder cover. The exterior styling is also quite handsome—with the exception of the short wheelbase, which make the overall profile look truncated. Acceleration is fairly quick, with a 0-40 time of 7.6 seconds, and handling is very sporty, with just a bit of understeer. The ride, though, may be the ELR’s best attribute—it’s plush without being at all floaty. On the downside, the instruments that indicate electric power and charging state are busy and confusing. The front spoiler, which is for improved aerodynamics, frequently scrapes on road dips and driveway entrances. And the rear seat is cramped, although legroom is sufficient if the front seats are moved far enough forward. Neither NHTSA nor IIHS has crash-tested the Cadillac ELR. The ELR can travel up to an EPA-estimated 36 miles on electricity alone.

### AVAILABLE ADVANCED SAFETY FEATURES

- Rearview camera
- Blind-spot monitoring
- Rear cross-traffic alert
- Lane-departure warning
- Adaptive cruise control
- Forward-collision warning

### STRONG POINTS

- Excellent ride quality
- Electric motor is powerful
- Sporty handling, with just a bit of understeer
- Beautifully finished interior

### WEAK POINTS

- Instrument displays are busy and confusing
- Cramped backseat
- Small rear window restricts visibility
- Front spoiler scrapes on dips and driveway entrances
- Tiny trunk-opening height

### TEST DATA

<table>
<thead>
<tr>
<th>Test Type</th>
<th>Score</th>
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<td>Visibility</td>
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<td>Stamin handling</td>
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<td>Ride quality</td>
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<td>Fuel economy</td>
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<td>Interior noise</td>
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<td>Acceleration</td>
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<td>Ease of entry and exit</td>
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<td>Turning circle</td>
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<td>Cargo capacity</td>
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### OVERALL RATING:

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<th>Overall Score</th>
<th>Highest Ranking</th>
<th>Overall Ranking</th>
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</thead>
<tbody>
<tr>
<td>58.29 - LOWEST</td>
<td>92.49</td>
<td>52</td>
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### LEAF RATING:

<table>
<thead>
<tr>
<th>Overall Observation</th>
<th>Rating</th>
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<tbody>
<tr>
<td>Strong Points</td>
<td>5</td>
</tr>
<tr>
<td>Weak Points</td>
<td>2</td>
</tr>
</tbody>
</table>

### PRICE

- **BASE PRICE:** $65,000
- **Price as tested:** $67,790

### AAA.com/greencar

AAA.com/greencar
### Ford Focus SE Ecoboost

**OVERALL OBSERVATIONS**

The Focus is Ford's attempt to compete with the successful Japanese/Korean entry-level compacts, and it does so quite well. We tested a Focus SE, with the 1.0-liter, 3-cylinder Ecoboost engine, which gets 33 mpg in combined driving. This turbocharged engine, though small, has decent power once you get the revs up. The SE trim on our test car included attractive 17-inch alloy wheels and Cooper 215/50R17 tires, which provided surprisingly good handling and a solid ride. The Focus's backseat and trunk are small, although the rear seats do fold down to increase cargo capacity. This is an easy-to-drive car and is reasonably equipped for only $21,000. The Focus was awarded a 5-star (out of 5) overall crash-test rating from NHTSA and a Top Safety Pick rating from IIHS. For 2016, a 6-speed automatic is available, as well as Ford's SYNC 3 touch-screen interface.

**VEHICLE SPECIFICATIONS**

- **Compact NonHybrid High MPG**
- **Overall Observations**
  - Strong Points
  - High fuel economy
  - Good value (a solid, small sedan for $21,000)
  - Good ride quality for a small car
  - Sporty styling in SE trim
  - Easy-to-use manual shifter
  - High fuel economy (33 mpg combined)
  - Good value (a solid, small car)
  - Good ride quality for a small car

**FUEL INFORMATION**

- **Regular**
  - Fuel type: Gasoline
  - Fuel capacity (gal): 12.4
  - EPA urban mpg: 29
  - EPA highway mpg: 40
  - EPA combined mpg: 33

**AVERAGE MPG AS TESTED BY AUTO CLUB**

- 70.20

**TEST DATA**

- **EPA emissions score:** 6.90
- **Braking:** 6.20
- **Crashworthiness:** 6.90
- **Visibility:** 6.90
- **Slalom handling:** 6.90
- **Ride quality:** 6.90
- **Fuel economy:** 6.90
- **Interior noise:** 6.90
- **Acceleration:** 6.90
- **Ease of entry and exit:** 6.90
- **Interior size:** 6.90
- **Turning circle:** 6.90
- **Cargo capacity:** 6.90

**MODEL YEAR: TESTED**

- **Ford Focus SE Ecoboost 2015**

**OVERALL SCORE**

- 92.49

### Scion iM

**OVERALL OBSERVATIONS**

The iM, one of two new Scions for 2016, is the marque's compact hatchback. It's easy to drive and park, with responsive steering and nimble handling, and it has a decent cargo capacity. Cabin materials are good quality, with lots of padded and soft-touch surfaces; dual-zone automatic climate control is standard. Yet the front seats are narrow and the backseat is cramped, suitable only for small children. Visibility to the rear and sides is poor, and ride comfort could be better. The 1.8-liter, 4-cylinder engine produces 137 hp, which isn't quite enough for this car; its acceleration times were slow. With its CVT transmission, the iM gets 32 mpg in combined driving. At press time, neither NHTSA nor IIHS had crash-tested the iM. In 2017, the Scion brand will disappear, and this vehicle will be rebranded as a Toyota.

**VEHICLE SPECIFICATIONS**

- **Compact NonHybrid High MPG**
- **Overall Observations**
  - Strong Points
  - Responsive steering, sporty handling
  - Easy to drive and park
  - Good fuel economy
  - Good value (a solid, small sedan for $21,000)
  - Complied interior for large occupants

**FUEL INFORMATION**

- **Regular**
  - Fuel type: Unleaded Regular
  - Fuel capacity (gal): 14
  - EPA urban mpg: 28
  - EPA highway mpg: 37
  - EPA combined mpg: 32

**AVERAGE MPG AS TESTED BY AUTO CLUB**

- 6.81

**TEST DATA**

- **EPA emissions score:** 6.29
- **Braking:** 6.79
- **Crashworthiness:** 6.19
- **Visibility:** 6.19
- **Slalom handling:** 6.19
- **Ride quality:** 6.19
- **Fuel economy:** 6.19
- **Interior noise:** 6.19
- **Acceleration:** 6.19
- **Ease of entry and exit:** 6.19
- **Interior size:** 6.19
- **Turning circle:** 6.19
- **Cargo capacity:** 6.19

**MODEL YEAR: TESTED**

- **Scion iM 2016**
Overall Observations

The Chevrolet Sonic is a small car that makes good use of its interior space. It’s roomy for front seat occupants and adequate in the rear if you’re not too tall. We tested the well-equipped LTZ package with the 1.4-liter turbocharged 4-cylinder engine (138 hp) and a 6-speed automatic transmission. This package makes more torque than the standard naturally aspirated 1.8-liter engine and gets better fuel economy to boot—31 mpg combined. General Motors likes to tout its advances in infotainment, but our evaluators uniformly panned the Sonic’s touch-screen interface. Hopefully, the MyLink infotainment system standard on LTZ models in 2016 is an improvement. The 2016 Sonic received a 5 star (out of 5) overall rating in NHTSA’s crash testing. Most 2015 trim levels edition received standard forward-collision warning IIHS (with optional front-crash prevention).

Strong Points

- Turbocharged, 1.4-liter engine provides surprising torque
- Easy to drive and park
- Roomy front seats for a small car
- Heated seats
- Good fuel economy (31 mpg combined)
- Turbocharged, 1.4-liter engine

Weak Points

- Cramped back seat
- Radio controls are on the touch screen, can be distracting
- Small sun visors
- Lacks rear center armrest
- Roomy front seats for a small car
- Heated seats
- Good fuel economy (31 mpg combined)
- Turbocharged, 1.4-liter engine

Test Data

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<th>Chevrolet Sonic LTZ</th>
<th>Toyota Corolla LE Eco</th>
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Vehicle Specifications

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<thead>
<tr>
<th>Model year tested</th>
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<th>2014</th>
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<tr>
<td>Number of passengers (F/R)</td>
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<td>2/3</td>
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<td>2860</td>
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<td>Exterior height (in)</td>
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<td>Wheelbase (in)</td>
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<td>Warranty (months/miles)</td>
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<td>1.8L DOHC 16V I4</td>
</tr>
<tr>
<td>Horsepower @ rpm</td>
<td>138 @ 6300</td>
<td>140 @ 6100</td>
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### Kia Forte EX

#### LEAF RATING:

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<thead>
<tr>
<th>OVERALL OBSERVATIONS</th>
<th>STRONG POINTS</th>
<th>WEAK POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMPACT NONHYBRID high MPG</td>
<td>Great handling</td>
<td>Low roofline restricts entry and exit</td>
</tr>
<tr>
<td></td>
<td>Active Eco mode for improved fuel economy</td>
<td>Small steering wheel controls</td>
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<tr>
<td></td>
<td>Front and rear heated seats</td>
<td>Insufficient number of gauges/warning lights</td>
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<td></td>
<td>Three different steering modes</td>
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#### TEST DATA

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<th>TEST VEHICLE SCORES (0 TO 10 POINTS)</th>
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<tr>
<td>Ride quality</td>
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<tr>
<td>Handling</td>
</tr>
<tr>
<td>Fuel economy</td>
</tr>
<tr>
<td>Interior size</td>
</tr>
<tr>
<td>Visibility</td>
</tr>
<tr>
<td>Cargo capacity</td>
</tr>
</tbody>
</table>

#### VEHICLE SPECIFICATIONS

- **Regular Fuel**
  - Fuel capacity (gal): 13.2
  - EPA urban mpg: 24
  - EPA highway mpg: 36
  - EPA combined mpg: 28

#### FUEL INFORMATION

- Regular Fuel: 024

#### AVERAGE MPG AS TESTED BY AUTO CLUB

- 6.79

#### NHTSA SAFETY RATINGS (2016 MODEL): N/A

#### AVAILABLE ADVANCED SAFETY FEATURES

- Rearview camera

#### OVERALL SCORE

- 92.49

#### BASE PRICE: $20,200; PRICE AS TESTED: $25,315

### Mini Cooper Countryman

#### LEAF RATING:

<table>
<thead>
<tr>
<th>OVERALL OBSERVATIONS</th>
<th>STRONG POINTS</th>
<th>WEAK POINTS</th>
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</thead>
<tbody>
<tr>
<td>COMPACT NONHYBRID high MPG</td>
<td>Fun to drive</td>
<td>Noisy cabin</td>
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<tr>
<td></td>
<td>Responsive steering feel</td>
<td>Stiff shocks</td>
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<tr>
<td></td>
<td>ABS brakes provide short stops</td>
<td>Poor rear visibility</td>
</tr>
<tr>
<td></td>
<td>Cute styling</td>
<td>Small, unusual controls</td>
</tr>
<tr>
<td></td>
<td>Fits in small parking spaces</td>
<td>Requires premium fuel</td>
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#### TEST DATA

<table>
<thead>
<tr>
<th>TEST VEHICLE SCORES (0 TO 10 POINTS)</th>
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<tbody>
<tr>
<td>Acceleration</td>
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<td>Ride quality</td>
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<td>Fuel economy</td>
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<tr>
<td>Interior size</td>
</tr>
<tr>
<td>Visibility</td>
</tr>
<tr>
<td>Cargo capacity</td>
</tr>
</tbody>
</table>

#### VEHICLE SPECIFICATIONS

- **Premium Fuel**
  - Fuel capacity (gal): 12.4
  - EPA urban mpg: 25
  - EPA highway mpg: 30
  - EPA combined mpg: 27

#### FUEL INFORMATION

- Premium Fuel: 027

#### AVERAGE MPG AS TESTED BY AUTO CLUB

- 6.30

#### NHTSA SAFETY RATINGS (2016 MODEL): N/A

#### AVAILABLE ADVANCED SAFETY FEATURES

None available

#### OVERALL SCORE

- 70

#### BASE PRICE: $24,145; PRICE AS TESTED: $24,145

### General Observations

The Kia Forte, which was completely redesigned for 2014, is a good example of how the automaker has greatly improved its styling and quality while maintaining excellent affordability. Our EX trim test vehicle, which was equipped with a 2.0L 4-cylinder, 173-hp engine and a 6-speed automatic transmission, is certified as a PZEV and got 28 mpg in combined driving. It came with the Premium package, which includes a sunroof, heated and cooled seats, and an HD radio, still, the MSRP was just over $25,000 as tested. Although the Forte handles and rides well, the hatchback’s roofline is low, making entry and exit difficult. The general exterior fit was good, but some materials inside the vehicle lacked quality. NHTSA has not crash-tested the Forte hatchback. The Forte has changed little since 2014, a redesigned 2017 edition is reportedly in the works and will likely be on sale later this year.

Econoboxes that aren’t econoboxes? That would be the line of Mini Coopers from BMW. Based on the iconic little British sports car, the Mini is tiny, cute, and immense fun to drive. We tested the larger, four-door Countryman version, whose sole econobox trait is its stingy, 27-mpg EPA combined fuel-economy rating. The Countryman’s handling and brakes are fantastic, and the car is easy to drive and to park. However, it seems like Mini went out of its way to equip it with small, odd, and awkward “British” controls for the heating and air-conditioning, radio, doors, rear hatch, and most other functions. Apart from changes to some option packages, the 2015 and 2016 Countryman remain the same. NHTSA has not crash-tested the Countryman.
**OVERALL OBSERVATIONS**
The Dodge Dart name harks back to the 1960s and recalls memories of a reliable small sedan. We tested the Aero version, which comes equipped with a turbocharged, 1.4-liter, inline-4 engine, good for 160 hp, and a 6-speed manual transmission. This combination provides the best fuel economy of any Dart, 33 mpg combined. The Dart is based on Alfa Romeo mechanicals, from parent company Fiat, but the connection isn’t apparent. The styling is sporty, and the Dart is well equipped for its $21,000 price tag. Additionally, it scores 5 stars (out of 5) overall in NHTSA's crash tests. On the downside, many of the Dart's controls are on a large touch screen, which can be distracting. And its bumpy ride makes selecting a radio preset (icons in a row at the top of the screen) an exercise in trying to hit a moving target. Changes for 2016 are minor and basically cosmetic.

<table>
<thead>
<tr>
<th>Dodge Dart SE Aero</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Base Price:</strong> $19,995; <strong>Price as Tested:</strong> $20,990</td>
</tr>
<tr>
<td><strong>EPA Combined MPG:</strong> 33</td>
</tr>
<tr>
<td><strong>Fuel Type:</strong> Unleaded Premium</td>
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<tr>
<td><strong>Engine Size:</strong> 1.4L DOHC Turbo</td>
</tr>
</tbody>
</table>

| **Model Year Test:** 2015 |
| **EPA Fuel Economy:** 28/34/33 |
| **Cash Weight:** 3,081 lbs |
| **Exterior Length:** 183.9 in |
| **Exterior Width:** 72.0 in |
| **Exterior Height:** 57.7 in |
| **Wheelbase:** 106.4 in |

### AVAILABLE ADVANCED SAFETY FEATURES
- Rearview camera

### TEST DATA
- **Braking:**
  - 360 ft to 60 mph: 119 ft
  - 65 ft to 0 mph: 36 ft
- **Crashworthiness:**
  - Overall Score: 5/5
  - Frontal Impact: 5/5
  - Side Impact: 5/5
- **Visibility:**
  - Overall Score: 5/5

### STRONG POINTS
- Sporty styling
- Large infotainment screen with Bluetooth and satellite radio

### WEAK POINTS
- Bumpy, noisy ride
- Requires premium fuel
- No exterior trunk release
- Lacks rear center armrest
- Mirror controls are not backlit

### VEHICLE SPECIFICATIONS
- **Model Year Tested:** 2015
- **Number of Passengers (F/R):** 5/3
- **Curb Weight (lbs):** 3,081
- **Exterior Length (in):** 183.9
- **Exterior Width (in):** 72.0
- **Exterior Height (in):** 57.7
- **Wheelbase (in):** 106.4
- **9 Air Bags or More:** Yes
- **Airbag Type:** 9
- **Towing Capacity (lbs):** 1,400
- **Type:** 1.4L DOHC Turbo
- **Engine Size:** 1.4L
- **Horsepower:** 160 @ 5500 rpm
- **Transmission:** Manual 6-speed
- **Braking:**
  - 360 ft to 60 mph: 119 ft
  - 65 ft to 0 mph: 36 ft
- **Crashworthiness:**
  - Overall Score: 5/5
  - Frontal Impact: 5/5
  - Side Impact: 5/5
- **Visibility:**
  - Overall Score: 5/5

### OVERALL RANKING
- **Overall Score:** 92.49
- **Overall Ranking:** 80

---

**Hyundai Accent SE**

<table>
<thead>
<tr>
<th>Hyundai Accent SE</th>
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<tbody>
<tr>
<td><strong>Base Price:</strong> $15,745; <strong>Price as Tested:</strong> $16,580</td>
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<tr>
<td><strong>EPA Combined MPG:</strong> 30</td>
</tr>
<tr>
<td><strong>Fuel Type:</strong> Unleaded Regular</td>
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<tr>
<td><strong>Engine Size:</strong> 1.4L DOHC Turbo</td>
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</tbody>
</table>

| **Model Year Test:** 2016 |
| **EPA Fuel Economy:** 25/33/30 |
| **Cash Weight (lbs):** 2,560 |
| **Exterior Length (in):** 172.0 |
| **Exterior Width (in):** 66.9 |
| **Exterior Height (in):** 57.1 |
| **Wheelbase (in):** 101.2 |
| **RestRAINT TYPE:** 8 Air Bags |
| **Warranty (months/miles):** 60,000 |
| **Towing Capacity (lbs):** 1,650 |

### AVAILABLE ADVANCED SAFETY FEATURES
- None available

### TEST DATA
- **Braking:**
  - 360 ft to 60 mph: 119 ft
  - 65 ft to 0 mph: 36 ft
- **Crashworthiness:**
  - Overall Score: 5/5
  - Frontal Impact: 5/5
  - Side Impact: 5/5
- **Visibility:**
  - Overall Score: 5/5

### STRONG POINTS
- Affordable purchase price
- Very good fuel economy
- Controls are simple and easy to use
- Excellent warranty
- Fits in small parking places

### WEAK POINTS
- Choppy ride, especially on the freeway
- Cramped rear seat
- Lots of cheap-looking plastic in the interior
- Lacks rear center armrest
- Lacks rear-seat cup holders

### VEHICLE SPECIFICATIONS
- **Model Year Tested:** 2016
- **Number of Passengers (F/R):** 5/3
- **Curb Weight (lbs):** 2,560
- **Exterior Length (in):** 172.0
- **Exterior Width (in):** 66.9
- **Exterior Height (in):** 57.1
- **Wheelbase (in):** 101.2
- **Airbag Type:** 8
- **Towing Capacity (lbs):** 1,650
- **Transmission Type:** Auto 6-speed
- **Braking:**
  - 360 ft to 60 mph: 119 ft
  - 65 ft to 0 mph: 36 ft
- **Crashworthiness:**
  - Overall Score: 5/5
  - Frontal Impact: 5/5
  - Side Impact: 5/5
- **Visibility:**
  - Overall Score: 5/5

### OVERALL RANKING
- **Overall Score:** 92.49
- **Overall Ranking:** 81
Midsize

Last year, we reported that the best-selling type of cars were midsize cars. No longer—crossovers/SUVs have recently grabbed that crown. Nonetheless, if a compact car is too small for your needs and you prefer a sedan or coupe body style over a crossover, chances are you can find a midsize car that suits your fancy. Midsize cars are spacious enough to accommodate at least four adults, their cabins have higher-quality materials and are quieter than those of smaller cars, they have plenty of cargo space, and they deliver the ride comfort—especially for longer trips—that subcompacts and compacts just can’t match. Midsize cars can also be fun to drive, with precise steering and responsive handling. And let’s not skip over how high fuel economy. Many of the top sellers—and not just hybrids or EVs—boast highway mpg numbers in the mid to high 30s.

