Co-op America Quarterly
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Economic Actions for a Just Planet
www.coopamerica.org

Fuels for the Future

Green Economy News:
Our Chicago Green Festival™ sets new records

Take Action on Climate Change:
Tell car companies and Congress you want climate-friendly cars, now

Corn Ethanol Isn't the Answer:
So which fuel *really* can curb emissions and reduce our dependence on foreign oil?

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In Cooperation

Making News and Making Waves: Fuels for the Future

Working together through Co-op America, you and our members around the country are advancing the ideas, practices, and holistic, system-changing solutions that are leading to a more just and sustainable future.

As thought leaders, key influencers in your families and communities, and people who take practical action, you're leading the way on recycling, Fair Trade, curbing climate change, stopping sweatshops, supporting local communities, saying "no" to irresponsible corporate practices and "yes" to growing the green economy. Even when others said that these ideas were impractical, you kept to it, providing the information and the example—inviting everyone to join in to help create a better world. And it's working!

Together, we're creating a great green wave that is sweeping the country. Thanks to decades of creating awareness—making news and making waves—more and more people now understand that we do indeed share a small planet, and are ready to do their part.

Our work together is more important than ever. As more people and businesses get ready to take action, we need to help them take sensible action.

That's why, in our *Climate Solutions* issue last fall, we laid out our 12-Step Action Plan to address climate change at the speed and scale required by the climate crisis. In our plan, we emphasize the importance of energy efficiency and renewable energy—and how they can do the job in the building and electricity sectors. When it comes to transportation, we underscore the importance of fuel efficiency, driving less, and transitioning to zero-emissions vehicles. In agriculture, our plan includes choosing local, organic food and eating low on the food chain (special thanks to vegetarians and vegans). And it means stopping deforestation, period.

As is our hallmark, we take thought leadership stands in this plan—calling for no more new coal or nuclear plants. Since last fall, climate scientists, many in the environmental community, and Al Gore himself have joined us in the call for a moratorium on coal-fired plants. And as more information about nuclear power comes to light, more people are learning that it is indeed too dangerous (starting with nuclear waste and ending with proliferation) and too slow—we can't build enough nuclear plants fast enough to make a dent in climate change.

In this issue, we are again making news and making waves, leading the way when it comes to climate solutions. Delving into the question of how we are going to fuel our cars going forward, we help you make choices about the new fuels that are emerging on the scene—from ethanol to biodiesel, from hydrogen to plug-in electric hybrids. We underscore the importance of fuel efficiency and driving less—these are the first steps when it comes to transportation. And then we help you sort out the claims and counterclaims for the other fuels.

> "Raise your voice to insist that our country stop going down the corn ethanol path."

And once again we take thought leadership stands—this time on hydrogen and corn ethanol.

We report that hydrogen as a transportation fuel makes no sense. Hydrogen isn't an energy source—you have to manufacture it. If you make if from coal, it is a disaster for the climate. And while producing it with renewables would make it a low-carbon fuel, the cost (in both carbon and economic terms) of building a hydrogen infrastructure will be too expensive—and take too long to address climate change.

We also call for a stop to the corn ethanol industry. Compared to gasoline, corn ethanol makes an insignificant contribution to climate solutions, especially when you factor in the climate pollution of the fuel and fertilizer that goes into growing the corn and manufacturing the ethanol.

Making our fuel from corn will cause a worldwide food crisis as serious as the peak oil or climate crises. It could cause a "peak food" crisis that would be as dangerous for our country as our dependence on foreign oil. The human suffering would be tragic.

Consider, for example, that according to the Environmental Policy Institute, converting the entire US corn harvest to ethanol would satisfy only 16 percent of our total US fuel needs. It would also send corn prices skyrocketing, hiking up the prices of everything from beef to soda (and every product containing corn syrup). Working families around the world will not be able to afford to eat.

