

AN HOUR'S DRIVE SOUTH OF Los Angeles on Interstate 5, Santa Ana (population 400,000) lies 13 miles inland from the Pacific Ocean and 100 miles from the Mexican border. Home of the world's first drag strip, the city is far more famous for its mountain winds that, in Raymond Chandler's words, "...curl your hair and make your nerves jump and your skin itch." I'm here to visit Mayor Miguel Pulido, a member of the board of the Air Quality Management District (AQMD), California's powerful smog-control agency. Although his house is only 200 feet away from the road, the tall trees and expansive yard make his 1.7-acre plot seem distinctly rural.

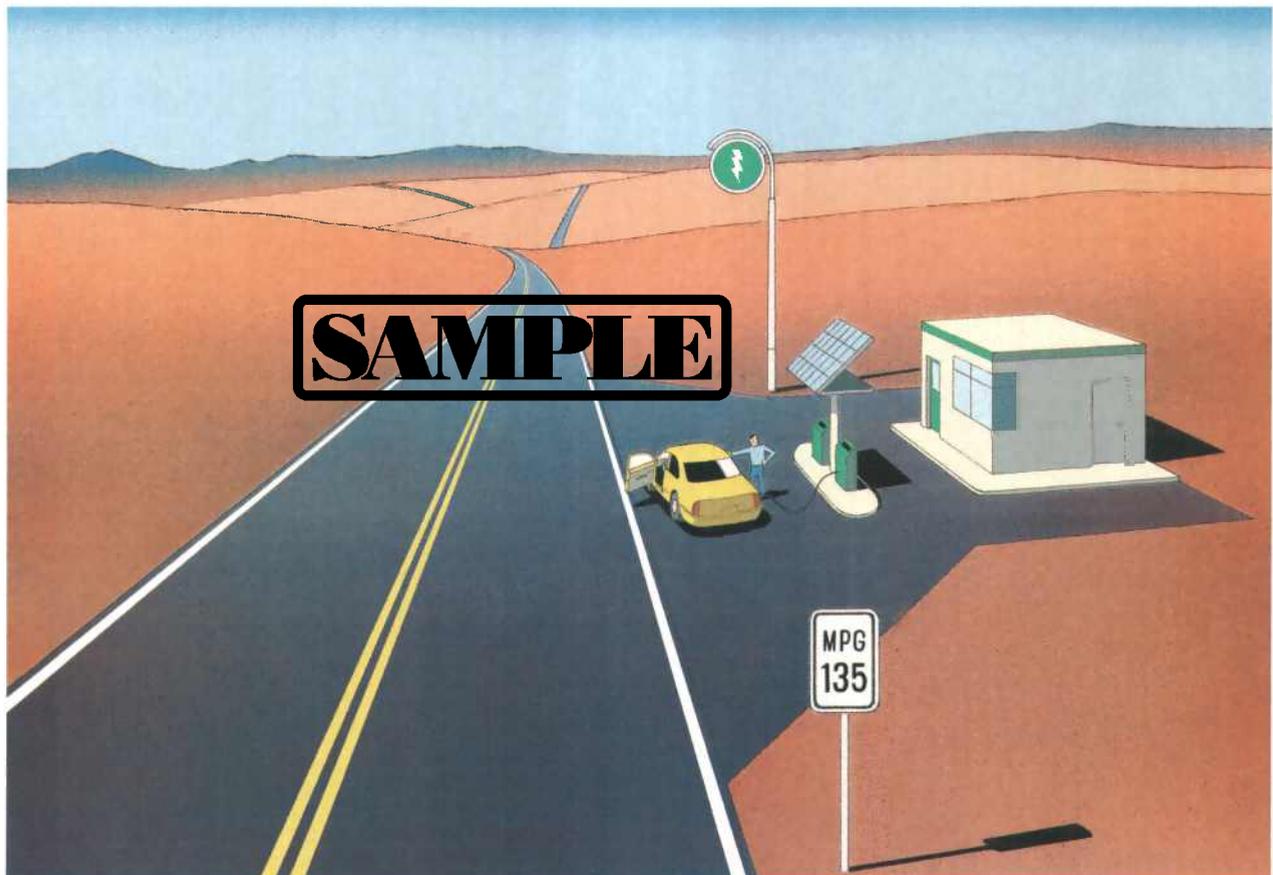
Major car companies with research and development centers in California, and