**MERCEDES-BENZ**

**E250 BlueTEC 4MATIC**

Mercdes-Benz has long been an industry leader in diesel-powered automobiles. We tested an E250 BlueTEC 4MATIC sedan equipped with a twin-turbo, 2.1-liter, 4-cylinder diesel rated at 195 hp. It ran from 0-60 in 8.5 seconds, was extremely quiet, and got 32 mpg in our testing. There’s a little throttle lag; otherwise, you wouldn’t know a diesel engine is under the hood. The E250’s $64,000 price tag buys lots of safety and convenience features, including adaptive cruise control, surround-view camera, lane-keeping assist, rear cross-traffic alert, parking assist, navigation, and satellite radio. NHTSA gave it a Top Safety Pick+ rating. The bottom line: The E250 BlueTEC is a high-quality luxury car that delivers excellent fuel economy. A redesigned E Class is due some time this summer.

**AVAILABLE ADVANCED SAFETY FEATURES**

- Surround-view camera
- Blind-spot monitoring
- Rear cross-traffic alert
- Lane-departure warning
- Lane-keeping assist
- Adaptive cruise control
- Forward-collision warning
- Forward-collision avoidance

**STRONG POINTS**

- Very good fuel economy (32 mpg combined)
- Loaded with safety and convenience features
- Easy to drive, comfortable ride
- Powerful brakes
- AWD traction
- Good front seat adjustability and comfort

**WEAK POINTS**

- High purchase price
- Slow, odd-shifting transmission
- MB Comand control system is complicated and distracting
- Three stalks on left side of steering wheel can be confusing
- Throttle lag

**TEST DATA/TEST VEHICLE SCORES (0 TO 10 POINTS)**

- **EPA emissions score**: 5.90
- **Braking**: 3.88
- **Crashworthiness**: 5.57
- **Visibility**: 4.50
- **Slalom handling**: 5.60
- **Ride quality**: 5.50
- **Fuel economy**: 5.61
- **Interior noise**: 5.69
- **Acceleration**: 5.54
- **Ease of entry/exit**: 6.68
- **Interior size**: 5.76
- **Turning circle**: 3.29
- **Cargo capacity**: 1.99

**NHTSA SAFETY RATINGS (2016 MODEL): ★★★★★**

**OVERALL RATING:** 78.27

**FUEL INFORMATION**

- **Fuel type**: Diesel #2
- **Fuel capacity (gal)**: 21.1
- **EPA urban mpg**: 27
- **EPA highway mpg**: 42
- **EPA combined mpg**: 32

**VEHICLE SPECIFICATIONS**

- **Model year tested**: 2014
- **Number of passengers (F/R)**: 2/3
- **Curb weight (lbs)**: 4380
- **Exterior length (in)**: 191.7
- **Exterior width (in)**: 81.5
- **Exterior height (in)**: 57.9
- **Wheelbase (in)**: 113.2
- **Restraint type**: 9 air bags or more
- **Warranty (months/miles)**: 48/50,000
- **Tire manufacturer and size**: Bridgestone 245/45R17
- **Transmission type**: Auto 7 speed
- **Engine size**: 2.1L Biturbo Diesel 4
- **Horsepower @ rpm**: 195 @ 3800

**PRICE AS TESTED:** $54,825; **AS TESTED:** $64,295
OVERALL OBSERVATIONS
With the GS 450h, Lexus combines a 3.5-liter, V6 gasoline engine, two electric motors (338 hp total), and a CVT transmission, taking advantage of a hybrid powertrain's strong points (electric motors provide maximum torque at low speeds) and delivering both excellent performance and high fuel economy. Our GS 450h test car got 31 mpg overall—35 MPG in the city and 27 mpg on the highway. Our test car was loaded with safety and convenience features, including LED headlights, Bluetooth, voice-activated navigation, satellite radio, and much more. NHTSA has not crash-tested the GS 450h. For 2016, the GS 450h provides equal or better performance. Our test car was loaded with safety and convenience features, including LED headlights, Bluetooth, voice-activated navigation, satellite radio, and much more. NHTSA has not crash-tested the GS 450h. For 2016, the GS 450h received a restyled front end and rear bumper and additional cameras. NHTSA awarded the 2016 Passat 5 stars (out of 5) overall in its crash-testing. In its side impact tests, the Passat 5 stars (out of 5) overall in its crash-testing. NHTSA awarded the 2016 Passat 5 stars (out of 5) overall in its crash-testing. Including rear air-conditioning vents, adaptive cruise control, and a collision-mitigation system with automated braking. NHTSA awarded the 2016 Passat 5 stars (out of 5) overall in its crash-testing.

NHTSA SAFETY RATINGS (2016 MODEL: N/A)
- • Reversing camera
- • Blind-spot monitoring
- • Rear cross-traffic alert
- • Lane-departure warning
- • Lane-keeping assist

AVAILABLE ADVANCED SAFETY FEATURES
- • Adaptive cruise control
- • Forward-collision warning
- • Forward-collision avoidance

TEST DATA
- • Good handling, fun to drive
- • Good braking performance
- • Plenty of backseat legroom

veh/vehicle_safety/Overview

VEHICLE SPECIFICATIONS

MODEL YEAR: 2014
NUMBER OF PASSENGERS: 5
CURB WEIGHT (lbs): 4400
EXTERIOR LENGTH (in): 190.7
EXTERIOR WIDTH (in): 72.4
EXTERIOR HEIGHT (in): 57.3
WHEELBASE (in): 108
RESTRAINT TYPE: 9 air bags or more
WARRANTY (MONTHS/MILES): 48/50,000
TIRED MANUFACTURER AND SIZE: Michelin P235/45R18
TOWING CAP (lbs): 2860 @ 6000 (338 total)
ENGINE SIZE: 3.5L, 24V DOHC V6
HORSEPOWER (hp): 286 @ 6000 (338 total)
ELECTRIC MOTOR HORSEPOWER: 197 hp (147 kW)

VEHICLE SPECIFICATIONS

MODEL YEAR: 2016
NUMBER OF PASSENGERS: 5
CURB WEIGHT (lbs): 3340
EXTERIOR LENGTH (in): 191.3
EXTERIOR WIDTH (in): 72.2
EXTERIOR HEIGHT (in): 58.5
WHEELBASE (in): 110.4
RESTRAINT TYPE: 8 air bags
WARRANTY (MONTHS/MILES): 36/36,000
TIRED MANUFACTURER AND SIZE: Continental 215/55R17
TOWING CAP (lbs): 2860 @ 6000 (338 total)
ENGINE SIZE: 3.5L, 24V DOHC V6
HORSEPOWER (hp): 286 @ 6000 (338 total)
ELECTRIC MOTOR HORSEPOWER: 197 hp (147 kW)

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AAA.com/greencar

BASE PRICE: $69,600; PRICES AS TESTED: $69,769

VEHICLE SPECIFICATIONS

MODEL YEAR: 2016
NUMBER OF PASSENGERS: 5
CURB WEIGHT (lbs): 3340
EXTERIOR LENGTH (in): 191.3
EXTERIOR WIDTH (in): 72.2
EXTERIOR HEIGHT (in): 58.5
WHEELBASE (in): 110.4
RESTRAINT TYPE: 8 air bags
WARRANTY (MONTHS/MILES): 36/36,000
TIRED MANUFACTURER AND SIZE: Continental 215/55R17
TOWING CAP (lbs): 2860 @ 6000 (338 total)
ENGINE SIZE: 3.5L, 24V DOHC V6
HORSEPOWER (hp): 286 @ 6000 (338 total)
ELECTRIC MOTOR HORSEPOWER: 197 hp (147 kW)

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AAA.com/greencar

BASE PRICE: $26,280; PRICES AS TESTED: $27,100

VEHICLE SPECIFICATIONS

MODEL YEAR: 2016
NUMBER OF PASSENGERS: 5
CURB WEIGHT (lbs): 3340
EXTERIOR LENGTH (in): 191.3
EXTERIOR WIDTH (in): 72.2
EXTERIOR HEIGHT (in): 58.5
WHEELBASE (in): 110.4
RESTRAINT TYPE: 8 air bags
WARRANTY (MONTHS/MILES): 36/36,000
TIRED MANUFACTURER AND SIZE: Continental 215/55R17
TOWING CAP (lbs): 2860 @ 6000 (338 total)
ENGINE SIZE: 3.5L, 24V DOHC V6
HORSEPOWER (hp): 286 @ 6000 (338 total)
ELECTRIC MOTOR HORSEPOWER: 197 hp (147 kW)

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**Overall Observations**

The Legacy is Subaru’s entry in the popular midsize sedan segment. Like other Subarus with the 2.5-liter, 4-cylinder “boxer” engine, it’s a PZEV. Changes to the engine provide more power and better fuel economy—30 mpg combined—than in the past. Our test vehicle was the well-equipped Premium trim level, which included heated front seats and mirrors, satellite radio, windshield-wiper washers, and, of course, Subaru’s AWD. Also worth noting was the optional EyeSight technology (adaptive cruise control, lane-departure warning, and rear cross-traffic detection). The Legacy’s ride is comfortable, its handling is typical AWD. Also worth noting was the optional EyeSight crash-prevention system, including adaptive cruise control with forward-collision warning, lane-departure warning, and rearview camera. The Legacy received 5 stars (out of 5) overall NHTSA crash-test rating for under $27,000. In addition, IIHS has awarded the Accord a Top Safety Pick+ rating (with optional front-crash prevention) every year since 2013.

**Strong Points**
- Loaded with safety/convenience technology
- Rear cross-traffic alert
- Rearview camera
- Lane-departure warning
- Lane-keeping assist
- Adaptive cruise control

**Weak Points**
- Too many controls on the touchscreen
- Lack of instrumentation
- It’s too easy to accidentally switch radio stations while adjusting the volume
- Blind-spot monitoring
- Rear cross-traffic warning

**Test Data**

<table>
<thead>
<tr>
<th>Vehicle Specifications</th>
<th>Test Vehicle Scores (0 to 10 Points)</th>
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<tbody>
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<td>EPA emissions score</td>
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<td>Braking</td>
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<td>Cargo capacity</td>
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**Vehicle Specifications**

- Model year tested: 2015
- Number of passengers (F/R): 2/3
- Curb weight (lbs): 3454
- Exterior length (in): 189.8
- Exterior width (in): 72.4
- Exterior height (in): 59.0
- Wheelbase (in): 108.3
- Restraint type: 8 air bags
- Warranty (months/miles): 36/36,000
- Tire manufacturer and size: Goodyear 225/55R17
- Towing cap. (lbs) w/o brakes: Not recommended
- Transmission type: CVT
- Engine size: 2.5L DOHC Flat 4
- Horsepower @ rpm: 175 @ 5800

**Honda Accord Sport Sensing**

The Honda Accord is extremely popular, routinely finishing in the top few car models for nationwide sales. For 2016, there were no big changes to the Accord, just small refinements. The standard 2.4-liter, 189-hp, inline 4 engine in our Accord Sport Sensing model test car was certified as a PZEV. This means you can experience all the qualities that make the Accord so popular (high build quality and reliability, powerful brakes, smooth but taut ride, good handling, roomy and comfortable interior) while contributing to cleaner air. At the same time, you can get a well-equipped car with 30 mpg in combined driving, as well as a 5-star (out of 5) overall NHTSA crash-test rating for under $27,000. In addition, IIHS has awarded the Accord a Top Safety Pick+ rating (with optional front-crash prevention) every year since 2013.

**Strong Points**
- Loaded with safety/convenience features
- Good handling in slalom course
- Lots of interior storage
- Roomy front seat
- Certified as a PZEV

**Weak Points**
- Slightly underpowered
- High tire noise
- Clumped rear seat
- Lack of instrumentation
- With rear seat folded down, the opening to the trunk is narrow

**Test Data**

<table>
<thead>
<tr>
<th>Vehicle Specifications</th>
<th>Test Vehicle Scores (0 to 10 Points)</th>
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**Vehicle Specifications**

- Model year tested: 2016
- Number of passengers (F/R): 2/3
- Curb weight (lbs): 3380
- Exterior length (in): 192.5
- Exterior width (in): 72.8
- Exterior height (in): 57.7
- Wheelbase (in): 109.3
- Restraint type: 8 air bags
- Warranty (months/miles): 36/36,000
- Tire manufacturer and size: Continental 235/40R19
- Towing cap. (lbs) w/o brakes: Not recommended
- Transmission type: CVT
- Engine size: 2.4L DOHC 16V-i-VTEC 14
- Horsepower @ rpm: 189 @ 6400

收集于: AAA Green Car Guide 2015

AAA.com/greencar
**Ford C-Max Hybrid SE**

**Vehicle Price**
- **Base Price:** $25,995; **Price as Tested:** $27,990

**Overall Observations**
The C-Max Hybrid is Ford’s first dedicated hybrid vehicle. It’s powered by a 2.0-liter, 4-cylinder engine and an electric motor, good for 188 total hp. EPA-estimated fuel economy is 40 mpg combined. It has good acceleration and a comfortable ride. Options on our test car included reverse-parking sensors, a power liftgate, and the MyFord Touch infotainment system, which brought the MSRP up to just under $28,000. The C-Max’s wagon body style has a good-sized cargo compartment (24 cu. ft. with the backseat up, 53 cu. ft. with it down). NHTSA’s overall crash-test rating is 4 stars (out of 5). From 2014–2016, the C-Max Hybrid has had no major changes. For 2016, it gets Ford’s Sync 3 infotainment system and an 8-inch touch screen.

**Test Data**
- **EPA emissions score:** 74.32
- **Braking:** Low
- **Crashworthiness:** Low
- **Visibility:** Poor
- **Salam handling:** Poor
- **Ride quality:** Poor
- **Fuel economy:** Poor
- **Interior noise:** Poor
- **Acceleration:** Poor
- **Ease of entry and exit:** Poor
- **Interior size:** Poor
- **Turning circle:** Poor
- **Cargo capacity:** Poor

**Overall Score**
- **Score:** 58.89
- **Rank:** Lowest
- **Overall:** 74.32

**Vehicle Specifications**
- **Model year tested:** 2013
- **Number of passengers (F/R):** 2/3
- **Curb weight (lbs):** 3650
- **Exterior length (in):** 173.6
- **Exterior width (in):** 72.0
- **Exterior height (in):** 63.9
- **Wheelbase (in):** 104.3
- **Restraint type:** 9 air bags or more
- **Warranty (months/miles):** 36/36,000
- **Tire manufacturer and size:** Michelin P225/55R17
- **Towing cap. (lbs) w/wo brakes:** 141 @ 6000 (188 Total)
- **Electric motor horsepower:** 118 hp

**FUEL INFORMATION**
- **Fuel type:** Regular
- **Fuel capacity (gal):** 13.5
- **EPA urban mpg:** 42
- **EPA highway mpg:** 37
- **EPA combined mpg:** 40

**Average MPG as Tested by Auto Club**
- **Score:** 0

**Available Advanced Safety Features**
- **Forward-collision warning**
- **Blind-spot monitoring**
- **Rear cross-traffic alert**
- **Lane-departure warning**
- **Adaptive cruise control**

**LEAF RATING:**
- **Overall Score:** 58.89
- **Rank:** Lowest

**LEAF RATING:**
- **Overall Score:** 92.49
- **Rank:** Highest

**Toyota Camry Hybrid SE**

**Vehicle Price**
- **Base Price:** $27,995; **Price as Tested:** $31,335

**Overall Observations**
Toyota completely redesigned its best-selling Camry, including the Hybrid, for 2015. Introduced in 2007, the Hybrid now gets 43 percent better overall mpg than the standard 4-cylinder Camry—40 versus 28. That means proportionally lower CO2 emissions, and the Hybrid meets stringent PZEV emissions standards, too. Its powertrain consists of a 2.5-liter, 4-cylinder engine, a CVT, an electric motor, and a battery pack. Combined power output is 200 hp. The Hybrid Camry retains most of every Camry’s strengths—it’s quiet, reliable, reasonably priced, roomy for a midsize car, and rides better than most. However, the battery takes up trunk space, and although the rear seatback folds, there’s only a small opening connecting to the trunk. NHTSA awarded the Camry Hybrid 5 stars (out of 5) overall in its crash tests. For 2015 and 2016, IHS gave the gasoline-powered Camry a Top Safety Pick+ rating (with optional front-crash prevention), it hasn’t tested the Camry Hybrid. The Camry Hybrid carries over into 2016 essentially unchanged.