What does make sense for our vehicles? Plug-in hybrid electric cars that get over 100 miles per gallon. If we charge these cars at night, the National Renewable Energy Lab says that we can run 73 percent of the daily commutes for all US light-duty vehicles (i.e. cars, trucks, SUVs, and vans) without building a single new power plant. And we can add wind power at night or solar during the day to make up the rest. Plug-in hybrid electric cars are here, now—we just need to make it a priority to get them to market. Together, we helped create the market for the gasoline hybrids like the Prius. People love them—let's use them as the door openers for plug-in electric vehicles.

Turn the pages for the details—and then join us. As a thought leader, raise your voice to insist that our country stop going down the corn ethanol path. Most people simply don't know about the problems of corn ethanol or the promise of the plug-in electric vehicles. Once again, let's lead the way.

Here's to making news and making great, green waves,

Alisa Gravitz, Executive Director

Fuels *for the* Future

If we hope to prevent a world climate crisis, we have to change the way we think about cars—how much we use them, how they're made, and what type of fuel we put in them (Surprise—it shouldn't be corn ethanol).

This past winter, one of scientists' apocalyptic climate crisis predictions already came true. Rising sea levels, caused by global warming, completely wiped out the inhabited island of Lohachara, which lay off India's coast in the Sundarban Delta, where the Bramaputra and Ganges Rivers meet and empty into the Bay of Bengal.

The island, once home to 10,000 people, has been slowly sinking beneath the waves for several years. In December 2006, it made history when scientists at Kolkata's Jadavpur University told the world that the last bit of Lohachara that had peeked above the delta waters had officially vanished from satellite photos—meaning that the island was the first inhabited land mass to be swallowed by water since the fabled Atlantis. A study conducted by the Jadavpur scientists attributed the sinking to global warming, exacerbated by increasingly intense storms and coastal erosion.

While Lohachara refugees went to neighboring islands like Sagar when their homes first started sinking 20 years ago, they risk having it happen all over again, as the hungry seas are creeping up the shores of 12 other islands in the delta.

According to at least three Jadavpur studies, around 70,000 residents of these Sundarban Delta islands are likely to turn into "environmental refugees" in the next 14 years. The islands are also home to 400 endangered Bengal tigers.

So by 2020, thousands of people living a low-impact, simple lifestyle based on a small-scale farm and fishing industry could watch their homes become nothing but a dark brown stain beneath the water, like Shyamal Mandal, who once lived on Lohachara, did 20 years ago.

Mandal has had to relocate twice due to rising sea levels. After his home on Lohachara flooded, he moved to the coast of neighboring Ghoramara island, where he farmed vegetables and rice. He told the *New York Times* that he watched his piece of land crack and fall into the water, and then he moved inland where it was safer. Now, his small mud house sits near the wreckage of what was once a bustling village, half of which is under the Ganges. Since 1969, nearly half of Ghoramara has been eaten by the waves.

All that stands between Mandal and the fate of his neighbors is a small mud embankment, and he told the *Times* that it, too, looks likely to crumble into the river. "What will happen next, we don't know," he said.

Dr. Sugata Hazra, director of Jadavpur's School of Oceanographic Studies, does know: "Ghoramara has been losing its land at a rate of 16 percent per year," he says. "Simplistically, only 15 percent will remain by 2100. But a single cyclone with more than a 2.5-meter surge height can entirely change the prediction scenario, and wipe out the island."

STOPPING THE INSANITY

The thought of our homes disappearing into the ocean may be unfathomable to those of us in the US, but it's a bitter fact of life today for islanders from the Sundarban Delta to the Pacific nations of Tuvalu and Vanuatu, among others. Unabated, global warming will turn millions more islanders and coastal dwellers around the world into climate refugees if we don't take meaningful action, soon. In an April 2007 report, the Intergovernmental Panel on Climate Change predicts that global warming could raise the ocean's surface as much as 23 inches by 2100. In his film *An Inconvenient Truth*, Al Gore translates that to mean that much of the Netherlands, New York City, and coastal Florida could all be underwater inside the next century.