individual auto tinkerers here, are competing in the quest for the best technology to decrease carbon emissions. Mayor Pulido is "knee-deep in both sides" of the current debate over auto efficiency: at 13 years old, he began helping out in his family's muffler shop, and he still works with a Mexican catalytic-converter manufacturer. But about eighteen months ago, the AQMD converted several Toyota Priuses into plug-in hybrids (PHEV's) to see if they could help solve the town's air pollution problem, and asked the mayor to be a volunteer test driver. Unlike regular hybrids, which can't run on electricity alone, plug-ins, at city speeds, can travel 20 all-electric miles—with zero emissions. Pulido became both a convert and an evangelist.

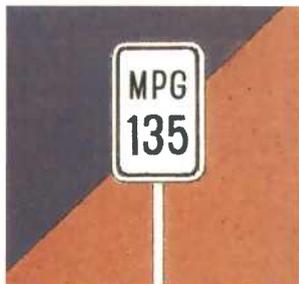
After a remarkably precocious drum solo by his seven-year-old son, the mayor takes »

Electric Avenue

A new kind of hybrid uses less gas and more electricity. All-electric cars are already here. What will this mean for the road trip of the future? DAVID MORRIS plugs in



me for a drive. The game is to see how far we can go without the gas engine kicking in. At about 35 miles per hour, the Prius engine starts up even if there is charge left in the battery. We watch the speedometer carefully. The mayor is adept. "I've driven 600 miles on eight gallons of gas," he announces. That's the equivalent of 77 miles per gallon—roughly *three* times the national average—and that's why, to Pulido and a growing nationwide constituency, plug-ins are the stepping-stone to a future of electric cars.



One company promises chargers that will fill batteries in 10 minutes

"We're getting closer to the tipping point," says Pat Cadam of Pat's Garage in San Francisco. He's a celebrated mechanic, one of the first to be trained on hybrids, and is rapidly becoming an expert on both plug-in hybrids and electric cars. His staff is giving a checkup to one of the four plug-in Priuses owned by Google. They find no problems. The Internet giant, it turns out, gives \$5,000 rebates to employees who buy hybrids—and recently announced a \$10 million initiative to promote and develop plug-ins.

OF COURSE, ELECTRIC cars were the future once before, and recently at that. In 1990, inspired by General Motors' electric prototype, the Impact, California passed a Zero-Emission

Vehicle mandate ordering major car companies selling cars in California to make 2 percent of them all-electric by 1998. Some 5,500 leased electric vehicles plied California's highways by 2000, refueling at hundreds of special charging stations. Automakers sued California to weaken the mandate; in 2003, despite protests by electric-car drivers, the state dramatically reduced electric-vehicle requirements. When the leases on its EV-1's expired, GM refused to renew them, recalled the cars, and crushed them. Today, only about 1,000 all-electric vehicles remain on California roads.

A few days after I meet up with Mayor Pulido, I'm driving one of those cars, a Toyota RAV4-EV, across the

Golden Gate Bridge toward Point Reyes with photographer Marc Geller, cofounder of the nonprofit Plug In America. Geller's car batteries allow 130 miles per charge. A digital display on the dash shows the percentage of electricity remaining in them. Whenever we drive up a hill, the number declines; the faster we go, the faster it drops. But when we coast downhill, it rises, thanks to a process called regenerative braking: when the brakes are used or the pedal is released (depending on the make of the car), the engine reverses its spin, converts its kinetic energy into electrical energy, and feeds it into the batteries. At the bottom of a half-mile hill, the RAV4-EV's battery reserve has increased by 1 percent. This is a familiar dashboard scenario for owners of hybrid cars, with one significant difference—electricity, not gasoline, recharges the RAV4-EV battery.