**Test Data**
- **EPA emissions score:** 71.7
- **Braking:** Poor
- **Crashworthiness:** Poor
- **Visibility:** Poor
- **Salam handling:** Poor
- **Ride quality:** Poor
- **Fuel economy:** Poor
- **Interior noise:** Poor
- **Acceleration:** Poor
- **Ease of entry and exit:** Poor
- **Interior size:** Poor
- **Turning circle:** Poor
- **Cargo capacity:** Poor

**Overall Score**
- **Score:** 58.89
- **Rank:** Lowest
- **Overall:** 71.7

**Vehicle Specifications**
- **Model year tested:** 2015
- **Number of passengers (F/R):** 2/3
- **Curb weight (lbs):** 3420
- **Exterior length (in):** 190.9
- **Exterior width (in):** 71.7
- **Exterior height (in):** 57.9
- **Wheelbase (in):** 109.3
- **Restraint type:** 9 air bags or more
- **Warranty (months/miles):** 36/36,000
- **Tire manufacturer and size:** Michelin P215/55R17
- **Towing cap. (lbs) w/wo brakes:** 156 @ 5700 (200 total)
- **Electric motor horsepower:** 141 hp (105 kW)

**FUEL INFORMATION**
- **Fuel type:** Regular
- **Fuel capacity (gal):** 17
- **EPA urban mpg:** 40
- **EPA highway mpg:** 38
- **EPA combined mpg:** 40

**Average MPG as Tested by Auto Club**
- **Score:** 0

**Available Advanced Safety Features**
- **Forward-collision warning**
- **Blind-spot monitoring**
- **Rear cross-traffic alert**
- **Lane-departure warning**
- **Adaptive cruise control**

**LEAF RATING:**
- **Overall Score:** 58.89
- **Rank:** Lowest

**LEAF RATING:**
- **Overall Score:** 92.49
- **Rank:** Highest
Hyundai Sonata Hybrid Limited

**OVERALL OBSERVATIONS**
The midsize Hyundai Sonata Hybrid, introduced in 2011, has been completely redesigned for 2016. Its drivetrain, with a new 2.0-liter engine and electric motor (193 total hp), delivers an EPA-estimated 41 mpg combined, a nearly 10 percent improvement. Our test car, with the Limited trim and the Ultimate package, had an MSRP of just under $36,000, which provides a vast array of comfort, safety, and convenience technologies. All in all, the Sonata Hybrid is well executed and a pleasure to drive. Its steering is precise, and its 6-speed automatic transmission shifts smoothly. The cabin is nicely executed and a pleasure to drive. Its steering is precise, and its 6-speed automatic transmission shifts smoothly. The cabin is nicely designed, roomy, and has plenty of backseat legroom. Another plus is Hyundai’s extensive warranty, one of the best in the industry. NHTSA awarded the Sonata Hybrid a 5 stars (out of 5) overall in its crash tests.

**GREEN CAR GUIDE 2016**
7.00

**TEST DATA**
- **EPA emissions score**: 4.56
- **Braking**: 4.56
- **Crashworthiness**: 4.59
- **Visibility**: 4.59
- **Slalom handling**: 4.87
- **Ride quality**: 4.96
- **Fuel economy**: 4.76
- **Interior noise**: 4.44
- **Acceleration**: 4.44
- **Ease of entry and exit**: 4.90
- **Interior size**: 4.95
- **Turning circle**: 4.47
- **Cargo capacity**: 4.99

**VEHICLE SPECIFICATIONS**
- **Model year tested**: 2016
- **Number of passengers (F/R)**: 2/3
- **Curb weight (lbs)**: 3680
- **Exterior length (in)**: 191.1
- **Exterior width (in)**: 73.4
- **Exterior height (in)**: 57.9
- **Wheelbase (in)**: 110.4
- **Frame type**: Unibody
- **Restraint type**: 9 air bags or more
- **Warranty (months/miles)**: 50/60,000
- **Tire manufacturer and size**: Michelin 215/55R17
- **Transmission type**: Auto 6 speed
- **Engine size**: 2.0L
- **Horsepower @ rpm**: 154 @ 6400 (193 total)
- ** Boone at**: 51 @ 1770-2000

**FUEL INFORMATION**
- **Regular**
- **Fuel capacity (gal)**: 15.9
- **EPA urban mpg**: 39
- **EPA highway mpg**: 43
- **EPA combined mpg**: 41

**TEST DATA**
- **EPA emissions score**: 4.61
- **Braking**: 4.61
- **Crashworthiness**: 4.61
- **Visibility**: 4.30
- **Slalom handling**: 4.91
- **Ride quality**: 4.95
- **Fuel economy**: 4.95
- **Interior noise**: 4.95
- **Acceleration**: 4.95
- **Ease of entry and exit**: 4.95
- **Interior size**: 4.95
- **Turning circle**: 4.95
- **Cargo capacity**: 4.95

**VEHICLE SPECIFICATIONS**
- **Model year tested**: 2015
- **Number of passengers (F/R)**: 2/3
- **Curb weight (lbs)**: 3680
- **Exterior length (in)**: 192.7
- **Exterior width (in)**: 71.1
- **Exterior height (in)**: 57.1
- **Wheelbase (in)**: 111.0
- **Frame type**: Unibody
- **Restraint type**: 9 air bags or more
- **Warranty (months/miles)**: 48/50,000
- **Tire manufacturer and size**: Michelin 215/55R17
- **Transmission type**: Auto 6 speed
- **Engine size**: 2.0L
- **Horsepower @ rpm**: 154 @ 6400 (193 total)

**NHTSA SAFETY RATING (2016 MODEL)**
- **Lane-departure warning**
- **Rear cross-traffic alert**
- **Rearview camera**

**AVAILABLE ADVANCED SAFETY FEATURES**
- **LANE DEPARTURE WARNING**
- **REAR CROSS TRAFFIC ALERT**
- **REARVIEW CAMERA**

**OVERALL OBSERVATIONS**
The ES 300h is Lexus’s entry-level luxury midsize hybrid sedan, powered by a 2.5-liter 4-cylinder engine and an electric motor that produce 200 hp total. A CVT and FWD are standard. The ES 300h is rated at 40 mpg for combined driving, excellent mileage for a car its size. Our test ES, equipped with a rearview camera, navigation system, heated and cooled front seats, blind-spot monitoring, and lane-departure warning, had an MSRP just over $45,000. The 300h has a well-designed and comfortable interior, with one major drawback—the cumbersome joystick used to control the radio, Bluetooth, and other features. Also, like many hybrid sedans, the trunk is small and the rear seats don’t fold down. The ES 300h received 5 stars overall (out of 5) in NHTSA crash-test ratings. For 2016, the gasoline-powered ES 350 is an IIHS Top Safety Pick+ (with optional front-crash prevention); the IIHS hasn’t crash-tested the 300h. The 2016 ES 300h gets better sound deadening, a new grille, and an available safety package.

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7.39

**TEST DATA**
- **EPA emissions score**: 4.66
- **Braking**: 4.66
- **Crashworthiness**: 4.66
- **Visibility**: 4.66
- **Slalom handling**: 4.36
- **Ride quality**: 4.36
- **Fuel economy**: 4.36
- **Interior noise**: 4.36
- **Acceleration**: 4.36
- **Ease of entry and exit**: 4.36
- **Interior size**: 4.36
- **Turning circle**: 4.36
- **Cargo capacity**: 4.36

**VEHICLE SPECIFICATIONS**
- **Model year tested**: 2015
- **Number of passengers (F/R)**: 2/3
- **Curb weight (lbs)**: 3660
- **Exterior length (in)**: 192.7
- **Exterior width (in)**: 71.1
- **Exterior height (in)**: 57.1
- **Wheelbase (in)**: 111.0
- **Frame type**: Unibody
- **Restraint type**: 9 air bags or more
- **Warranty (months/miles)**: 48/50,000
- **Tire manufacturer and size**: Michelin 215/55R17
- **Transmission type**: CVT
- **Engine size**: 2.5L
- **Horsepower @ rpm**: 154 @ 6400 (193 total)

**NHTSA SAFETY RATING (2016 MODEL)**
- **Lane-departure warning**
- **Rear cross-traffic alert**
- **Rearview camera**

**AVAILABLE ADVANCED SAFETY FEATURES**
- **LANE DEPARTURE WARNING**
- **REAR CROSS TRAFFIC ALERT**
- **REARVIEW CAMERA**
## Overall Observations

The Ford C-Max Energi, which debuted in 2013, is Ford’s first plug-in hybrid. It’s powered by a 2.0-liter, 4-cylinder engine and an electric motor that produces 188 hp. Our test vehicle cost nearly $38,000, about $10,000 more than the standard C-Max Hybrid SE we tested, but this doesn’t take any federal and state tax incentives into account. In addition, the Energi’s 20-mile all-electric range can lower operating costs further. The C-Max Energi rides well but feels a bit underpowered. It handled well on our slalom course, but it has a large turning radius, and its large battery reduces trunk space. On a positive note, we averaged 45 mpg overall. Its NHTSA overall crash-test score is 38 out of 5. For 2016, the Energy gets Ford’s SYNC 3 infotainment system and an 8-inch touch screen.

## Strong Points
- Comfortable seating
- Good headroom
- Certified as AT PZEV

## Weak Points
- Poor rear visibility
- Small trunk
- Insufficient instrumentation
- Radio controls are difficult to use
- Large turning radius

### Vehiclet Specifications

- **Model year tested:** 2013
- **Number of passengers (F/R):** 2/3
- **Curb weight (lbs):** 3820
- **Exterior length (in):** 173.6
- **Exterior width (in):** 72.0
- **Exterior height (in):** 63.8
- **Wheelbase (in):** 104.3
- **Restrain type:** 9 air bags or more
- **Warranty (months/miles):** 36,360,000
- **Tire manufacturer and size:** Michelin P225/50R17
- **Towing cap. (lbs) w/wo brakes:** 141 @ 6000 (188 Total)
- **Electric motor horsepower:** 118 @ 6000

---

## Mazda6

### Mazda6 i Grand Touring

The Mazda6 was completely redesigned for 2014. We drove the top-of-the-line Mazda6 i Grand Touring version, which had a 2.5-liter, 4-cylinder, 184-hp engine and a 6-speed automatic transmission. It’s rated by the EPA at an impressive 30 mpg in combined driving; in our testing, we averaged 27 mpg. The Mazda6 has strong acceleration and handled well on the slalom course. With a base price of $30,290, it’s not cheap, but it’s well equipped and provides good value. For about $1,200, you can add many safety technologies, including forward-collision warning, lane-departure warning, and blind-spot monitoring. The Mazda6 received an overall crash-test rating of 41 stars (out of 5) from NHTSA. And it’s been an IIHS Top Safety Pick+ vehicle (with optional front-crash prevention) from 2014-2016. In 2015 and 2016, the Mazda6 received only minor cosmetic and features changes.

## Strong Points
- Very good fuel economy
- Good handling and ride quality
- Heated seats

## Weak Points
- Cramped interior
- Limited rear visibility
- Touch-screen difficult to use
- Limited luggage capacity

### Vehiclet Specifications

- **Model year tested:** 2014
- **Number of passengers (F/R):** 2/3
- **Curb weight (lbs):** 3390
- **Exterior length (in):** 191.5
- **Exterior width (in):** 72.4
- **Exterior height (in):** 57.1
- **Wheelbase (in):** 111.4
- **Restraint type:** 8 air bags
- **Warranty (months/miles):** 36,360,000
- **Tire manufacturer and size:** Dunlop P225/45R19
- **Towing cap. (lbs) w/wo brakes:** 2,500
- **Transmission type:** CVT
- **Front wheel drive**: 2.5L DOHC 16
- **Engine size:** 184 @ 5700

---

## Test Data

### Test Vehicle Scores (0 to 10 Points)

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### Test Data

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Hyundai Sonata Eco

**Test Data**
- **VEHICLE SPECIFICATIONS**
  - EPA emissions score: 2.99
  - Braking: 2.61
  - Crashworthiness: 6.69
  - Visibility: 7.06
  - Stallion handling: 6.47
  - Ride quality: 8.17
  - Fuel economy: 4.81
  - Interior noise: 6.41
  - Acceleration: 6.52
  - Ease of entry and exit: 6.94
  - Interior size: 3.37
  - Turning circle: 3.17
  - Cargo capacity: 3.89

**Overall Observations**
Redesigned for 2015, the midsize Hyundai Sonata sedan offers a surprising number of standard features for the price. Our test vehicle, the new Eco trim level, had a turbocharged, 1.6-liter, 4-cylinder engine rated at 178 horsepower and a 7-speed automatic transmission. It was extremely well equipped—including navigation, satellite radio, heated leather front seats, and Bluetooth—for just over $28,000. The new Sonata provides a quiet, comfortable ride and responsive handling; its EPA combined fuel economy is estimated at 32 mpg. The downsides of the Sonata's sleek styling is poor visibility close to the vehicle, especially to the rear—although the rearview camera helps. The Sonata received an overall rating of 5 stars (out of 5) in NHTSA's crash tests and, for 2015 and 2016, a Top Safety Pick+ ranking from IIHS (with optional front-crash prevention). For 2016, the Sonata gets a standard rearview camera and automatic headlights.

**NHTSA Safety Ratings (2016 Model):**
- **Crashworthiness:** 58.89
- **Braking:** 58.21
- **Crashworthiness:** 83.5
- **Visibility:** 58.1
- **Stallion handling:** 112.2
- **Ride quality:** 83.5
- **Fuel economy:** 83.5
- **Interior noise:** 58.2
- **Acceleration:** 46.6
- **Ease of entry and exit:** 47
- **Interior size:** 58.2
- **Turning circle:** 83.5
- **Cargo capacity:** 46.6

**Test Data**
- **Test Vehicle scores (0 to 10 Points):**
  - **Acceleration:** 191.1
  - **Braking:** 320
  - **Crashworthiness:** 320
  - **Visibility:** 191.1
  - **Stallion handling:** 112.2
  - **Ride quality:** 191.1
  - **Fuel economy:** 191.1
  - **Interior noise:** 320
  - **Acceleration:** 112.2
  - **Ease of entry and exit:** 46.6
  - **Interior size:** 58.2
  - **Turning circle:** 83.5
  - **Cargo capacity:** 46.6

**Vehicle Specifications**
- **Model year tested:** 2015
- **Number of passengers (F/R):** 2/3
- **Curb weight (lbs):** 3320
- **Exterior length (in):** 191.1
- **Exterior width (in):** 73.4
- **Exterior height (in):** 58.1
- **Wheelbase (in):** 110.4
- **Restraint type:** 9 air bags or more
- **Warranty (months/miles):** 60/60,000
- **Tire manufacturer and size:** Hankook 205/65R16
- **Towing cap. (lbs) w/wo brakes:** Not recommended
- **Transmission type:** CVT
- **Front wheel:** Not recommended
- **Engine size:** 1.6L Turbo GDI I4
- **Horsepower @ rpm:** 178 @ 5500

Ford Fusion Hybrid S

**Test Data**
- **VEHICLE SPECIFICATIONS**
  - EPA emissions score: 2.68
  - Braking: 4.13
  - Crashworthiness: 5.53
  - Visibility: 6.74
  - Stallion handling: 6.74
  - Ride quality: 6.74
  - Fuel economy: 6.74
  - Interior noise: 6.74
  - Acceleration: 5.53
  - Ease of entry and exit: 5.53
  - Interior size: 5.53
  - Turning circle: 5.53
  - Cargo capacity: 5.53

**Overall Observations**
Fully redesigned in 2013, the Ford Fusion Hybrid has seen only incremental changes since. We found the 2016 model we tested to be a mixed bag. On one hand, it provided a solid, comfortable ride. The steering feel is excellent, as is brake pedal feel, with short stopping distances. The backseat, too, is comfortable, with good legroom. The EPA-estimated fuel economy is an excellent 42 mpg combined, and the base price of around $25,000 is reasonable. On the other hand, the Fusion Hybrid’s acceleration is just mediocre, the engine is loud and rough, the transition from EV power to ICE power could be smoother, trunk space is compromised by the presence of the hybrid battery pack, and some controls look cheap and are overly complicated. A redesigned 2017 Fusion Hybrid is expected later this year.