How do we curb global warming, now and for the future? Co-op America laid out our 12-step plan of action in our Fall 2006 *Climate Solutions* edition of the *Quarterly* (available free online at www.coopamerica.org/pdf/caq70.pdf), based on the research of scientists at Princeton University's Carbon Mitigation Initiative (CMI), as well as feedback from the scientists and experts who make up our Solar Catalyst program. They all emphasized that we have to take big, bold action right now if we're to have a prayer of preventing the worst effects of global warming, like those suffered by the Sundarban islanders: Specifically, we need to bring our emissions levels flat by 2054, and reduce them to zero by 2100.

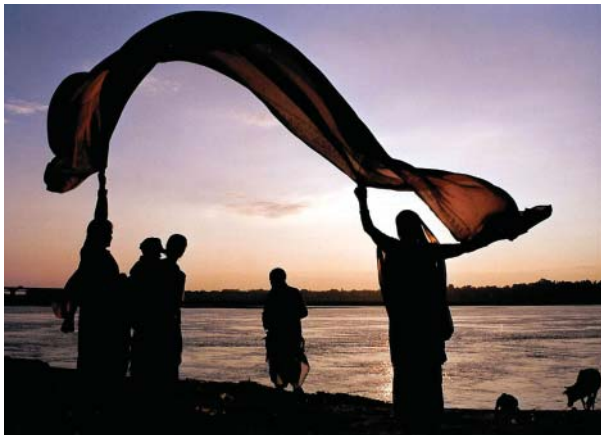
Our plan breaks down the climate-cooling actions needed to achieve these goals into 12 steps. (For an overview, see the sidebar at right.) Because transportation is responsible for 28 percent of emissions in the US, four of our steps have to do with our transportation choices.

CAN CARS HELP COOL THE WORLD?

This issue of *Co-op America Quarterly* focuses on the most problematic and controversial of the transportation steps: how to fuel our cars right now, as we work toward the day when our world fleet is made up of zero-emissions vehicles powered by clean, renewable energy—a day in which we'll rarely use our cars anyway, because our cities and towns will be so well-designed for walking and biking.

To start, we need to **REPLACE FOSSIL FUELS WITH 100 TIMES MORE BIOFUELS** than we currently have, made from waste so we don't displace cropland and forests. And we don't mean just any old biofuel. While some politicians and media outlets can make it seem like any biofuel is a good choice for the environment, they couldn't be more wrong.

On pp. 13–21, we prove it by analyzing seven fuels—examining their environmental impacts, their potential for reducing global warming emissions, and their prospects for the future. One comes out on top, and despite the hype you've undoubtedly been witnessing, it's not corn ethanol. (See p. 24 for our in-depth exposé on why corn ethanol is no answer to the climate crisis.)



AP Wide World/ RAJESH KUMAR SINGH

Over 70,000 islanders living in India's Sundarban Delta are likely to become environmental refugees in the next 14 years. At least 12 of the islands are in danger of sinking beneath the Ganges River due, in part, to a rise in sea levels caused by global warming.

But even the best biofuel makes no sense unless we use technology available today to make cars that use much less fuel. Following step one of our action plan, **IMPROVING OUR AVERAGE FUEL ECONOMY** from 30 to 60 miles per gallon by 2054,

Co-op America's 12-Step Plan to Curb Climate Change

How much is enough when it comes to climate solutions? Co-op America's 12-Step Program shows how we can address the climate crisis at the speed and scale necessary. We need to take each of the 12 steps starting today—and achieve them by 2054.

1) Up average **FUEL ECONOMY** to 40 mpg by 2012, then 60 mpg.
2) **CUT OUR DRIVING** by 50 percent.
3) Move to **ZERO EMISSIONS** vehicle technology.
4) **REPLACE FOSSIL FUELS** with waste-based biofuels, without displacing cropland or forests.
5) **BUILDING EFFICIENCY:** Reduce energy use by 25 percent in existing buildings; zero emissions for new buildings.
6) Increase **SOLAR POWER** by at least 700-fold.
7) Increase **WIND POWER** by at least 80-fold.
8) Stop **DEFORESTATION**, and increase **RECYCLING**.
9) **PHASE OUT COAL:** No new coal plants starting now.
10) **PHASE OUT COAL:** Replace 1,400 coal plants with natural gas, as a short-term emissions-reduction strategy.
11) **PHASE OUT COAL:** Double the efficiency of remaining coal plants, as a short-term emissions-reduction strategy.
12) Support **LOCAL, ORGANIC AGRICULTURE**; **STOP SOIL EROSION** with conservation tillage, and **EAT LESS MEAT** (special thanks to vegetarians and vegans).