Hybrids might never have been developed without the drive systems, software, electronics, and batteries created for electric vehicles built after California's Zero-Emission mandate. In her book *Plug-in Hybrids*, journalist Sherry Boschert tells the story of how the hybrid grew a socket. Owners of the 2004 Toyota Prius began to wonder about the blank black button on the dashboard, which the operating manual didn't explain. Online auto aficionados found out that in Japan, pressing the button disabled the gas engine's automatic cut-in, which allowed the car to travel solely on electricity for one mile as long as its speed was kept under 35 mph.

An anonymous Texas engineer figured out how to activate the Prius button stateside, and that inspired California entrepreneur Felix Kramer to put out an online call for help in converting another Prius—one that could go farther. Electrical engineer Ron Gremban offered both his car and know-how. One-and-a-half years and one nickel-hydride battery later, they had a plug-in vehicle that could travel at least 20 emission-free miles—about the distance the average American drives per day. Its rear windshield reads: WORLD'S FIRST 100+ MPG PLUG-IN PRIUS.

Last year, Kramer took his own plug-in hybrid—the world's eighth—to Washington, D.C., to show public officials that fuel efficiency could be doubled >>

ELECTRIC CARS: A TIMELINE

BY JENNIFER WELBEL

1835

Vermont inventor Thomas Davenport builds America's first electric car.

1920

Smog is born: For the first time since cars hit the road, gas engines beat out electric and steam power.

1987

The sun shines when GM's solar-powered Sunraycer takes the World Solar Challenge in Australia.

JAN. 1990

L.A.'s auto show goes high voltage when electrical engineer Alan Cocconi debuts the GM Impact electric prototype.

SEPT. 1990

Eco-conscious California passes a Zero-Emission mandate: By 1998, 2 percent of cars sold there must be electric.



Read the Patient Information that comes with VESicare before you start taking it and each time you get a refill. There may be new information. This leaflet does not take the place of talking with your doctor or other healthcare professional about your condition or treatment. Only your doctor or healthcare professional can determine if treatment with VESicare is right for you.

What is VESicare?

VESicare is a prescription medicine used in adults to treat the following symptoms due to a condition called overactive bladder:

- Having to go to the bathroom too often, also called "urinary frequency,"
- Having a strong need to go to the bathroom right away, also called "urgency,"
- Leaking or wetting accidents, also called "urinary incontinence."

VESicare has not been studied in children.

What is overactive bladder?

Overactive bladder occurs when you cannot control your bladder contractions. When these muscle contractions happen too often or cannot be controlled, you can get symptoms of overactive bladder, which are urinary frequency, urinary urgency, and urinary incontinence (leakage).

Who should NOT take VESicare?

Do not take VESicare if you:

- are not able to empty your bladder (also called "urinary retention"),
- have delayed or slow emptying of your stomach (also called "gastric retention"),
- have an eye problem called "uncontrolled narrow-angle glaucoma",
- are allergic to VESicare or any of its ingredients. See the end of this leaflet for a complete list of ingredients.

What should I tell my doctor before starting VESicare?

Before starting VESicare, tell your doctor or healthcare professional about all of your medical conditions including if you:

- have any stomach or intestinal problems or problems with constipation,
- have trouble emptying your bladder or you have a weak urine stream,
- have an eye problem called narrow-angle glaucoma,
- have liver problems,
- have kidney problems,
- are pregnant or trying to become pregnant (It is not known if VESicare can harm your unborn baby),
- are breastfeeding (It is not known if VESicare passes into breast milk and if it can harm your baby. You should decide whether to breastfeed or take VESicare, but not both).

Before starting on VESicare, tell your doctor about all the medicines you take including prescription and nonprescription medicines, vitamins, and herbal supplements. While taking VESicare, tell your doctor or healthcare professional about all changes in the medicines you are taking including prescription and nonprescription medicines, vitamins and herbal supplements. VESicare and other medicines may affect each other.

How should I take VESicare?

Take VESicare exactly as prescribed. Your doctor will prescribe the dose that is right for you. Your doctor may prescribe the lowest dose if you have certain medical conditions such as liver or kidney problems.

- You should take one VESicare tablet once a day.
- You should take VESicare with liquid and swallow the tablet whole.
- You can take VESicare with or without food.
- If you miss a dose of VESicare, begin taking VESicare again the next day. Do not take 2 doses of VESicare in the same day.
- If you take too much VESicare or overdose, call your local Poison Control Center or emergency room right away.