**NHTSA Safety Ratings (2016 Model):**
- **Crashworthiness:** N/A
- **Braking:** N/A
- **Crashworthiness:** N/A
- **Visibility:** N/A
- **Stallion handling:** N/A
- **Ride quality:** N/A
- **Fuel economy:** N/A
- **Interior noise:** N/A
- **Acceleration:** N/A
- **Ease of entry and exit:** N/A
- **Interior size:** N/A
- **Turning circle:** N/A
- **Cargo capacity:** N/A

**Test Data**
- **Test Vehicle scores (0 to 10 Points):**
  - **Acceleration:** 118.8
  - **Braking:** 25.6
  - **Crashworthiness:** 25.6
  - **Visibility:** 25.6
  - **Stallion handling:** 25.6
  - **Ride quality:** 25.6
  - **Fuel economy:** 25.6
  - **Interior noise:** 25.6
  - **Acceleration:** 25.6
  - **Ease of entry and exit:** 25.6
  - **Interior size:** 25.6
  - **Turning circle:** 25.6
  - **Cargo capacity:** 25.6
Ford Fusion Energi Titanium

VEHICLE SPECIFICATIONS

MODEL YEAR: 2014
NUMBER OF PASSENGERS: 5
CURB WEIGHT (lbs): 3,753
EXTERIOR LENGTH (in): 188.3
EXTERIOR WIDTH (in): 74.5
EXTERIOR HEIGHT (in): 57.5
WHEELBASE (in): 106.7
RESTRAINT TYPE: 9 air bags or more
WARRANTY (months/miles): 36/36,000
TIRE MANUFACTURER AND SIZE: Michelin P255/50R17
TOURING CAP.: 46 (lbs) w/o brakes
TOURING CAP.: 46 (lbs) w/ brakes
TRANSMISSION TYPE: CVT
FRONT WHEEL SIZE: 2.0L I4
ENGINE SIZE: 141 @ 6000 (188 total)
HORSEPOWER @ RPM: 118 @ 6000 (88 kW)

TEST DATA:

EPA EMISSIONS SCORE: 91.3
CRASHWORTHINESS: 6.89
VISIBILITY: 6.80
SALON HANDLING: 6.55
RIDE QUALITY: 5.94
FUEL ECONOMY: 4.74
ACCELERATION: 6.17
EASE OF ENTRY AND EXIT: 6.38
INTERIOR SIZE: 6.11
TURNTING CIRCLE: 7.04
CARGO CAPACITY: 7.71

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OVERALL OBSERVATIONS

The Ford Fusion is a popular midsized sedan with excellent design inside and out. The plug-in hybrid version features a large battery pack that allows for all-electric operation for about 20 miles, providing lower operating costs. As with the Fusion Hybrid, the Energi’s acceleration is good. Our test car was well-equipped, easy to drive, and very comfortable. The battery pack takes up a lot of space in the trunk, however, giving it much less capacity than a standard Fusion. Additionally, the MSPR was high, but federal and state tax credits offset some of the cost. The Fusion Energi received 5 stars (out of 5) overall in NHTSA’s crash tests. For 2015, the Fusion Energi got a standard rearview camera; there were no significant changes for 2016.

LEAF RATING:

OVERALL SCORE: 70.92
BEST: 70.92
LOWEST: 0
RANKING: 50

FUEL INFORMATION

FUEL TYPE: Electricity/Regular
FUEL CAPACITY (gal): 14
EPA URBAN MPG: 40
EPA HIGHWAY MPG: 36
EPA COMBINED MPG: 38
EPA COMBINED MPGe: 88

BATTERY CHARGE TIME

120V: 7 HRS
240V: 2.5 HRS

AVAILBLE ADVANCED SAFETY FEATURES

• Rearview camera
• Blind-spot monitoring
• Rear cross-traffic alert
• Lane-departure warning
• Lane-keeping assist

STRONG POINTS

• Excellent fuel economy
• Meets AT PZEV requirements
• Quality fit and finish
• Comfortable, quiet ride
• Well-equipped with safety features

WEAK POINTS

• Limited trunk size
• A/C and radio controls are hard to use
• Poor braking performance
• Rear seat backrest opens only a tiny slit
• Noise can drag when exiting steep driveways

TEST VEHICLE SCORING (0 TO 10 POINTS)

RIDE QUALITY: 4.05
FUEL ECONOMY: 10.00
ACCELERATION: 7.00
COMFORT: 4.00
EASE OF USE: 4.00
ECONOMY: 4.00
VALUE: 4.00
OVERALL: 58.9

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Chrysler 200 Limited

VEHICLE SPECIFICATIONS

MODEL YEAR: 2015
NUMBER OF PASSENGERS: 5
CURB WEIGHT (lbs): 3,840
EXTERIOR LENGTH (in): 192.3
EXTERIOR WIDTH (in): 73.6
EXTERIOR HEIGHT (in): 58.7
WHEELBASE (in): 108.0
RESTRAINT TYPE: 9 air bags or more
WARRANTY (months/miles): 36/36,000
TIRE MANUFACTURER AND SIZE: Goodyear 215/55R17
TOURING CAP.: 46 (lbs) w/o brakes
TOURING CAP.: 46 (lbs) w/ brakes
TRANSMISSION TYPE: CVT
FRONT WHEEL SIZE: 2.4L MultiAir 4
ENGINE SIZE: 141 @ 6000 (188 total)
HORSEPOWER @ RPM: 118 @ 6000 (88 kW)

TEST DATA:

EPA EMISSIONS SCORE: 92.49
CRASHWORTHINESS: 6.90
VISIBILITY: 6.88
SALON HANDLING: 6.74
RIDE QUALITY: 6.38
FUEL ECONOMY: 5.78
ACCELERATION: 6.78
EASE OF ENTRY AND EXIT: 7.75
INTERIOR SIZE: 6.64
TURNTING CIRCLE: 7.71
CARGO CAPACITY: 7.71

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OVERALL OBSERVATIONS

The 2015 Chrysler 200 is the latest entry from Fiat Chrysler Automobiles (FCA) into the crowded midsized sedan category. Our test vehicle had the Limited trim level and was well equipped but still had an MSPR of less than $26,000. The 2.4-liter, inline 4-cylinder engine combined with a new 9-speed automatic transmission gives respectable acceleration and fuel economy (EPA-estimated 28 mpg combined). But the 200 really shines on the highway, where it’s quiet, comfortable, and rides well. The 200 scored 5 stars (out of 5) overall in NHTSA’s crash tests and earned a 2015 Top Safety Pick+ rating from IIHS (with optional front-crash prevention). On the downside, many of the 200’s controls are on a touchscreen, and are small, nonintuitive, and potentially distracting. But the 200’s attractive looks and performance have finally made FCA a player in the highly contested midsized sedan market. For 2016, the Chrysler 200 is basically unchanged.

LEAF RATING:

OVERALL SCORE: 67.72
BEST: 67.72
LOWEST: 0
RANKING: 62

FUEL INFORMATION

FUEL TYPE: Regular
FUEL CAPACITY (gal): 15.8
EPA URBAN MPG: 23
EPA HIGHWAY MPG: 36
EPA COMBINED MPG: 28

AVERAGE MPG AS TESTED BY AUTO CLUB

EPA COMBINED MPG: 29
EPA URBAN MPG: 20
EPA HIGHWAY MPG: 38

AVAILBLE ADVANCED SAFETY FEATURES

• Rearview camera
• Blind-spot monitoring
• Rear cross-traffic alert
• Lane-departure warning
• Lane-keeping assist

STRONG POINTS

• Good value; well equipped, including Bluetooth, and satellite radio
• New 9-speed automatic transmission
• Quiet on the highway
• Comfortable, roomy front seats
• Smooth ride, except when hitting bumps at freeway speeds

WEAK POINTS

• Touch screen and controls are small
• Visibility a poor close to the front and rear of the car
• Shifter is a round knob
• Rear seat entrance is impeded by a low door

TEST VEHICLE SCORING (0 TO 10 POINTS)

RIDE QUALITY: 5.85
FUEL ECONOMY: 9.20
ACCELERATION: 6.59
COMFORT: 6.55
EASE OF USE: 7.55
ECONOMY: 6.54
VALUE: 7.54
OVERALL: 58.8

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MIDSIZE NONHYBRID HIGH MPG

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MIDSIZE  NONHYBRID HIGH MPG

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Large

Sometimes, only a big car will do. If you often need to transport four or five adults in comfort, for instance, or you do a lot of long-distance driving, nothing beats a large car for roominess and comfort. But you can still drive a green machine. The current selection includes the best-selling EV in the world; a car that runs on both gasoline and CNG; a sophisticated hybrid that gets 40 mpg; and high-mpg gasoline-powered cars. Some of these cars are pricey, but several have MSRP between $30,000 and $40,000—just a little more than the average price of a car today.

TESLA Model S 70D

The Tesla Model S 70D defies EV stereotypes. Sleek styling, blazing acceleration, sporty handling, and an air of sophistication separate the Model S from other alternative-fueled vehicles. Inside, you’ll immediately notice the massive 17-inch center display that handles navigation, audio, vehicle settings, and even Internet browsing, although it may confuse those who are less tech-savvy. The standard interior is surprisingly stark and plain. This carries over to the seats, which are flatbottomed, a bit hard, and covered with a utilitarian fabric. Dynamically, the Model S is excellent, with quick, smooth acceleration that makes passing other vehicles a breeze. The ride is comfortably firm. However, on rough road surfaces, drivers feel vibration through the chassis and the steering column. The 70D also exhibits excessive regenerative braking, but it’s easy to get accustomed to it. If you’re fortunate enough to live or work near a Tesla Supercharger station (next page, upper right), you’ll find that a no-cost charge is about as easy as plugging in your phone. NHTSA awarded the Model S 5 stars (out of 5) overall in its crash tests.

TEST DATA

EPA emissions score 58.89
Braking 7.26
Crashworthiness 5.57
Visibility 5.87
Stability handling 7.18
Ride quality 7.95
Interior noise 5.87
Fuel economy 7.75
Acceleration 6.78
Ease of entry & exit 7.47
Interior size 4.34
Turning circle 6.56
Cargo capacity 4.96

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NHTSA SAFETY RATINGS (2016 MODEL): ★★★★★

AVAILABLE ADVANCED SAFETY FEATURES:
- Rearview camera
- Blind-spot monitoring
- Lane-departure warning
- Lane-keeping assist
- Adaptive cruise control
- Forward-collision mitigation

LEAF ELECTRIC

LOWEST HIGHEST

Base Price: $75,000 Price as tested: $77,700

Overall Observations

Charge is about as easy as plugging in your phone. The only minimal interior storage except for the large center floor tray. Lower lip of front fascia scrapes on driveways.

Available Advance Safety Features:
- Rearview camera
- Blind-spot monitoring
- Lane-departure warning
- Lane-keeping assist
- Radar display shows surrounding vehicles
- Adaptive cruise control
- Forward-collision mitigation

Fuel Information:
- Fuel type: Electricity
- Battery capacity (kWh): 70
- EPA UMPG: 101
- EPA highway MPGe: 102
- EPA combined MPGe: 101
- EPA estimated range (mi.): 240

Vehicle Specifications:
- Model year tested: 2015
- Number of passengers (P/R): 2/3
- Curb weight (lbs): 4660
- Exterior length (in.): 196.0
- Exterior width (in.): 77.3
- Exterior height (in.): 56.5
- Wheelbase (in.): 116.5
- Illumination: 9 air bags or more
- Warranty (months/miles): 48/50,000
- Tire manufacturer and size: Michelin 245/45R19
- Transmission type: Auto 1 speed
- Auto 1 speed
- All wheel - full time
- Engine size: 3-phase 4-pole AC induction
- Horsepower @ rpm: 328 total

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## Acura RLX Sport Hybrid SH-AWD Advance

**OVERALL OBSERVATIONS**
Acura’s luxury flagship, the RLX sedan, has a hybrid variant, introduced in 2014. It features a 3.5-liter V6 and three electric motors (one on the front axle and two on the rear), which produce a total of 377 hp. The Technology Package, with many advanced safety features—such as forward-collision mitigation with automatic braking, lane-departure intervention, and blind-spot monitoring—is standard on the Sport Hybrid. Our test vehicle also had the high-end Advance package, which features a 360-degree camera. The RLX Hybrid is comfortable, powerful, and rides well, with decent handling. The EPA fuel-economy estimate is 30 mpg in combined driving. Like most hybrid sedans, the trunk is smaller and the rear seat doesn’t fold down because of the battery placement. NHTSA hasn’t crash tested the Sport Hybrid.

### LEAF SPECIFICATIONS

**Over all Score:** 58.89 (Lowest) 92.49 (Highest)

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<td><strong>AVERAGE MPG AS TESTED BY AUTO CLUB</strong></td>
<td>0 0 2 1</td>
</tr>
</tbody>
</table>

### VEHICLE SPECIFICATIONS

- **Model year tested:** 2016
- **Number of passengers (F/R):** 2/3
- **Curb weight (lbs):** 4360
- **Exterior length (in):** 196.1
- **Exterior width (in):** 74.4
- **Exterior height (in):** 57.7
- **Wheelbase (in):** 112.2
- **Transmission type:** 9-speed automatic
- **Engine size:** 3.5L SOHC 24V i-VTEC V6
- **Fuel capacity (gal):** 15.1
- **Start-stop button:** Yes

### AVAILABLE ADVANCED SAFETY FEATURES

- Rearview camera
- Blind-spot monitoring
- Lane-departure warning
- Adaptive cruise control

### STRONG POINTS

- Comfortable ride
- Loaded with safety and convenience technology
- AWD traction
- LED headlights
- Rear window open fully

### WEAK POINTS

- Small trunk; rear seat doesn’t fold down
- Uses premium fuel
- Infringement controls are all on a touchscreen, except for a small volume knob that is not backlit
- Complicated controls
- Large turning radius

### NHTSA SAFETY RATINGS (2016 MODEL):

- **NHTSA Rating:** 5 stars (out of 5)
- **Test description:** Overall in NHTSA’s crash tests. For 2016, the IntelliLink infotainment system was updated.

### FUEL INFORMATION

- Premium
- Unleaded Premium

### EPA Combined MPG

- 30

### EPA Highway MPG

- 32

### EPA City MPG

- 28

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## Buick LaCrosse

**OVERALL OBSERVATIONS**
The LaCrosse is Buick’s flagship large sedan. The base price for our test car was just over $36,000, and included leather upholstery, heated front seats, rear parking assist, and a rearview camera. Equipped with a 3.6-liter V6 that puts out 304 hp mated to a 6-speed automatic transmission, the LaCrosse rides very well. Without the rearview camera, however, visibility to the rear is limited, because the rear-quarter panels create blind spots, a problem compounded by small side mirrors. Fortunately, in 2015 a rearview camera became standard. The overall capacity of the trunk is adequate, but the shape and design present a problem for some cargo. Overall, the LaCrosse has the look and feel of a sedan that costs much more. It scored 5 stars (out of 5) in NHTSA’s crash tests. For 2016, the IntelliLink infotainment system was updated. A redesigned model year 2017 LaCrosse is due to go on sale later in 2016.

### LEAF SPECIFICATIONS

**Over all Score:** 58.89 (Lowest) 92.49 (Highest)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fuel Information</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Fuel type:</strong></td>
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<tr>
<td><strong>Fuel capacity (gal):</strong></td>
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<tr>
<td><strong>EPA urban mpg:</strong></td>
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</tr>
<tr>
<td><strong>EPA highway mpg:</strong></td>
<td>21</td>
</tr>
<tr>
<td><strong>AVERAGE MPG AS TESTED BY AUTO CLUB</strong></td>
<td>0 0 2 0</td>
</tr>
</tbody>
</table>

### VEHICLE SPECIFICATIONS

- **Model year tested:** 2016
- **Number of passengers (F/R):** 2/3
- **Curb weight (lbs):** 4140
- **Exterior length (in):** 196.9
- **Exterior width (in):** 73.1
- **Exterior height (in):** 59.2
- **Wheelbase (in):** 111.7
- **Transmission type:** 6-speed automatic
- **Engine size:** 3.6L DOHC 24V VVT V6
- **Fuel capacity (gal):** 15.1
- **Start-stop button:** Yes

### AVAILABLE ADVANCED SAFETY FEATURES

- Rearview camera
- Blind-spot monitoring
- Lane-departure warning
- Adaptive cruise control

### STRONG POINTS

- Good ride quality
- Strong performance
- Roomy, comfortable front seats
- Well-equipped, including Bluetooth, satellite radio, and automatic climate control
- Meets stringent PZEV emission standards

### WEAK POINTS

- Difficult to see to the rear and sides
- Too much road noise
- Vague steering feel
- Musty brake- pedal feel
- Start-stop button is hidden behind the steering wheel

### NHTSA SAFETY RATINGS (2016 MODEL):

- **NHTSA Rating:** 5 stars
- **Test description:** Overall in NHTSA’s crash tests. For 2016, the IntelliLink infotainment system was updated.

### FUEL INFORMATION

- Premium
- Unleaded Regular

### EPA Combined MPG

- 28

### EPA Highway MPG

- 21

### EPA City MPG

- 0

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Lexus

**Overall Observations**

Lexus thinks that green and performance can go together, so the automaker decided to put the hybrid LS 600h L model at the top of its lineup. The LS 600h L is a marvelous luxury/performance sedan that’s powerful, quiet, comfortable, and loaded with just about every convenience and safety feature you can imagine. Its 5.0-liter V8, two electric motors, and CVT move the LS 600h L quickly down the road. Total output is 438 hp, which is still good for a respectable 20 mpg combined and meets strict SULEV II emissions standards. Priced starting at $135,000, the LS 600h L luxury and performance don’t come cheap, but it can compete with offerings from the elite manufacturers of the world and still offer the environmental benefits of a hybrid. Neither NHTSA nor IIHS has crash-tested the LS 600h L.