These steps track with what climate science says about how much carbon we need to prevent from accumulating in the atmosphere to avoid the worst consequences of climate change—including the Princeton University Carbon Mitigation Initiative's assessment of how to do this using existing technology and practices. See the Fall 2006 *Co-op America Quarterly* for details: Call 800/58-GREEN to order or download at www.coopamerica.org/PDF/CAQ70.pdf.

would reduce our world climate emissions by 1 billion tons. There are prototype cars on the road today that average 100 mpg—see p. 28 for how to help get them to market soon.

Though many of our lawmakers say they want to reduce our dependence on foreign oil for security reasons, they've largely ignored vehicle efficiency standards as a possible method. And it's a shame, because upping the efficiency of our US fleet is the quickest, most cost-effective, and least painful way we can use less oil and less fuel, in addition to driving less. Find out how to encourage them to take action on fuel efficiency standards on p. 22.

OUR VISION FOR THE FUTURE

We can achieve over 4 billion tons of greenhouse gas reductions per year by driving more efficient cars powered by better fuels, in addition to reducing our time behind the wheel. By 2054, we need to be well on our way toward zero-emission vehicles powered by renewable energy—as well as communities designed for increased walking and biking—if we hope to counter climate change.

But as we work toward that day, the immediacy of the climate crisis means we have to act now, with the technology we have available today. When it comes to our transportation choices, our best short-term strategy is to get our most fuel-efficient cars on the road (in the form of plug-in hybrid-electric vehicles—see p. 28), and power them with our best, lowest-emission biofuel (biodiesel made from waste). Send our postcards next to p. 18 to car companies and lawmakers today to demand action.

While changing the way we get from A to B is no magic bullet to stopping global warming, driving less and driving smarter can go a long way toward ensuring that no one has to watch his or her home crumble into the sea again. CAQ

—Tracy Fernandez Rysavy

Christopher Owyoung

The April 2007 "Sea of People" Step It Up rally had protestors in blue marking predicted water lines throughout New York City, caused by a global-warming-induced rise in sea levels. Scientists have projected that much of lower Manhattan will be permanently flooded within the next few generations if we don't act now to curb climate change.

DRIVE LESS, SAVE THE EARTH

When it comes to transportation, changing our cars and changing our fuels won't curb the worst effects of global warming—from widespread drought and severe coastal flooding, to an increase in insect-borne diseases worldwide, as well as a host of other problems—which scientists predict will hit us hard during this century if we continue on with business as usual.

For that, we'll also need to curb our driving habits.

To get our emissions down to acceptable levels, the average driver will need to half his/her time behind the wheel, going from 10,000 miles per year to 5,000 by 2054. (That's only a two percent reduction in driving per year—everyone can do this.) And that's in addition to upping average fuel economy from 30 to 60 miles per gallon and increasing our use of waste-based fuels.

Back in 2004, Co-op America published our *Sustainable Transportation* guide (available free online at www.coopamerica.org/pdf/caq64.pdf) to help our members drive less. But given the seriousness of the impending climate crisis, it doesn't hurt to remind ourselves to live car-lite or car-free. Here are some of our favorite strategies:

• **WALK, BIKE, AND DECREASE THE NUMBER OF SHORT TRIPS YOU TAKE BY CAR.** Try this to start: Find your home on a local map. Then, using a compass, draw a circle around your home with your farthest known bikeable location in the circle's perimeter. Try walking or biking to everything inside the circle.

• **TRY AN ELECTRIC BIKE.** The latest electric bikes can go up to 25 miles per hour, and the battery does all the heavy pedaling when you go uphill. You can even charge the batteries with solar power. See our *Real Money* article, "The Case for Electric Bikes," free online at www.coopamerica.org/go/ebikes.