What are the possible side effects with VESicare?

The most common side effects with VESicare are:

- blurred vision. Use caution while driving or doing dangerous activities until you know how VESicare affects you.
- dry mouth.
- constipation. Call your doctor if you get severe stomach area (abdominal) pain or become constipated for 3 or more days.
- heat prostration. Heat prostration (due to decreased sweating) can occur when drugs such as VESicare are used in a hot environment.

Tell your doctor if you have any side effects that bother you or that do not go away.

These are not all the side effects with VESicare. For more information, ask your doctor, healthcare professional or pharmacist.

How should I store VESicare?

- Keep VESicare and all other medications out of the reach of children.
- Store VESicare at room temperature, 50° to 86°F (15° to 30°C). Keep the bottle closed.
- Safely dispose of VESicare that is out of date or that you no longer need.

General information about VESicare

Medicines are sometimes prescribed for conditions that are not mentioned in patient information leaflets. Do not use VESicare for a condition for which it was not prescribed. Do not give VESicare to other people, even if they have the same symptoms you have. It may harm them.

This leaflet summarizes the most important information about VESicare. If you would like more information, talk with your doctor. You can ask your doctor or pharmacist for information about VESicare that is written for health professionals. You can also call (866) 972-4636 toll free, or visit www.VESICARE.com.

What are the ingredients in VESicare?

Active ingredient: sulfamethoxazole succinate

Inactive ingredients: lactose monohydrate, corn starch, hypromellose 2910, magnesium stearate, talc, polyethylene glycol 8000 and titanium dioxide with yellow ferric oxide (5 mg VESicare tablet) or red ferric oxide (10 mg VESicare tablet)

Manufactured by:
Astellas Pharma Technologies Inc.
Norman, Oklahoma 73072

Marketed by:
Astellas Pharma US, Inc.
Deerfield, IL 60015-2548

Marketed and Distributed by:
GlaxoSmithKline
Research Triangle Park
North Carolina 27709



right now, without sacrificing safety or comfort. Until then, even most electric-vehicle enthusiasts had scoffed at any car that relied on gas. But Kramer proved, and publicized through his nonprofit campaign, California Cars Initiative (CalCars.org), that a vehicle could run on electricity as its primary power source, with a gasoline backup, instead of the other way around.

The electric cars manufactured in the 90's under California's Zero-Emission mandate had to rely on their own curbside and parking lot charging stations. The new electric vehicles and plug-in hybrids do not. In front of his house in Redwood City, Kramer plugs a yellow three-pronged connector attached to an extension cord into his Prius and puts the other end into an ordinary electric outlet in his garage. "I call it the fueling infrastructure of the future," he says. And the power plant of the future? He shows me his four-kilowatt rooftop solar system, the flat panels barely visible from his backyard. But solar-powered or not, any ordinary household has the capacity to recharge a plug-in hybrid's battery. The cost, experts say, is a few cents per charge.

How long it takes to refill a car's batteries depends in large part on the electricity coming out of a designated socket. Most household circuits are 120 volts and take six to eight hours to refill a car's battery. A 220-volt circuit that runs an electric washer and dryer will recharge a battery in half that time. Fast rechargers are currently in development. One company, Phoenix Motorcars, in Rancho Cucamonga, California, will offer all-electric pickup trucks and SUV's to business fleets next year,

promising rapid chargers that can refill batteries in just 10 minutes.

So far, the only plug-in hybrids available to the public are hybrids that have been converted in very small shops. Seventy or so custom PHEV's are now on the road. But before too long, there could be upwards of 800. New York State is converting 600 of the hybrids in its state fleet to plug-ins, and California businesses and local agencies are adding 100 more. That doesn't count the private conversions going on or the plug-ins in development at such companies as Volvo, GM, and Ford. Toyota announced in August that it will be testing 10 newly redesigned plug-in Priuses in Japan.