### Vehicle Specifications

<table>
<thead>
<tr>
<th>Feature</th>
<th>Value</th>
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<tbody>
<tr>
<td>Model year tested</td>
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</tr>
<tr>
<td>Number of passengers (F/R)</td>
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<tr>
<td>Curb weight (lbs)</td>
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<td>Exterior length (in)</td>
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<td>Exterior width (in)</td>
<td>73.8</td>
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<td>Exterior height (in)</td>
<td>58.3</td>
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<td>Wheelbase (in)</td>
<td>121.7</td>
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<td>Restraint type</td>
<td>9 air bags or more</td>
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<td>Warranty (months/miles)</td>
<td>48/50,000</td>
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<tr>
<td>Tire manufacturer and size</td>
<td>Michelin 245/45R19</td>
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<tr>
<td>Towing capacity (lbs)</td>
<td>3,600</td>
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<tr>
<td>Horsepower (hp)</td>
<td>389 @ 4,800 rpm (438 total)</td>
</tr>
<tr>
<td>Electric motor horsepower</td>
<td>221 hp (37 kW)</td>
</tr>
</tbody>
</table>

**Fuel Information**

- Fuel type: Premium
- Fuel capacity (gal): 22.2
- EPA urban mpg: 19
- EPA highway mpg: 23
- EPA combined mpg: 20

**Average MPG as Tested by Auto Club**

- Overall score: 72.33
- Lowest: 58.39
- Highest: 92.49
- Overall ranking: 42

**Test Data**

<table>
<thead>
<tr>
<th>Test Vehicle Scores (0 to 10 Points)</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Braking</td>
<td>6.78</td>
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<tr>
<td>Crashworthiness</td>
<td>8.23</td>
</tr>
<tr>
<td>Visibility</td>
<td>7.90</td>
</tr>
<tr>
<td>Slam-on handling</td>
<td>8.64</td>
</tr>
<tr>
<td>Ride quality</td>
<td>8.64</td>
</tr>
<tr>
<td>Fuel economy</td>
<td>8.64</td>
</tr>
<tr>
<td>Interior noise</td>
<td>8.64</td>
</tr>
<tr>
<td>Acceleration</td>
<td>8.64</td>
</tr>
<tr>
<td>Ease of entry and exit</td>
<td>8.90</td>
</tr>
<tr>
<td>Interior size</td>
<td>8.97</td>
</tr>
<tr>
<td>Turning circle</td>
<td>8.97</td>
</tr>
<tr>
<td>Cargo capacity</td>
<td>8.97</td>
</tr>
</tbody>
</table>

**NHTSA Safety Ratings**

- Model year tested: 2014
- Number of passengers (F/R): 2/2
- Curb weight (lbs): 5680
- Exterior length (in): 205.1
- Exterior width (in): 73.8
- Exterior height (in): 58.3
- Wheelbase (in): 121.7
- Restraint type: 9 air bags or more
- Warranty (months/miles): 48/50,000
- Tire manufacturer and size: Michelin 245/45R19
- Towing capacity (lbs): 3,600
- Horsepower (hp): 389 @ 4,800 rpm (438 total)
- Electric motor horsepower: 221 hp (37 kW)

**Available Advanced Safety Features**

- Reversing camera
- Blind-spot monitoring
- Rear cross-traffic alert
- Lane-departure warning
- Lane-keeping assist
- Adaptive cruise control
- Forward-collision warning
- Forward-collision avoidance
- Lane-keeping assist

**Toyota Avalon Limited**

**Overall Observations**

Toyota redesigned the Avalon in 2013, aiming to attract a younger demographic. Equipped with dynamic radar cruise control, automatic high beams, and a precollision system, our top-of-the-line Limited version was priced at more than $42,000. Blind-spot monitoring and rear cross-traffic alert systems are standard on the 2016 edition of this trim level. With its 3.5-liter V6, which produces 268 hp, the Avalon has great acceleration, handled well on the slalom course, and provides a smooth, comfortable ride (albeit on the firm side). It’s EPA-rated at 25 mpg combined, decent for a large nongybrid sedan. From 2014–2016, the Avalon received only minor feature changes and upgrades.

### Vehicle Specifications

<table>
<thead>
<tr>
<th>Feature</th>
<th>Value</th>
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<tbody>
<tr>
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<td>Exterior length (in)</td>
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<td>Exterior width (in)</td>
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<tr>
<td>Exterior height (in)</td>
<td>57.5</td>
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<tr>
<td>Fuel economy</td>
<td>111.0</td>
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<tr>
<td>Interior noise</td>
<td>9 air bags or more</td>
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<tr>
<td>Warranty (months/miles)</td>
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<tr>
<td>Tire manufacturer and size</td>
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<tr>
<td>Towing capacity (lbs)</td>
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<tr>
<td>Horsepower (hp)</td>
<td>235 and 24V6</td>
</tr>
<tr>
<td>Electric motor horsepower</td>
<td>268 @ 6200</td>
</tr>
</tbody>
</table>

**Fuel Information**

- Fuel type: Regular
- Fuel capacity (gal): 17
- EPA urban mpg: 21
- EPA highway mpg: 31
- EPA combined mpg: 25

**Average MPG as Tested by Auto Club**

- Overall score: 70.70
- Lowest: 53.90
- Highest: 92.49
- Overall ranking: 53

**Test Data**

<table>
<thead>
<tr>
<th>Test Vehicle Scores (0 to 10 Points)</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Braking</td>
<td>6.78</td>
</tr>
<tr>
<td>Crashworthiness</td>
<td>8.23</td>
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<tr>
<td>Visibility</td>
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<td>Slam-on handling</td>
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<td>Ride quality</td>
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<tr>
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</tr>
<tr>
<td>Ease of entry and exit</td>
<td>8.90</td>
</tr>
<tr>
<td>Interior size</td>
<td>8.97</td>
</tr>
<tr>
<td>Turning circle</td>
<td>8.97</td>
</tr>
<tr>
<td>Cargo capacity</td>
<td>8.97</td>
</tr>
</tbody>
</table>

**NHTSA Safety Ratings**

- Model year tested: 2013
- Number of passengers (F/R): 2/3
- Curb weight (lbs): 3430
- Exterior length (in): 195.2
- Exterior width (in): 72.2
- Exterior height (in): 57.5
- Fuel economy: 111.0
- Interior noise: 9 air bags or more
- Warranty (months/miles): 36/36,000
- Tire manufacturer and size: Michelin P235/45R18
- Towing capacity (lbs): 1000/1000
- Horsepower (hp): 235 and 24V6
- Electric motor horsepower: 268 @ 6200

**Available Advanced Safety Features**

- Reversing camera
- Blind-spot monitoring
- Rear cross-traffic alert
- Lane-departure warning
- Lane-keeping assist
- Adaptive cruise control
- Forward-collision warning
- Forward-collision avoidance
- Lane-keeping assist

**AAA Green Car Guide 2016**

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LARGE HYBRID

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LARGE NONHYBRID HIGH MPG
**Toyota Avalon Hybrid XLE Plus**

**VEHICLE SPECIFICATIONS**

- **Model year tested:** 2016
- **Number of passengers (F/R):** 2/3
- **Curb weight (lbs):** 3594
- **Exterior length (in):** 195.3
- **Exterior width (in):** 72.2
- **Exterior height (in):** 57.5
- **Wheelbase (in):** 111.0
- **Front air bags or more:** Not recommended
- **Tire manufacturer and size:** Michelin PM215/55R17
- **Transmission type:** CVT
- **Engine size:** 2.5L DOHC 16V VVT-i I4
- **Horsepower @ rpm:** 195 @ 5700 (200 total)
- **Electric motor horsepower:** 141 @ 4500 (105 kW)

**OVERALL OBSERVATIONS**

The Toyota Avalon handles well for a big car, is extremely quiet, and delivers a smooth, luxurious ride. It combines a 2.5-liter, 4-cylinder gasoline engine with two electric motors (good for 200 hp total) and a CVT transmission to provide strong acceleration, excellent fuel economy (40 mpg), and low emissions (AP TPEV). There’s plenty of room inside, including good backseat legroom. Trunk space is reduced somewhat because of the hybrid battery pack but is still decently sized. Our base-level XLE Plus test car was well equipped, with features like keyless ignition and entry, dual-zone automatic climate control, leather upholstery, heated front seats, and a rearview camera. Neither NHTSA nor IHS has crash-tested the Avalon Hybrid.

**TEST DATA**

- **EPA emissions score:** 4.80
- **Braking:** 4.95
- **Curtain air bags:** 5.00
- **Forward-collision avoidance:** 5.00
- **Forward-collision warning:** 5.00
- **Automatic emergency braking:** 5.00
- **Plenty of interior storage:** 5.00
- **Stylish leather seats and dashboard:** 5.00
- **Rearview camera:** 5.00

**NHTSA SAFETY RATINGS (2016 MODEL): N/A**

**AVAILABLE ADVANCED SAFETY FEATURES**

- **Reverse camera**
- **Blind-spot monitoring**
- **Lane-departure warning**
- **Rear cross-traffic alert**
- **Blind-spot monitoring**
- **Rearview camera**
- **Lane-keeping assist**

**STRENGTHS**:

- Excellent fuel economy
- Excellent highway ride quality
- Very quiet cabin
- Good hybrid power

**WEAKNESSES**: Soft brake-pedal feel

**AVG. MPG AS TESTED BY AUTO CLUB**: 58.89

**BASE PRICE:** $36,650; PRICE AS TESTED: $37,485

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**Chevrolet Impala 3LT CNG Bi-Fuel**

**VEHICLE SPECIFICATIONS**

- **Model year tested:** 2015
- **Number of passengers (F/R):** 2/3
- **Curb weight (lbs):** 4120
- **Exterior length (in):** 201.3
- **Exterior width (in):** 73.0
- **Exterior height (in):** 58.9
- **Wheelbase (in):** 111.7
- **RestRAINT type:** 9 air bags or more
- **Tire manufacturer and size:** Firestone P235/50R18
- **Transmission type:** Auto 6 speed
- **Front wheel:** 3.6L DOHC Bi-Fuel V6
- **Engine size:** 230 @ 4800 (CNG)

**OVERALL OBSERVATIONS**

With the demise of the Honda Civic Natural Gas, the Chevrolet Impala Bi-Fuel, which has an MSRP of just under $41,000, is the only passenger car sold in the U.S. that runs on CNG (or, in this case, on gasoline, too). It has a special tank in the trunk that holds enough CNG for about 150 miles of city driving; a switch on the dashboard lets the driver shift between the two fuels. EPA-estimated MPGe when burning CNG is 19. The Impala Bi-Fuel has a stylish cabin (apart from some low-grade plastics), plenty of interior room, and a comfortable ride. However, its handling is lackluster, with a mushy brake pedal and a vague steering feel. Also, there’s an audible, high-pitched whine during CNG operation.

**TEST DATA**

- **EPA emissions score:** 6.50
- **Braking:** 6.50
- **Curtain air bags:** 6.50
- **Forward-collision avoidance:** 6.50
- **Forward-collision warning:** 6.50
- **Automatic emergency braking:** 6.50
- **Plenty of interior storage:** 6.50
- **Stylish leather seats and dashboard:** 6.50
- **Rearview camera:** 6.50

**NHTSA SAFETY RATINGS (2016 MODEL): N/A**

**AVAILABLE ADVANCED SAFETY FEATURES**

- **Reverse camera**
- **Blind-spot monitoring**
- **Lane-departure warning**
- **Rear cross-traffic alert**
- **Blind-spot monitoring**
- **Rearview camera**
- **Lane-keeping assist**

**STRENGTHS**:

- Option to drive on either CNG or gasoline, with the combined range of both tanks
- Roomy interior
- Plenty of interior storage
- Stylish leather seats and dashboard

**WEAKNESSES**: Little steering feel

**AVG. MPG AS TESTED BY AUTO CLUB**: 63.11

**BASE PRICE:** $40,510; PRICE AS TESTED: $42,625
The Ford F-150 has been the best-selling truck for 35 years straight. And of course there’s room for improvement. Ford’s improved SYNC 3 infotainment system is available. It earned a 5 star (out of 5) overall safety rating from NHTSA and, with optional front-crash prevention, a Top Safety Pick rating from IIHS.

### Strong Points
- Roomy interior with tremendous cargo capacity and utility
- Heated/cool front seats
- Well equipped with standard and optional features including satellite radio, Bluetooth, and a power tailgate opener
- Visibility, especially to the front

### Weak Points
- Entry/exit is difficult because of ride height (needs running boards)
- Large turning radius, difficult to park
- Electric parking brake is placed low on the dash

### Test Data
- EPA emissions score: 76.50
- Braking: 2.96
- Crashworthiness: 9.81
- Visibility: 5.70
- Slalom handling: 7.24
- Ride quality: 7.94
- Fuel economy: 9.20
- Interior noise: 3.48
- Acceleration: 6.10
- Ease of entry and exit: 7.58
- Interior size: 8.10
- Turning circle: 11.92
- Cargo capacity: 5.77

### Overall Rating
- Overall score: 75.73
- Model year tested: 2015
- Curb weight (lbs): 4620
- Exterior length (in): 231.9
- Exterior width (in): 96.8
- Exterior height (in): 75.5
- Wheelbase (in): 145.0
- Restraint type: 8 air bags
- Warranty (months/miles): 36/36,000
- Tire manufacturer and size: Michelin 265/60R18 760/1000
- Auto 6 speed
- Rear wheel
- Engine size: 2.7L V6 EcoBoost
- Horsepower @ rpm: 325 @ 5750

### Vehicle Specifications
- Model year tested: 2015
- Number of passengers (P/R): 3/3
- Curb weight (lbs): 4620
- Exterior length (in): 231.9
- Exterior width (in): 96.8
- Exterior height (in): 75.5
- Wheelbase (in): 145.0
- Restraint type: 8 air bags
- Warranty (months/miles): 36/36,000
- Tire manufacturer and size: Michelin 265/60R18 760/1000
- Auto 6 speed
- Rear wheel
- Engine size: 2.7L V6 EcoBoost
- Horsepower @ rpm: 325 @ 5750
OVERALL OBSERVATIONS

The Chevrolet Silverado 1500 LT is equipped with a 4.3-liter, 285-hp V6. Our test vehicle was a flex-fuel capable 4x4 rated at 19 mpg. The Silverado’s cabin is huge and comfortable, and its ride quality is surprisingly good. Full-size trucks have the best instrumentation layouts in the industry, and the Silverado’s controls are especially easy to use. This truck sits high off the ground, providing excellent distance visibility, but it’s virtually impossible to see anything close to the truck below the hood line. Like other full-size 4x4s, the Silverado is hard to get into, ground, providing excellent distance visibility, but it’s virtually impossible to see anything close to the truck below the hood line. Like other full-size 4x4s, the Silverado is hard to get into, hard to execute U-turns with, and won’t fit in many parking spots. NHTSA awarded it a 5-star (out of 5) overall rating in its crash testing. The Silverado’s payload is up to 2,133 pounds. Full-size trucks sell in high quantities, and the Chevy Silverado has earned its ranking near the top.

NHTSA SAFETY RATINGS (2016 MODEL): ★★★★★

AVAILABLE ADVANCED SAFETY FEATURES

- Rearview camera
- Lane-departure warning
- Lane-keeping assist
- Forward-collision warning
- Rearview camera
- Good ride quality for a 4x4 truck
- Easy-to-use full instrumentation
- Quiet

TEST DATA TEST VEHICLE SCORES (0 TO 10 POINTS)

- Ease of entry and exit: 6.00
- Interior size: 5.00
- Turning circle: 6.00
- Cargo capacity: 6.00

VEHICLE SPECIFICATIONS

- Model year tested: 2014
- Number of passengers (F/R): 3/3
- Curb weight (lbs): 6600
- Exterior length (in): 238.6
- Exterior width (in): 80.0
- Exterior height (in): 73.8
- Wheelbase (in): 153.0
- Restraint type: 8 air bags
- Warranty (months/miles): 36/36,000
- Tire manufacturer and size: Bridgestone LT255/70R17
- Towing cap. (lbs) w/wo brakes: 6600
- Transmission type: Auto 6 speed
- Engine size: 4.3L EcoTec3 V6
- Horsepower @ rpm: 285 @ 6300

OVERALL SCORE: 71.74

AVERAGE MPG AS TESTED BY AUTO CLUB

- EPA urban mpg: 17
- EPA highway mpg: 22
- EPA combined mpg: 19

Model Year: 2014

Price as tested: $42,610

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SUV

SUVs are all about utility and versatility. Most SUVs today are actually crossovers, with carlike unibodies rather than traditional body-on-frame construction. And most spend their time only on paved roads. The greenest SUVs are compact and midsize, like Honda’s new HR-V or the venerable Toyota Highlander Hybrid. Because SUVs are tall, they have more room inside than comparably sized sedans or hatchbacks, and they provide a higher seating position that makes driving easier. They also have liftgates that, like those on a hatchback, make it easier to load cargo into the rear. And if you need to tow a trailer but don’t care for pickups, most SUVs are up to the challenge. Finally, there are plenty of green SUVs to choose from—hybrids, diesels, and SUVs with conventional internal combustion engine powertrains.

SUBARU

Outback 2.5i Premium

Redesigned for 2015, the Subaru Outback is a 4-door SUV equipped with a 2.5-liter 4-cylinder “boxer” engine and AWD. Dual-zone automatic climate control, heated seats, and Bluetooth connectivity are also standard. Our Premium test vehicle also had Subaru’s excellent EyeSight crash-prevention system. For 2015, Subaru introduced steering-responsive fog lights, which come on automatically when you turn the car, shining light around the corner. Overall, the Outback handles well, and has decent room inside and a comfortable ride. And since the Outback is a PZEV, you get a rugged vehicle that’s easier on the environment. It gets a 5 star (out of 5) overall crash-test rating from NHTSA. It’s also an IIHS Top Safety Pick+ for 2015 and 2016 (with optional front-crash prevention).