• Get a local transit map from your local bus, commuter rail, and subway lines, and resolve to **TAKE PUBLIC TRANSPORTATION** as often as possible.

• Talk to your supervisor about **TELECOMMUTING** more, or join a carpool.

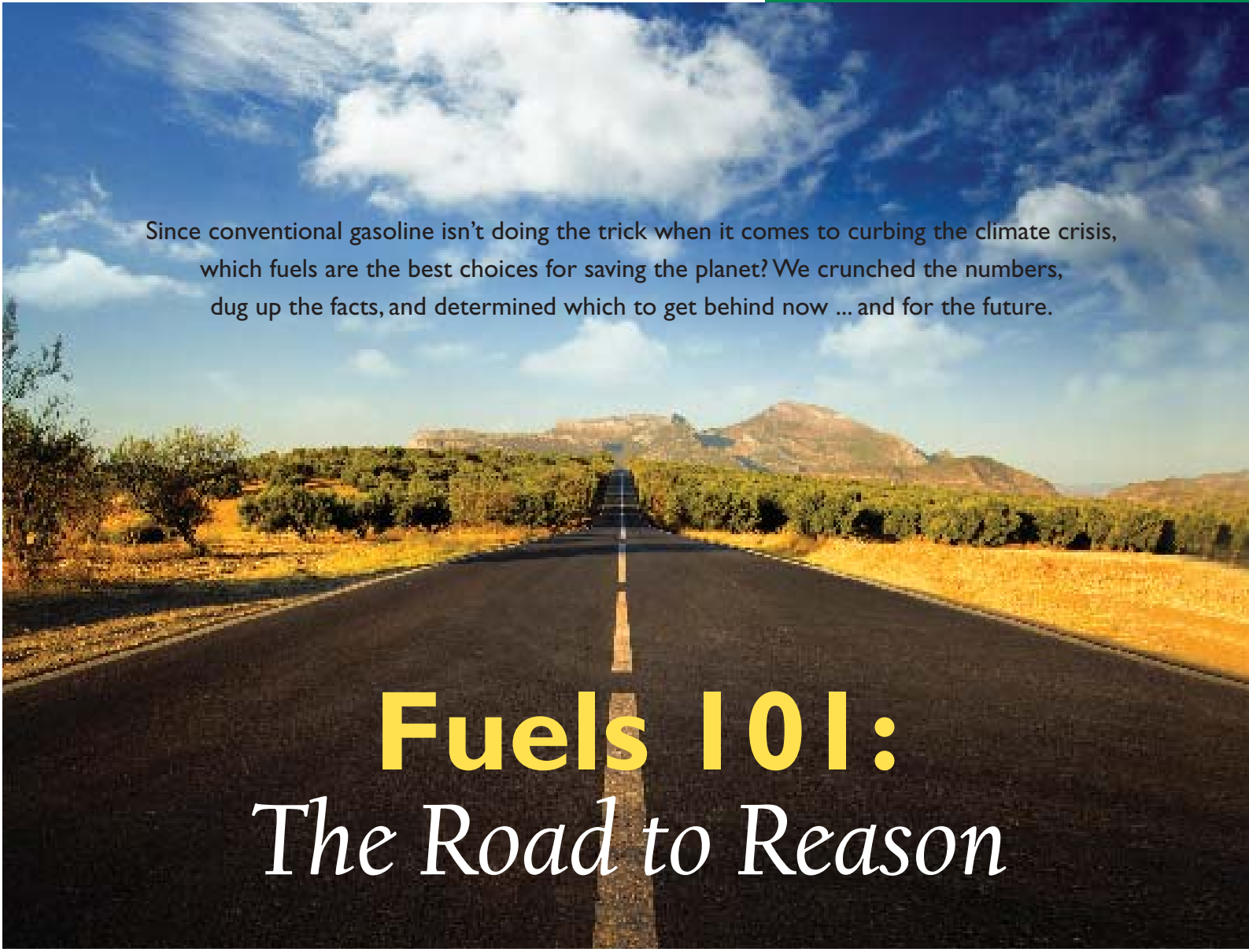
• If you must drive to work, **KEEP A BIKE AT THE OFFICE** for lunchtime errands or short-distance meetings.