If plug-in hybrids are the bridge to all-electric cars, then the bridge and the cars may arrive at the same time. Plug-ins will soon be less expensive to acquire and will far exceed the national gas-mileage average. But electric vehicles already out there get an energy equivalent of up to 130 mpg. Tesla Motors, maker of the widely heralded Tesla Roadster, says its car will have a range of more than 200 miles per charge. (A gas car can travel 300 to 400 miles on one tankful.)

DOES ALL THIS MEAN a guilt-free road trip anytime soon? The answer to that question leans toward yes. Even on the highway, running on gas, plug-in hybrids will still have greater fuel efficiency. Flexible-fuel plug-in hybrids can run on gasoline or bio fuels (ethanol or biodiesel), the last mitigating our dependence on foreign oil while also lowering emissions. >>

1996
GM leases EV-1 electric cars.

1997
Toyota unveils the first mass-produced gas-electric hybrid car, the Prius, to drivers in Japan.

JULY 1999
Honda shows the Insight, the first hybrid vehicle available in the United States.

DEC. 1999
With the first leases up, GM begins to take its electric cars off the road.

When and if electric vehicles start to dominate, that will mean more stops for charging, perhaps, but also less money laid out along the way. Bryon Bliss of Phoenix Motorcars, which is now awaiting federal certification of its electric sports utility truck (SUT), predicts that filling stations will start out offering free rapid charges as a lure to get motorists to stop and shop in their stores. As more plug-ins and all-electrics go on the road, quick-charging stations will begin displacing gas pumps. Drivers could conceivably enter an era when, like the ATM's that have wandered beyond banks, quick-charging stations will also be found at motels and hotels, parking lots, retail stores, you name it. In August, in fact, Tesla and Hyatt Hotels announced a partnership (Tesla investor Nicholas Pritzker, nephew of Hyatt's founder, bought one of the company's first cars). Hyatt plans to install chargers in its hotels that will take a car to full charge in 3½ hours or to a half-charge in 1½ hours. The company is basically saying, Come into Hyatt for lunch, plug in, and leave with a refilled "gas tank" that'll take you another 100 miles. Stay overnight, and you'll have a completely refilled battery.

One obvious point critics of PHEV's and electric cars make is that they still contribute emissions by taking energy from power plants. But the United States uses little oil in generating power, and even when electric cars draw energy from existing power plants—half of which are coal-fired—they cause around 35 percent less pollution than gas-powered cars. (Emissions are virtually eliminated if the electricity comes from renewable resources like

wind and sunlight.) Where will all this new electricity come from? If cars are charged mainly at night, we already have enough capacity to support millions of PHEV's and electric cars without building any new power plants.

THE MOST TALKED-ABOUT new electric car, hands down, is the Tesla Roadster, for which many of the roughly 600 buyers have plunked down a \$30,000 to \$50,000 deposit without ever having kicked the tires or looked inside. I catch up with one of the two Roadster engineering prototypes in Chicago, where public relations director David Vespremi takes me for a spin. He once taught racecar driving, a skill I am grateful for as he darts in and out of blessedly modest traffic in Chicago. It's a bracing experience to accelerate so quickly—the Roadster is capable of going from 0 to 60 in four seconds, with barely a sound.

The company expects to sell 800 Roadsters this year and up to 2,000 in 2008, and sales may capitalize its next, more ambitious undertaking: a new plant in Albuquerque with the capacity to build 20,000 five-passenger sedans (they'll cost half the Roadster's \$98,000 price) per year. Phoenix Motorcars wants to set up headquarters at a factory in southern California that can turn out thousands of electric vehicles annually. It looks as if cars themselves may help pave the way to a carbon-free future. +

David Morris is the cofounder and vice president of the Institute for Local Self-Reliance, in Minneapolis, and author of its report Driving Our Way to Energy Independence.

2003-2005
GM starts destroying recalled EV-is. Protesters persuade Toyota and Ford to sell rather than crush some of their remaining cars.

2005
Ron Gremban and Felix Kramer convert a Prius into the world's first plug-in hybrid.

2006
Tesla Motors introduces the Roadster electric car, promising an energy efficiency equivalent of 135 mpg.

2007 Tom Hanks buys an AC Propulsion eBox, the first lithium-ion-battery-powered electric car. Toyota announces testing of its own plug-in Prius.



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