TEST vehicle scores (0 TO 10 POINTS)

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<thead>
<tr>
<th>Feature</th>
<th>EPA emissions score</th>
<th>Braking score</th>
<th>Crashworthiness score</th>
<th>Visibility score</th>
<th>Slalom handling score</th>
<th>Ride quality score</th>
<th>Fuel economy score</th>
<th>Interior noise score</th>
<th>Acceleration score</th>
<th>Ease of entry and exit score</th>
<th>Interior size score</th>
<th>Turning circle score</th>
<th>Cargo capacity score</th>
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<tbody>
<tr>
<td>SCORES</td>
<td>6.60</td>
<td>6.51</td>
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</tbody>
</table>

NHTSA SAFETY RATINGS (2016 MODEL): ★★★★★

AVAILABLE ADVANCED SAFETY FEATURES

- Rearview camera
- Adaptive cruise control
- Lane-departure warning
- Lane-keeping assist
- Forward-collision warning
- Forward-collision mitigation
- Forward-collision avoidance

WEAK POINTS

- Slightly underpowered
- Too many potentially distracting controls on the touch screen
- Cargo in the trunk is in plain view
- High doorsills impede entry and exit

STRONG POINTS

- Roomy, flexible interior
- AWD traction
- Certified as a PZEV
- Well equipped, including crash-avoidance technology (forward-collision mitigation, rear cross-traffic warning, blind-spot monitoring, and rearview camera)
- EPA emissions score:
- Braking score:
- Crashworthiness score:
- Visibility score:
- Slalom handling score:
- Ride quality score:
- Fuel economy score:
- Interior noise score:
- Acceleration score:
- Ease of entry and exit score:
- Interior size score:
- Turning circle score:
- Cargo capacity score:

TEST DATA TEST VEHICLE SPECIFICATIONS

<table>
<thead>
<tr>
<th>Vehicle Price</th>
<th>Base Price: $31,535</th>
<th>Price as Tested: $26,995</th>
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</thead>
<tbody>
<tr>
<td>EPA combined mpg:</td>
<td>25</td>
<td>28</td>
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<tr>
<td>Fuel capacity (gal):</td>
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<td>Fuel type:</td>
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<td>Towing cap. (lbs) w/wo brakes:</td>
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<td>3300</td>
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<tr>
<td>Transit manufacturer and size:</td>
<td>CVT</td>
<td>CVT</td>
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<tr>
<td>Engine size:</td>
<td>2.5L, DOHC Flat 4</td>
<td>2.5L, DOHC Flat 4</td>
</tr>
<tr>
<td>Horsepower @ rpm:</td>
<td>175 @ 8800</td>
<td>175 @ 8800</td>
</tr>
</tbody>
</table>

SAFETY FEATURES

Forward-collision avoidance
Forward-collision warning
GREAT POINTS

- Lane-departure warning
- Lane-keeping assist
- Forward-collision warning
- Forward-collision mitigation
- Forward-collision avoidance

WEAK POINTS

- Slightly underpowered
- Too many potentially distracting controls on the touch screen
- Cargo in the trunk is in plain view
- High doorsills impede entry and exit

STRONG POINTS

- Roomy, flexible interior
- AWD traction
- Certified as a PZEV
- Well equipped, including crash-avoidance technology (forward-collision mitigation, rear cross-traffic warning, blind-spot monitoring, and rearview camera)
- EPA emissions score:
- Braking score:
- Crashworthiness score:
- Visibility score:
- Slalom handling score:
- Ride quality score:
- Fuel economy score:
- Interior noise score:
- Acceleration score:
- Ease of entry and exit score:
- Interior size score:
- Turning circle score:
- Cargo capacity score:
**Toyota Highlander Hybrid Limited**

**OVERALL OBSERVATIONS**
Redesigned for 2014, the Toyota Highlander Hybrid has most traditional SUV virtues but avoids typical SUV vices. For example, it’s versatile and has lots of room, but it’s not so large as to appear arrogant, and it gets better combined fuel economy—28 mpg—than many sedans. What’s more, its safety and toughness are more than skin deep: it scores an overall 5-star (out of 5) crash-test rating from NHTSA and comes equipped with front, side, driver’s knee, and three-row side curtain air bags. Another plus is Toyota’s well-deserved reputation for reliability. All in all, the Highlander Hybrid is a rare example of being able to “have your cake and eat it, too.” For 2015 and 2016, the Highlander Hybrid is unchanged.

**NHTSA SAFETY RATINGS (2016 MODEL):★★★★★
AVAILABLE ADVANCED SAFETY FEATURES**
- Rearview camera
- Blind-spot monitoring
- Rear cross-traffic alert
- Lane-departure warning
- Adaptive cruise control

**TEST DATA**
- Model year tested: 2014
- Number of passengers (F/R): 2/3
- Curb weight (lbs): 4861
- Exterior length (in): 191.1
- Exterior width (in): 75.8
- Exterior height (in): 70.1
- Wheelbase (in): 110.0
- Restraint type: 9 air bags or more
- Warranty (months/miles): 36/36,000
- Tire manufacturer and size: Toyo P245/65R19
- Towing cap. (lbs) w/brakes: 3500
- Transmission type: CVT
- Drivetrain type: All wheel - full time
- Engine size: 2.5L, DOHC 24V 4S
- Horsepower @ rpm: 231 @ 5800 (280 total)

**VEHICLE SPECIFICATIONS**
- EPA emissions score: 7.88
- Braking: 8.01
- Crashworthiness: 8.84
- Visibility: 9.00
- Slam-on handling: 8.70
- Ride quality: 7.62
- Fuel economy: 6.89
- Interior noise: 6.53
- Acceleration: 4.53
- Ease of entry and exit: 4.92
- Interior size: 4.69
- Turning circle: 5.90
- Cargo capacity: 3.50

**FINALIST**
BASE PRICE: $47,300; PRICE AS TESTED: $50,660

---

**Subaru Forester 2.5i Touring**

**OVERALL OBSERVATIONS**
The Subaru Forester was completely redesigned for 2014. Our 2.5i Touring version, powered by a 2.5-liter “boxer” 4-cylinder engine that delivers 170 hp, was a certified PZEV that delivered a comfortable, quiet ride. A worthy family vehicle, the Forester has an EPA combined rating of 27 mpg, excellent for an AWD SUV; our test vehicle averaged 25 mpg. Although it’s not as large as some SUVs, the Forester has a roomy interior and great visibility. The adaptive cruise control and lane-departure warning systems are nice safety features to have, although the lane-departure system in our test car didn’t always function perfectly. The Forester scored 5 stars (out of 5) overall in NHTSA’s crash tests and received a Top Safety Pick+ rating from IIHS for 2014–2016 (with optional front-crash prevention). Noteworthy changes include a standard rearview camera for 2015 and an improved touch-screen interface for 2016.

**NHTSA SAFETY RATINGS (2016 MODEL):★★★★★
AVAILABLE ADVANCED SAFETY FEATURES**
- Rearview camera
- Lane-departure warning
- Adaptive cruise control
- Forward-collision warning
- Forward-collision avoidance

**TEST DATA**
- Model year tested: 2014
- Number of passengers (F/R): 2/3
- Curb weight (lbs): 3470
- Exterior length (in): 190.9
- Exterior width (in): 70.7
- Exterior height (in): 68.2
- Wheelbase (in): 103.9
- Restraint type: 9 air bags or more
- Warranty (months/miles): 36/36,000
- Tire manufacturer and size: Yokohama P225/60R17
- Towing cap. (lbs) w/brakes: 3500
- Transmission type: CVT
- Drivetrain type: All wheel - full time
- Engine size: 2.5L, DOHC Flat 4
- Horsepower @ rpm: 175 @ 5800

**VEHICLE SPECIFICATIONS**
- EPA emissions score: 8.01
- Braking: 6.90
- Crashworthiness: 6.80
- Visibility: 7.90
- Slam-on handling: 4.32
- Ride quality: 6.37
- Fuel economy: 5.49
- Interior noise: 5.69
- Acceleration: 6.49
- Ease of entry and exit: 7.21
- Interior size: 4.48
- Turning circle: 4.48
- Cargo capacity: 4.25

**FINALIST**
BASE PRICE: $30,820; PRICE AS TESTED: $32,220

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**AAA Green Car Guide 2016**

AAA.com/greencar
Overall Observations
The Lexus NX series is the automaker’s entry into the luxury compact crossover category. We tested the NX 300h, a hybrid featuring a 2.5-liter, 154-hp gasoline engine and three electric motors (one powers the rear axle to provide AWD). This combination provides high fuel economy (62 mpg combined) and meets stringent 5.0 g/L CO2 emission standards, but it lags somewhat in performance: The gas engine drones under hard acceleration. Our test vehicle was well equipped, handled nimbly, and proved easy and comfortable to drive around town. It had the expected flexibility of an SUV, but its small windows limit visibility, and the trunk area is small with the rear seats in place. NHTSA gave the NX 300h a 5 star (out of 5) overall crash-test rating. IIHS awarded the 2016 NX series a Top Safety Pick+ (with optional front-crash prevention). For 2016, the NX 300h is공부

Fuel information
- Fuel Type: Regular
- Fuel Capacity (gal): 14.8
- EPA Urban mpg: 33
- EPA Highway mpg: 30
- EPA Combined mpg: 32

Average MPG as Tested by Auto Club
- 6.09
- 7.29
- 7.50

Test data
- Model year tested: 2015
- Number of passengers (F/R): 2/3
- Curb weight (lbs): 4160
- Exterior length (in): 182.3
- Exterior width (in): 83.9
- Exterior height (in): 64.8
- Wheelbase (in): 104.7
- Restraint type: 9 air bags or more
- Warranty (months/miles): 48/50,000
- Tire manufacturer and size: Bridgestone 225/60R18
- Towing cap. (lbs) w/o brakes: 2,000
- Transmission type: CVT
- Drivetrain type: All wheel - full time
- Engine size: 2.5L DOHC 16V 14
- Horsepower (rpm): 154 @ 7000 (194 total)
- Electric motor horsepower: 141 hp (105 kW)

Lexus NX 300h

Vehicle specifications
- Base price: $47,045; Price as Tested: $47,045

Lexus NX 300h

Overall Observations
The Mazda CX-5 is Mazda’s compact SUV, known for its responsive handling, good fuel economy, and reliability. We tested the Touring version with a 2.5-liter, 4-cylinder engine rated at 184 hp, a 6-speed automatic transmission, and AWD. It’s EPA rated at 26 mpg combined, has a base price of about $27,000, and enough room to haul kids around or take a family on vacation. Another nice feature was its adaptive HD headlamps, which make nighttime driving easier and safer. The CX-5’s downsides are few but significant: high interior noise levels and a harsh ride. Still, with all its optional equipment, the CX-5 delivered good value, with an MSR under $30,000. NHTSA awarded the CX-5 an overall crash-test rating of 4 stars (out of 5). And from 2014-2016, IIHS has awarded the CX-5 a Top Safety Pick+ rating (with optional front-crash prevention). For 2016, the CX-5 gets minor exterior styling changes, better materials in the cabin, an upgraded infotainment system, and more sound insulation.

Fuel information
- Fuel type: Regular
- Fuel capacity (gal): 15.3
- EPA urban mpg: 24
- EPA highway mpg: 30
- EPA combined mpg: 26

Average MPG as Tested by Auto Club
- 6.09
- 7.29
- 7.50

Test data
- Model year tested: 2014
- Number of passengers (F/R): 2/3
- Curb weight (lbs): 4160
- Exterior length (in): 182.3
- Exterior width (in): 83.9
- Exterior height (in): 64.8
- Wheelbase (in): 104.7
- Restraint type: 9 air bags or more
- Warranty (months/miles): 48/50,000
- Tire manufacturer and size: Bridgestone 225/60R18
- Towing cap. (lbs) w/o brakes: 2,000
- Transmission type: CVT
- Drivetrain type: All wheel - full time
- Engine size: 2.5L DOHC 16V 14
- Horsepower (rpm): 154 @ 7000 (194 total)
- Electric motor horsepower: 141 hp (105 kW)

Mazda CX-5 Touring AWD

Vehicle specifications
- Base price: $26,660; Price as Tested: $29,775

Mazda CX-5 Touring AWD
**Toyota RAV4 Hybrid Limited**

**OVERALL OBSERVATIONS**
In 2016, Toyota finally gave its fans what they've waited for in the RAV4 Hybrid—a compact crossover with a hybrid drive. Our Limited model was well equipped, with a stylish brown leatherette interior, a sport steering wheel, and sport seats with big bolsters to keep the driver and front passenger in place during cornering. Unfortunately, the RAV4 Hybrids sporty exterior and interior styling don’t carry over to its vehicle dynamics. The handling is fine, but the variable-ratio steering is usually too light (at low speeds) or too heavy in effort. There’s also some torque steer, and when accelerating hard, the steering feels too light. At an EPA-rated 33 mpg combined, fuel economy is good but not great, considering that several midsize and large hybrid sedans achieve 40 mpg.

**VEHICLE SPECIFICATIONS**
- **Model year tested:** 2016
- **Number of passengers (F/R):** 2/3
- **Curb weight (lbs):** 4000
- **Exterior length (in):** 181.1
- **Exterior width (in):** 72.6
- **Exterior height (in):** 67.1
- **Towing cap. (lbs) w/wo brakes:** 1500 (104.7) 150 @ 5700 (194 total)
- **All wheel - full time**
- **Engine type:** 3.5L 24V DOHC VVT V6
- **Engine size:** 3.5L
- **FUEL INFORMATION**
  - Fuel type: Regular
  - Fuel capacity (gal): 14.8
  - EPA urban mpg: 34
  - EPA highway mpg: 31
  - EPA combined mpg: 33
- **AVERAGE MPG AS TESTED BY AUTO CLUB:** 7.64

**TEST DATA**
- **EPA emissions score:** 7.20
- **Braking:**
- **Crashworthiness:**
- **Visibility:**
- **Stability handling:**
- **Ride quality:**
- **Fuel economy:**
- **Interior noise:**
- **Acceleration:**
- **Ease of entry and exit:**
- **Interior size:**
- **Turning circle:**
- **Cargo capacity:**
- **Price as Tested:** $34,910; Price as Tested: $35,865

**LEAF RATING:**
- **OVERALL SCORE:** 58.89
- **RANKING:** 33

**AVAILABLE ADVANCED SAFETY FEATURES**
- Rearview camera
- Blind-spot monitoring
- Rear cross-traffic alert
- Lane-departure warning
- Lane-keeping assist

**TEST VEHICLE SCORES (0 TO 10 POINTS)**
- **Ease of entry and exit:** 6.12
- **Interior size:** 5.23
- **Turning circle:** 5.23
- **Cargo capacity:** 3.87

**NHTSA SAFETY RATINGS (2016 MODEL): **
- N/A

**Strong Points**
- Attractive interior styling
- Good— but not great— fuel economy
- Sport seats
- Spacious rear-seat area
- Selectable driving modes (EV, Eco, and Sport)

**Weak Points**
- Sport seats may be tight for larger individuals
- Variable ratio steering can be either too light or too heavy
- Some torque steer
- Steering gets light during hard acceleration
- Gasoline engine comes on with a bang during start and hard acceleration
- Navigation/entertainment touch-panel display can be overly sensitive to inputs

**AAA Green Car Guide 2016**

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**Lexus RX 450h**

**OVERALL OBSERVATIONS**
Introduced in 2010, the Lexus RX 450h was the first green luxury SUV on the market. Its V6 engine and two electric motors (three for AWD models) generate 308 hp, offering both performance and great fuel economy—30 mpg combined. The RX 450h is impeccably finished and provides a responsive, luxurious ride. It’s loaded with the safety, comfort, and convenience features you’d expect, including LED exterior lighting, rearview camera, reclining rear seats, heated and ventilated front seats, and available blind-spot monitoring with rear cross-traffic alert. However, despite the hybrid system’s power, our 0-60 mph time was only a slightly better-than-average 7.5 seconds. Also, the joystick navigation and multimedia controller remain controversial, liked by some testers and disliked by others. NHTSA has not yet crash-tested the 2016 RX 450h.

**VEHICLE SPECIFICATIONS**
- **Model year tested:** 2016
- **Number of passengers (F/R):** 2/3
- **Curb weight (lbs):** 4820
- **Exterior length (in):** 192.5
- **Exterior width (in):** 74.6
- **Exterior height (in):** 67.7
- **Towing cap. (lbs) w/wo brakes:** 3500 (109.8)
- **Transmission type:** CVT
- **All wheel - full time**
- **Engine type:** 3.5L 24V DOHC VVT V6
- **Engine size:** 3.5L
- **FUEL INFORMATION**
  - Fuel type: Premium
  - Fuel capacity (gal): 17.2
  - EPA urban mpg: 30
  - EPA highway mpg: 31
  - EPA combined mpg: 33
- **AVERAGE MPG AS TESTED BY AUTO CLUB:** 72.40

**TEST DATA**
- **EPA emissions score:** 7.98
- **Braking:**
- **Crashworthiness:**
- **Visibility:**
- **Stability handling:**
- **Ride quality:**
- **Fuel economy:**
- **Interior noise:**
- **Acceleration:**
- **Ease of entry and exit:**
- **Interior size:**
- **Turning circle:**
- **Cargo capacity:**
- **Price as Tested:** $53,635; Price as Tested: $59,255

**LEAF RATING:**
- **OVERALL SCORE:** 58.89
- **RANKING:** 39

**AVAILABLE ADVANCED SAFETY FEATURES**
- Rearview camera
- Blind-spot monitoring
- Rear cross-traffic alert
- Lane-departure warning
- Lane-keeping assist

**TEST VEHICLE SCORES (0 TO 10 POINTS)**
- **Ease of entry and exit:** 7.20
- **Interior size:** 7.20
- **Turning circle:** 7.20
- **Cargo capacity:** 3.87

**NHTSA SAFETY RATINGS (2016 MODEL): **
- N/A

**Strong Points**
- Great fuel economy for its size (30 mpg EPA combined)
- Excellent ride quality
- Very quiet cabin
- Good hybrid power

**Weak Points**
- Handling is just okay for a vehicle with so many superlatives
- Getting into the vehicle is slightly difficult because of its height and lack of running boards
- High purchase price
## Jeep Grand Cherokee Summit 4X4

**VEHICLE SPECIFICATIONS**

- **OVERALL OBSERVATIONS**
  - The Jeep Grand Cherokee was a prototypical “tough” SUV when it disappeared from the market several years ago, but the reintroduced 2014 model turns that image around a bit. Our test vehicle was tough but also plush. It came with adaptive cruise control, rearview camera, heated/ventilated front seats, heated rear seats and steering wheel, and a Harmon Kardon sound system with 19 speakers. All these amenities work well. NHTSA awarded the Grand Cherokee 4 stars (out of 5)
  - Good visibility
  - Plush interior
  - Convenience features
  - Good fuel economy for a typical SUV

- **Strong Points**
  - Utility and flexibility
  - Good fuel economy for a vehicle of this size
  - Loaded with safety and convenience features
  - Plush interior
  - Strong torque
  - Good visibility
  - Rear seats recline

- **Weak Points**
  - High purchase price
  - Stipple handling in slalom test
  - High step-in
  - Unusual shifter

- **TEST VEHICLE SCORES (0 TO 10 POINTS)**
  - 71.98

- **AVGMPG AS TESTED BY AUTO CLUB**
  - 24.6

- **FUEL INFORMATION**
  - Diesel #2
  - Fuel capacity (gal): 24.6
  - EPA urban mpg: 21
  - EPA highway mpg: 28
  - EPA combined mpg: 24

- **PRICE AS TESTED:** $52,190; **PRICE AS TESTED:** $57,190

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## Hyundai Tucson Fuel Cell

**VEHICLE SPECIFICATIONS**

- **OVERALL OBSERVATIONS**
  - Hyundai introduced the Tucson Fuel Cell in mid-2014, and this is the first fuel-cell vehicle we’ve reviewed in the AAA Green Car Guide. It’s adapted from the gasoline-powered Tucson and is available—for lease only—in certain areas of California. In a fuel-cell vehicle, electricity, produced onboard by a chemical reaction of hydrogen and water, powers the vehicle. Typically, strong electric-motor torque is a benefit of electric vehicles, but the Tucson had very little low-end torque from a stop and was weak on passing power at speed. It also produced some body roll and long stopping distances at the test track, although during everyday driving, the handling, stopping, and acceleration were, for the most part, fine.

- **Strong Points**
  - Good drivability
  - High-tech fuel-cell powertrain
  - Much longer range than most battery-electric vehicles
  - Free hydrogen fuel (for now)

- **Weak Points**
  - Unavailability of hydrogen fuel
  - No bottom-end torque
  - Weak passing power
  - Long stopping distances
  - Dated, plastic-filled interior

- **TEST VEHICLE SCORES (0 TO 10 POINTS)**
  - 71.11

- **AVGMPGe AS TESTED BY AUTO CLUB**
  - 102

- **FUEL INFORMATION**
  - Hydrogen
  - Fuel capacity (gal): 37
  - EPA urban mpg: 49
  - EPA highway mpg: 51
  - EPA combined mpg: 50

- **PRICE AS TESTED:** $50,895; **PRICE AS TESTED:** $50,895

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## TEST DATA

**EPA emissions score**
- Braking: 5.99
- Crashworthiness: 8.93
- Visibility: 9.72
- Slalom handling: 7.70
- Ride quality: 7.88
- Fuel economy: 7.97
- Interior noise: 9.18
- Acceleration: 6.44
- Ease of entry and exit: 6.42
- Interior size: 7.89
- Turning circle: 5.98
- Cargo capacity: 5.78

**VEHICLE SPECIFICATIONS**
- Model year tested: 2014
- Number of passengers (F/R): 2/3
- Curb weight (lbs): 4580
- Exterior length (in): 189.8
- Exterior width (in): 76.5
- Exterior height (in): 69.3
- Wheelbase (in): 114.8
- Restraint type: 9 air bags or more
- Warranty (months/miles): 36/36,000
- Tire manufacturer and size: Goodyear P265/50R20
- Transmission type: 6-speed automatic
- All-wheel drive
- Engine size: 3.5L, ECO-Diesel V6
- Horsepower @ rpm: 240 @ 3600

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## TEST DATA

**EPA emissions score**
- Braking: 7.86
- Crashworthiness: 7.38
- Visibility: 7.30
- Slalom handling: 8.87
- Ride quality: 8.83
- Fuel economy: 8.76
- Interior noise: 6.84
- Acceleration: 6.54
- Ease of entry and exit: 6.52
- Interior size: 7.96
- Turning circle: 4.93
- Cargo capacity: 4.44

**VEHICLE SPECIFICATIONS**
- Model year tested: 2015
- Number of passengers (F/R): 2/3
- Curb weight (lbs): 4100
- Exterior length (in): 173.6
- Exterior width (in): 71.7
- Exterior height (in): 65.2
- Wheelbase (in): 103.9
- Restraint type: 8 air bags
- Warranty (months/miles): Kumho 225/60R17
- Transmission type: Auto 1 speed
- Front wheel: Hydrogen Fuel Cell
- Engine size: Horsepower @ rpm: 134 @ 5000
**Vehicle Specifications**

**Subaru Crosstrek Hybrid**  
**Vehicle**: Subaru Crosstrek Hybrid  
**Price**: $30,120; **Price as Tested**: $30,120  

**NHTSA Safety Ratings (2016 Model)**:  
- **Crashworthiness**: 4 stars (out of 5)  
- **Side Impact**: 5 stars (out of 5)  
- **Forward Collision**: 4 stars (out of 5)  

**AVAILABLE ADVANCED SAFETY FEATURES**  
- Rearview camera  
- Blind-spot monitoring  
- Rear cross-traffic alert  
- Lane-keeping assist  

**Overall Observations**  
The Crosstrek Hybrid, Subaru's first commercially available hybrid, combines the utility and ground clearance of an SUV with the smaller exterior size and low center of gravity of a passenger car. It's rated at 31 mpg combined by EPA—but only 3 mpg more than the nonhybrid version. We got 26 mpg with our test vehicle, which was equipped with a rearview camera, sunroof, Bluetooth, and heated seats. Typical of most Subarus, it had AWD, which provides improved traction in any weather. The Crosstrek Hybrids' 160-hp drivetrain could use more power, but otherwise its on-road manners are good. However, the controls for the navigation and sound system are a step backward from the excellent controls on earlier Subaru models. The Crosstrek Hybrid received an overall rating of 5 stars (out of 5) in NHTSA's crash tests. For 2016, the Hybrid gets significant improvements to its braking and handling systems, with improved traction in any weather. The Crosstrek Hybrid's 160-hp drivetrain is well-tuned, and the cabin is quiet under normal driving conditions. The Crosstrek Hybrid is a great choice for those looking for a hybrid that is both environmentally friendly and capable of handling a variety of driving conditions.

**Test Data**  
- **EPA emissions score**: 76.80  
- **Braking**: 2.26  
- **Crashworthiness**: 4.36  
- **Visibility**: 3.90  
- **Slalom handling**: 4.10  
- **Ride quality**: 4.49  
- **Fuel economy**: 5.39  
- **Interior noise**: 5.90  
- **Acceleration**: 3.88  
- **Ease of entry and exit**: 5.49  
- **Turning circle**: 4.55  
- **Cargo capacity**: 3.89  

**Fuel Information**  
- **Fuel type**: Regular  
- **Fuel capacity (gal)**: 13.7  
- **EPA urban mpg**: 29  
- **EPA highway mpg**: 33  
- **EPA combined mpg**: 31  

**Average MPG as Tested by Auto Club**: 0.023

**Strong Points**  
- Good fuel economy  
- AWD traction  
- Engine stop-start system  

**Weak Points**  
- Touch-screen radio controls aren't smooth  
- Front seat has to be moved forward to fold down the rear seat  
- Lack of traditional instrumentation

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**Honda HR-V EX-L NAVI**  
**Vehicle**: Honda HR-V EX-L NAVI  
**Price**: $24,990; **Price as Tested**: $25,470  

**NHTSA Safety Ratings (2016 Model)**:  
- **Crashworthiness**: 5 stars (out of 5)  
- **Side Impact**: 5 stars (out of 5)  
- **Forward Collision**: 4 stars (out of 5)  

**AVAILABLE ADVANCED SAFETY FEATURES**  
- Rearview camera  
- Electric parking brake  
- Lane-keeping assist  

**Overall Observations**  
For 2016, Honda released its entry in the increasingly popular compact-crossover market, the HR-V, which is based on the Honda Fit. It's equipped with a 1.8-liter, 4-cylinder, 141-hp engine and a CVT transmission. We averaged almost 28 mpg during our testing. The HR-V is priced in the neighborhood of $25,000, but it's surprisingly well-equipped, including satellite radio, moonroof, navigation, fog lights, and Bluetooth. Even though it's relatively small, the HR-V has a sporty driving demeanor and a flexible Magic Seat interior that can be configured to haul passengers or a wide variety of cargo. On the downside, it feels underpowered at anything but around-town speeds, and the cabin is noisy under even moderate acceleration. The HR-V received a 5 star (out of 5) overall crash-test rating from NHTSA.

**Test Data**  
- **EPA emissions score**: 84.60  
- **Braking**: 2.26  
- **Crashworthiness**: 4.36  
- **Visibility**: 3.90  
- **Slalom handling**: 4.10  
- **Ride quality**: 4.49  
- **Fuel economy**: 5.39  
- **Interior noise**: 5.90  
- **Acceleration**: 3.88  
- **Ease of entry and exit**: 5.49  
- **Turning circle**: 4.55  
- **Cargo capacity**: 3.89  

**Fuel Information**  
- **Fuel type**: Regular  
- **Fuel capacity (gal)**: 13.2  
- **EPA urban mpg**: 28  
- **EPA highway mpg**: 35  
- **EPA combined mpg**: 31  

**Average MPG as Tested by Auto Club**: 0.023

**Strong Points**  
- Good fuel economy  
- Easy to drive  
- Well equipped for $25,000  

**Weak Points**  
- Underpowered, with lots of engine noise  
- A/C and radio controls have no knobs  
- The rear seat is difficult to enter and exit  
- Car lacks rear center armrest  
- Electric parking brake
### Mazda CX-3 Grand Touring

**OVERALL OBSERVATIONS**

For 2016, Mazda released the CX-3, its entry in the crowded compact crossover market. It's equipped with a 2.0-liter, 4-cylinder, 146-hp engine and a 6-speed automatic transmission; EPA combined fuel economy is rated 31 mpg. Our test vehicle was the top-of-the-line Grand Touring version, which sells for about $28,000. It came well equipped, sporting a list of features befitting a luxury car, such as 18-inch alloy wheels, adaptive LED headlights, a sunroof, navigation, and a satellite radio. Mazda prides itself on creating drivers' cars, and the CX-3 is no exception. It provides responsive handling, with precise steering and a comfortable (if firm) ride—although some engine and road noise invade the cabin. The front seats are roomy and comfortable, but the backseat is another story. It's hard to get in and out of and useless for adult passengers. At press time, neither NHTSA nor IIHS had crash-tested the CX-3.

### TEST DATA

<table>
<thead>
<tr>
<th>Feature</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ease of entry and exit</td>
<td>6.90</td>
</tr>
<tr>
<td>Visibility</td>
<td>9.00</td>
</tr>
<tr>
<td>Slalom handling</td>
<td>7.77</td>
</tr>
<tr>
<td>Towing cap. (lbs) w/o brakes</td>
<td>120</td>
</tr>
<tr>
<td>Cargo capacity</td>
<td>4.89</td>
</tr>
<tr>
<td>Turning circle</td>
<td>1.49</td>
</tr>
<tr>
<td>Exterior width (in)</td>
<td>101.2</td>
</tr>
<tr>
<td>Wheelbase (in)</td>
<td>69.6</td>
</tr>
<tr>
<td>Exterior length (in)</td>
<td>188.3</td>
</tr>
<tr>
<td>Engine size</td>
<td>1.5L 4-cyl</td>
</tr>
<tr>
<td>Horsepower @ rpm</td>
<td>146 @ 6000</td>
</tr>
</tbody>
</table>

### VEHICLE SPECIFICATIONS

- **Model year tested:** 2016
- **Number of passengers:** 5
- **Curb weight (lbs):** 2880
- **Exterior length (in):** 188.3
- **Exterior width (in):** 70.7
- **Wheelbase (in):** 101.2
- **8 air bags:**
- **Towing cap. (lbs) w/o brakes:** 120
- **Engine size:** 1.5L 4-cyl
- **Horsepower @ rpm:** 146 @ 6000

### Mazda CX-3 Grand Touring

**FUEL INFORMATION**

- **Fuel type:** Regular
- **Fuel capacity (gal):** 12.7
- **EPA urban mpg:** 29
- **EPA highway mpg:** 35
- **EPA combined mpg:** 31

**AVERAGE MPG AS TESTED BY AUTO CLUB**

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel economy</td>
<td>31</td>
</tr>
</tbody>
</table>

### Mazda CX-3 Grand Touring

**NHTSA SAFETY RATINGS (2016 MODEL):** N/A

### AVAILABLE ADVANCED SAFETY FEATURES

- **Lane-departure warning**
- **Adaptive cruise control**
- **Forward-collision avoidance**
- **Automatic high-beam headlight**
- **Blind-spot monitoring**

### Mazda CX-3 Grand Touring

**WEAK POINTS**

- **Lack of instrumentation**
- **Armrest is over the cup holders, so tall drinks won't fit**

**STRONG POINTS**

- **Good fuel economy**
- **Rearview camera**
- **Good value: well equipped**
- **Easy and enjoyable to drive**
- **Great for city driving**
- **Roomy and comfortable heated front seats**
- **Forward-collision warning**
- **Forward-collision avoidance**

### Mazda CX-3 Grand Touring

**OVERALL SCORE:** 80.89

### Mazda CX-3 Grand Touring

**OVERALL RATING:** 66

## Chevrolet Trax LT FWD

**OVERALL OBSERVATIONS**

The Trax crossover is equipped with a turbocharged, 1.4-liter, 4-cylinder engine, good for 138 hp, and a 6-speed automatic transmission. We averaged over 28 mpg during our testing. Our test vehicle was priced below $24,000, so we didn't expect too many creature comforts. But, as it turned out, it came equipped with the necessities and more. A rearview camera is standard—which is a good thing because of the limited rear visibility. And even though it's small, the Trax's flexible interior can be configured to haul passengers or a wide variety of cargo. The Trax received 5 stars (out of 5) overall from NHTSA in its crash tests. For 2016, the Trax is essentially unchanged.

### TEST DATA

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<td>1.5L 4-cyl</td>
</tr>
<tr>
<td>Horsepower @ rpm</td>
<td>146 @ 6000</td>
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</table>

### VEHICLE SPECIFICATIONS

- **Model year tested:** 2015
- **Number of passengers:** 5
- **Curb weight (lbs):** 2805
- **Exterior length (in):** 186.4
- **Exterior width (in):** 69.9
- **Wheelbase (in):** 100.6
- **8 air bags or more:**
- **Warranty (months/miles):** Continental P205/70R16
- **Towing cap. (lbs) w/o brakes:**
- **Engine size:** 1.5L 4-cyl
- **Horsepower @ rpm:** 146 @ 6000

### Chevrolet Trax LT FWD

**FUEL INFORMATION**

- **Fuel type:** Regular
- **Fuel capacity (gal):** 14
- **EPA urban mpg:** 26
- **EPA highway mpg:** 34
- **EPA combined mpg:** 29

**AVERAGE MPG AS TESTED BY AUTO CLUB**

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel economy</td>
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</tr>
</tbody>
</table>

### Chevrolet Trax LT FWD

**NHTSA SAFETY RATINGS (2016 MODEL):**

### AVAILABLE ADVANCED SAFETY FEATURES

- **Forward-collision alert**
- **Lane-departure warning**
- **Rearview camera**
- **Emergency braking**
- **Automatic high-beam headlight**

### Chevrolet Trax LT FWD

**WEAK POINTS**

- **Lots of road and tire noise**
- **Rear seat cramped; difficult to enter and exit**
- **Large rear headrest limit visibility**
- **Front end scarpes when exiting a driveway**
- **Sloppy handling**
- **Lots of road and tire noise**
- **Weak Points**

**STRONG POINTS**

- **Good fuel economy**
- **Utility—the front passenger seat folds down for hauling long objects**
- **Well equipped for the price, including Bluetooth, satellite radio, and 10 air bags**
- **Lots of cup holders**

### Chevrolet Trax LT FWD

**OVERALL SCORE:** 80.89

### Chevrolet Trax LT FWD

**OVERALL RATING:** 68

## SUV NONHYBRID HIGH MPG

### AAA GREEN CAR GUIDE 2016

**BASE PRICE:** $24,990; **PRICE AS TESTED:** $28,340

## 2016 Mazda CX-3 Grand Touring

**VEHICLE SPECIFICATIONS**

- **Fuel type:** Regular
- **Fuel capacity (gal):** 12.7
- **EPA urban mpg:** 29
- **EPA highway mpg:** 35
- **EPA combined mpg:** 31

**AVERAGE MPG AS TESTED BY AUTO CLUB**

<table>
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<th>Category</th>
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</thead>
<tbody>
<tr>
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</table>

## 2016 Mazda CX-3 Grand Touring

**FUEL INFORMATION**

- **Fuel type:** Regular
- **Fuel capacity (gal):** 14
- **EPA urban mpg:** 26
- **EPA highway mpg:** 34
- **EPA combined mpg:** 29

**AVERAGE MPG AS TESTED BY AUTO CLUB**

<table>
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<tbody>
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## 2016 Mazda CX-3 Grand Touring

**GREEN CAR SCORES**

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<tr>
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<tbody>
<tr>
<td>Visibility</td>
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<td>Cargo capacity</td>
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<tr>
<td>Interior noise</td>
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<tr>
<td>Ride quality</td>
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<td>Ease of entry and exit</td>
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<tr>
<td>Exterior noise</td>
<td>5.57</td>
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<tr>
<td>Slalom handling</td>
<td>4.88</td>
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<tr>
<td>Braking</td>
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<tr>
<td>Crashworthiness</td>
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<tr>
<td>Overall</td>
<td>81.5</td>
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## 2016 Mazda CX-3 Grand Touring

**OVERALL RATING:** 66

**HIGHEST SCORING GREEN CAR**

- **Chevrolet Sonic LT Turbo**

**LOWEST SCORING GREEN CAR**

- **Ford Focus SE**

## AAA Green Car Guide 2016

**AAA.com/greencar**
OVERALL OBSERVATIONS
The Crosstrek, Subaru’s small crossover, has many typical Subaru attributes: AWD, a boxer engine with some of the sportiest sounds of any 4-cylinder out there, and the rugged Subaru styling that targets adventurous drivers. The Crosstrek’s handling, however, isn’t especially sharp; there’s a slight delay from the steering input to the vehicle taking a set and turning. The ride, too, is a bit choppy. Even our Premium model came with an old-fashioned metal key. On some trim levels, you can get these features as part of a $2,100 package that includes a moonroof and navigation. NHTSA awarded the Crosstrek 5 stars (out of 5) overall in its crash tests. IIHS rated it a Top Safety Pick+ (with optional front-crash prevention).

OVERALL OBSERVATIONS
The upscale Encore, new to the Buick lineup in 2013, is equipped with standard luxury features other compact crossovers often lack, like a power driver’s seat on the base trim level. The Encore has a quiet, comfortable ride, optional AWD traction, and decent cargo space with the backseat folded down. However, its turbocharged, 1.4L engine could use more power at lower speeds, and backseat room is tight for larger passengers. The Encore handled pretty well on our slalom course, and we averaged 24 mpg overall. The rearview camera is necessary because of the Encore’s limited rear visibility. Optional forward-collision alert, lane-departure warning, blind-spot monitoring, and rear cross-traffic alert systems are great safety items. All these features are available for a base MSRP right around $30,000. The 2016 Encore has a 5-star (out of 5) overall NHTSA crash-test rating, and, with optional front-crash prevention, it earns a Top Safety Pick rating from IIHS.

NHTSA SAFETY RATINGS (2016 MODEL): 
• Rearview camera
• Blind-spot monitoring
• Rear cross-traffic alert
• Lane-departure warning
• Adaptive cruise control

AVAILABLE ADVANCED SAFETY FEATURES
• Forward-collision collision warning
• Forward-collision avoidance

TEST DATA
Model year tested: 2016
Number of passengers (P/R): 2/3
Curb weight (lbs): 3220
Exterior length (in): 175.2
Exterior width (in): 70.1
Exterior height (in): 63.6
Wheelbase (in): 103.7
Restraint type: 9 air bags or more
Warranty (months/miles): 36/36,000
Tire manufacturer and size: Yokohama P225/55R17 1500/1000
Transmission type: CVT
Engine size: 2.0L DOHC 16V I4
Horsepower @ rpm: 148 @ 6200

VEHICLE SPECIFICATIONS
Base Price: $22,795; Price as Tested: $26,240
Price as Tested: $32,425

TEST DATA
Model year tested: 2013
Number of passengers (P/R): 2/3
Curb weight (lbs): 3250
Exterior length (in): 168.5
Exterior width (in): 69.9
Exterior height (in): 65.2
Wheelbase (in): 100.6
Restraint type: 9 air bags or more
Warranty (months/miles): 48/50,000
Tire manufacturer and size: Continental P215/55R18
Transmission type: Auto 6 speed
Engine size: 1.4L DOHC 14V Turbo
Horsepower @ rpm: 138 @ 4800

AAA GREEN CAR GUIDE 2016
AAA.com/greencar
AAA.com/greencar
**Mitsubishi Outlander ES**

**VEHICLE SPECIFICATIONS**

**OVERALL OBSERVATIONS**

The Outlander, which was extensively redesigned for 2014, can seat seven— if those riding in the third row are kids. If you use only the first two rows for passengers, there’s plenty of room in the back to store stuff. Our ES version, a preproduction prototype, showed good fit and finish. It was equipped with a 2.4-liter, 4-cylinder engine good for 166 hp and a CVT transmission. We averaged over 25 mpg with reasonable acceleration scores, although the engine is buzzy when pushed and feels weak in Eco mode. Handling in the slalom course was poor but would be acceptable in normal driving. The Outlander lacks many of the niceties that much of the competition comes with, but with an MSRP under $24,000, it’s also less costly than most. The 2016 Outlander with FWD got 4 stars (out of 5) overall in NHTSA’s crash testing. The IIHS awarded it a Top Safety Pick + rating (with optional front-crash prevention).

**FUEL INFORMATION**

- Fuel type: Regular
- Fuel capacity (gal): 16.6
- EPA urban mpg: 25
- EPA highway mpg: 31
- EPA combined mpg: 27

**NHTSA SAFETY RATINGS (2016 MODEL):**

- **NHTSA Rating:** 4 stars
- **EPA Combined MPG:** 27
- **EPA Urban MPG:** 25
- **EPA Highway MPG:** 31
- **Fuel Capacity (gal):** 16.6
- **Fuel Type:** Unleaded Regular

**TEST DATA TEST VEHICLE SCORES (1 TO 5 POINTS)**

- **Braking:** 3.5
- **Crashworthiness:** 5.0
- **Visibility:** 4.8
- **Slalom handling:** 4.0
- **Ride quality:** 4.8
- **Fuel economy:** 4.3
- **Interior noise:** 4.8
- **Acceleration:** 4.5
- **Ease of entry and exit:** 5.0
- **Interior size:** 4.9
- **Turning circle:** 3.4
- **Cargo capacity:** 1.8

**VEHICLE SPECIFICATIONS**

- **Model year tested:** 2014
- **Number of passengers (F/R):** 2/3/2
- **Curb weight (lbs):** 3280
- **Exterior length (in):** 183.3
- **Exterior width (in):** 70.9
- **Exterior height (in):** 66.1
- **Wheelbase (in):** 105.1
- **Restraint type:** 9 air bags or more
- **Warranty (months/miles):** 60/60,000
- **Tire manufacturer and size:** Yokohama P215/70R16
- **Towing cap. (lbs w/o brakes):** 2400 lb
- **Transmission type:** CVT
- **Front wheel:** 2.4L MIVEC SOHC 16V 14
- **Horsepower @ rpm:** 66 @ 6000

**OVERALL SCORE:** 54

**AVERAGE MPG AS TESTED BY AUTO CLUB:**

- **Lowest Green Car Cost/Point:** $245
- **Highest Green Car Cost/Point:** $2,135
- **Base Price:** $23,820
- **Price as Tested:** $23,820
- **AAA Mobile Battery Service** helps over 1 million members each year with their battery needs. No matter where you are — home, office or at the mall. It’s just another way we’re always with you.

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illuminates a light, usually in the right or left side of the car, to detect vehicles in potential blind spots or radar.

BSM. Blind-spot monitoring uses radar to detect vehicles, a potential blind spot to the rear or side of a car. Typically, this system illuminates a light, usually in the right or left side-view mirror, indicating that it’s unsafe to make a lane change. If a driver puts a turn signal on when another car is detected in the blind spot, the system will alert the driver.

G. Gasoline. Gasoline is essentially a hydrocarbon fuel, used in vehicles that are powered by an internal combustion engine.

C. Corporate average fuel economy refers to federal regulations or standards designed to improve the country’s overall fuel economy for passenger vehicles. Passenger cars and light trucks sold in the U.S. must meet a specified minimum mpg figure, based on a weighted average of how many vehicles of each type automakers sell (e.g., compacts, SUVs, midsize cars). If they don’t meet the standard, automakers must pay a penalty. Periodically, the government raises CAFE standards. By 2025, cars and light trucks will have to achieve a real-world average of about 42 mpg.

CNG, LNG, NGV. CNG is compressed natural gas, mostly methane, the same substance that’s piped into homes. Natural gas is compressed to either 3,000 pounds per square inch (psi) or 3,600 psi when used in motor vehicles. LNG is liquefied natural gas, which is cryogenically chilled to temperatures as low as −275°F to liquefy it, at which point it occupies 1/600 of its volume as a gas, making efficient storage and transportation possible. NGV stands for natural gas vehicle, one that has been designed or converted to use CNG or less, LNG for its fuel source.

CPO. Certified pre-owned car is a late-model used car that’s been thoroughly inspected and reconditioned mechanically and cosmetically. That’s a look and drive like new, and then given an extended warranty backed by the automaker.

CVT. Using pulleys connected by a belt or chain instead of conventional gears, a continuously variable transmission can precisely control the fuel supply, eliminating or reducing engine noise, or simply to provide improved fuel economy or performance. A CVT is as efficient as a conventional transmission, and far more efficient than a typical automatic.

D. Direct fuel injection (also known as gasoline direct injection, or GDI) squirts atomized fuel into the engine’s cylinders rather than into the manifold, which makes for more efficient combustion. A fuel-injected engine is more efficient and provides better driving performance than an engine with indirect injection.

DOD. To reduce fuel use, a computer detects some of the cylinders in a two-cylinder engine as a replacement—on-demand engine when it’s cruising along and not working hard.

DRL. Many new-model vehicles have daytime running lights, which are reduced-intensity headlights that make cars more visible to oncoming traffic, making daytime driving safer.

FEV, FCM, FCA. A fuel-cell electric vehicle or fuel-cell vehicle uses hydrogen fuel cells to create electricity via a chemical process in which the hydrogen fuel reacts with oxygen from the air to power its onboard electric motor. FEVs are zero-emissions vehicles (ZEVs). EXCONE refers to the Hyundai Fuel Cell, the Toyota Mirai, and the upcoming Honda Fuel Cell.

FCW, FCM, FCA. Forward-collision warning, forward-collision mitigation, and forward-collision avoidance systems alert drivers to the potential threat of a collision, and in some applications automatically apply the vehicle’s brakes to try to minimize the damage. An FCW system provides audible and visual alerts to warn drivers of a possible crash, but it doesn’t intervene to prevent a crash. An FCM system lets drivers know a collision is imminent, if the driver doesn’t take action, the system applies the brakes to try to minimize the damage. An FCA system alerts drivers to prevent the crash or at least reduce its severity, it also may increase seatbelt tension.

FWD. Most passenger vehicles are equipped with front-wheel drive, in which engine power is routed to the front wheels. FWD gives better traction for climbing hills because the engine’s weight is over the drive wheels.

GGE. The gasoline gallon equivalent is the amount of an alternative fuel (e.g., hydrogen) it takes to equal the energy content of a gallon of gasoline.

GWR. Gross vehicle weight rating is the maximum allowable total weight, including the weight of the vehicle, fuel, passengers, and cargo. The GWR is usually found on the driver’s door or the door jamb.

HDG. High-density-intensity discharge headlights and a high-voltage discharge through a mix of gases, including xenon, in a microdischarge bulb to produce an extrasolar or (blurred) light three times brighter than a conventional halogen headlight. HD headlights enable drivers to see objects more clearly and at greater distances. These lights are sometimes referred to as xenon or HIDs, either in the steering wheel or driver’s seat, or a combination of the three.

LED. Light-emitting diodes are semiconductor chips arranged to produce a desired light pattern when electricity is passed through them via a process called electroluminescence. LEDs are very bright, they provide a wider range of colors, and they are more durable than halogen or high-intensity-discharge (HID) headlights. Although they use less electricity and provide a brighter longer-lasting light than halogen, they are used less often as daytime running lights and in tail light assemblies, then as headlamps in high-end vehicles. Advances in gas-discharge technologies have made LEDs cheaper and brighter than in the past. As a result, they’re being used as headlamps in an increasing number of cars. LEDs are equally as bright, and in some applications brighter, than HID.

AAA. When a car starts to drift out of its lane, a lane-keeping-assist system can nudge the steering wheel to direct the car toward the center of the lane, or it selectively applies a single wheel to guide the car back into the lane. Such corrections are subtle, and drivers and electric motor are connected separately to the transmission. This enables the vehicle to operate either as the gas engine alone or the electric motor alone.

ICE. Internal combustion engines are powered by gasoline, diesel, compressed natural gas (CNG), liquefied natural gas (LNG), or biodiesel. In recent years, automakers have used a variety of techniques (e.g., hybrid and direct injection) to make their engines more efficient.

NHTSA. The Insurance Institute for Highway Safety is an independent, nonprofit scientific and educational organization dedicated to reducing the number of deaths and injuries from crashes on the nation’s roads. One of its principal activities is evaluating the safety of passenger vehicles, based on the results of a variety of crash tests that simulate real-world collisions. Based on the results of these crashes, NHTSA awards vehicles a rating of either “good,” “acceptable,” or “poor” in a series of tests.

MPG, MPGe. Miles per gallon is a number that indicates the estimated distance traveled by a vehicle per gallon of gasoline used, typically calculated over a complete trip. A related term, MPGe, means miles per gallon equivalent, and is used by the government to compare the energy consumption of alternative-fuel vehicles, such as EVs, with the fuel economy of vehicles powered by gasoline, diesel, compressed natural gas, or biodiesel. The MPGe is the estimated number of miles a vehicle can travel on the quantity of fuel (in gallons) needed to drive the equivalent distance on gasoline, with the same energy content as a gallon of gasoline. The website fueleconomy.gov reports the EPA-estimated mpg and MPGe of most recent car models.

MSRP. Manufacturer suggested retail price—the key word being suggested, since a dealer can sell a car at a lower or higher price.

NTSSA. NHTSA—“nontax,” the National Highway Traffic Safety Administration is a federal agency that sets car safety standards, issues recalls, and performs crash tests.

OBD. On-board diagnostics refers to a diagnostic system that monitors whether a
vehicle's emissions-control system is operating correctly. In general, OEM systems illuminate a malfunction indicator light on the dashboard if it detects a problem, often using the terms service engine soon or check engine. OEMs are a computer-based system that monitors with its vehicle's emissions-control system. It provides a standardized way to locate problems by reading diagnostic trouble codes and operating data.

OEM. Original equipment manufacturer, the manufacturer of record for a fully assembled vehicle. Many vehicle parts are built by external suppliers, but the OEM is responsible for the final production of the vehicle.

P2528/35R20. This is an example of a series of letters and numbers on a tire's sidewall, which refers to the following tire characteristics: The first letter indicates the tire's intended use or vehicle class (in this case, passenger); the next three numbers are the tire's width in millimeters; the numbers following the slash are the ratio of the tire sidewall height to wheel diameter; the final two digits refer to the tire's fabrication (bias, diagonal, or, in this case, radial); the final two digits refer to the tire's speed rating. In this case, radial; the final two digits refer to the tire's speed rating. In this case, radial.

The first letter indicates the tire's intended use or vehicle class (in this case, passenger); the next three numbers are the tire's width in millimeters; the numbers following the slash are the ratio of the tire sidewall height to wheel diameter; the final two digits refer to the tire's fabrication (bias, diagonal, or, in this case, radial); the final two digits refer to the tire's speed rating. In this case, radial.

RCA. Blind-spot monitoring (defined above) may be paired with a rear-view cross-traffic alert function, which is useful when drivers back out of a parking spot. When the car is in reverse, the RCA system flashes a warning signal in the side mirror and sounds a warning tone to alert drivers if a vehicle is approaching from the left or right.

Regenerative braking. Hybrids, plug-in hybrids, hydrogen fuel cell, and battery-electric vehicles are typically equipped with regenerative braking, which means that when the car coasts or brakes, its electric motor helps to slow the car down and functions as a generator to convert the vehicle's kinetic energy into electricity and charge the battery pack.

RPM. Engine speed is measured in revolutions per minute, that is, how many times per minute the crankshaft rotates.

RWD. Rear-wheel drive is commonly found on pickups, truck-based SUVs, sports cars, and high-performance and luxury sedans. RWD enables trucks to use heavy-duty components, and because loads in their beds are over the rear wheels, RWD provides better traction. On a sports or performance car, RWD improves handling by being more evenly distributed along the car's owner's manual. Multi-grade oil designations include two numbers—in this case, 10W-30. The first number (10) means that an engine can pump this oil of grade as easily as a single-grade SAE 10 oil. (W means winter, not weight). It's easier for an engine to pump a “thinner” oil, e.g., 5W, at a given temperature than it is to pump 10W. The second number (30) means that the viscosity of this multigrade oil at a 10°C (12°F) operating temperature is equivalent to the viscosity of a single-grade SAE 30 oil at the same temperature.

TCS. A traction-control system uses the same wheel-speed sensors as an antilock brake, with additional electronic controls to sense the speed of each drive wheel. It then applies braking force and/or reduces engine power to the drive wheels to prevent spin and loss of traction. Some sophisticated AWD vehicles have advanced systems that supply power to only one wheel and simultaneously apply braking force to the others in an attempt to maintain traction. Traction control does not give a vehicle more traction; it simply prevents the drive wheels from spinning.

V6, V8, 4. These terms refer to the vehicle's engine configuration and number of cylinders. A 4-cylinder engine has two banks of cylinders typically three or four cylinders per bank) offset by 60 or 90 degrees from each other. An 1 engine configuration has the individual cylinders in a vertical line, referred to as inline.

VIN. The 17-digit designation is a car's unique vehicle identification number. The VIN is broken down into groups of numbers and letters that provide the following: the first five are vehicle attributes (body style, model, etc.), the next five are the chassis number, followed by the check digit, model year, and assembly plant; the remaining six characters identify a specific vehicle that came off the assembly line.

VSS. Variable-suspension system refers to a suspension system (springs, shock absorbers, and linkages) that varies in stiffness and ride height. Fully active suspensions electronically monitor road and vehicle conditions and continuously adjust settings in real time to control the motion of the car.

Weight. Vehicle variable timing refers to an enhanced engine-valve-train configuration used in many of today's automobiles. VVT allows the lift, duration, or timing (any or all of these) of the intake and/or exhaust valves to be changed during engine operation to improve fuel economy and engine power and to lower emissions.

ZEV, PZEV, AT PZEV, SULEV, ULLEV. Emissions certification levels for California and other states that have adopted California's emissions standards. ZEV. A zero-emissions vehicle produces no harmful emissions at the tailpipe. Currently, the only technologies that can meet this standard are battery-electric vehicles and powered by hydrogen fuel cells (HFCVs). PZEV. Partial-zero-emissions vehicles produce only minor amounts of harmful (i.e., smog-causing) pollutants; the tailpipe and are certified to produce no emissions from fuel evaporation. The tailpipe standards have been set by the California Air Resources Board (CARB) to be equivalent to the emissions caused by electricity generation needed to charge a battery-electric car. This level is based on the relatively clean mix of electricity-generating sources (natural gas, hydro, nuclear, and renewable) in California. For other regions, where electricity is not as clean because it is generated from burning coal or oil, operating a PZEV may mean being cleaner than operating a battery-electric vehicle, especially when considering smog precursors, that state's ZEV standards also have set 15-17 years to achieve 15-150,000-mile emissions wails.

AT PZEV. Advanced-technology partial-zero-emissions vehicles meet the same emissions standards as a PZEV, but use technology that can eventually evolve into a true ZEV. This is envisioned as “advanced,” thus earning the manufacturer additional zero-emissions-vehicle credits. This terminology is being changed, and in the future such vehicles will be called ZEV (transitional-zero-emissions-vehicles).

SULEV. Super-ultra-low-emissions vehicles have the same tailpipe standards as a PZEV but with some evaporative emissions.

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