• Get a **CARGO CARRIER FOR YOUR BIKE** to extend your zero-emissions hauling capabilities. XtraCycle (888/537-1401, www.xtracycle.com) sells an attachment that can turn any bike into a heavy-duty hauler, and Lightfoot Cycles (406/821-4750, www.lightfootcycles.com) and Revolution Rickshaws (212/239-3491, www.revolutionrickshaws.com) sell cargo-hauling cycles.

• Instead of owning a car, **TRY CAR SHARING.** Fee-based car-share programs like Flexcar (877/FLEXCAR, www.flexcar.com) and Zipcar (866/4-ZIPCAR, www.zipcar.com) park their cars throughout more than 20 US cities. Members pay by the hour to use the cars as they need them.

• When you need to rent a car, try a **LOW-EMISSIONS RENTAL** vehicle from companies like EVRental (877/EV-RENTAL, www.evrental.com). If you belong to the Better World Club (866/238-1137, www.betterworldclub.com), the "green Triple A," you can get a discount on green rentals—as well as roadside assistance for your bike and car.

When you do drive, **OFFSET YOUR EMISSIONS** with a reputable offset program. For more on these programs, see our *Real Money* article, "Carbon Offsets Demystified," online at www.coopamerica.org/pubs/realmoney/articles/carbonoffsets.cfm.



Since conventional gasoline isn't doing the trick when it comes to curbing the climate crisis, which fuels are the best choices for saving the planet? We crunched the numbers, dug up the facts, and determined which to get behind now ... and for the future.

Fuels 101: *The Road to Reason*

There's a lot of talk about "alternative fuels" to gasoline and diesel these days, especially as national security concerns make reducing our dependence on foreign oil a priority. As the world wakes up to the looming climate crisis, it's become apparent that we need to do something drastic about our transportation—which produces 28 percent of our emissions in the US—to stem the greenhouse gas tide.

Although certain politicians would have you believe that one fuel is as good as another, the "new" fuels are not all created equal. In fact, some are nearly as bad as gasoline when it comes to environmental impact, and others couldn't be scaled up in a meaningful way without creating other major problems.

So you know that gasoline isn't sustainable by any stretch of the imagination, but what you may not know is which fuels are your best bet for people and the planet? Which have a polar bear's chance in the Arctic of meaningfully mitigating the global warming threat? Which pollute less? Which would be the easiest and the most sensible options for replacing gasoline as our main fuel for getting from A to B?

We answer these questions and more in the following pages, where we break down the alternative fuels that have been generating headlines of late—corn ethanol, hydrogen fuel cells, ultra-low-sulfur diesel, natural gas, cellulosic ethanol, biodiesel, and electric hybrid technologies. Which one is best? Follow our "road to reason," starting from the worst choices and working up to the best, and see.

Keep in mind that we don't recommend using even the best options on this road forever. To truly avert a global climate crisis, we need to bring emission-free technologies online by the end of the century. Replacing fossil fuels with the low-impact options available today is an important step forward as we work toward the day when our entire world fleet is made up of zero-emission vehicles, fueled with renewable energy—and which are rarely used in cities and towns designed to encourage walking and biking.

Cars running on unsustainable alternative fuels ride on a red "road" across the tops of the pages of this article. Those using fuels with better environmental impacts but some significant trouble spots travel a yellow road. And cars powered with the very best alternative fuels for now and the future drive on a green road.

At the end of the road, meet Robert Clear and Barbara Judd, Co-op America members and subjects of the True Tale on p. 23 who've chosen the most sustainable road of all—they don't drive a car, period, choosing instead to bike, walk, and take public transportation exclusively.

Once you've gotten the facts, join us in driving less and pushing for ways to get the entire country to drive better.

Chrysler Sebring Flex-Fuel

E85 Corn Ethanol

Verdict: Stop the corn ethanol industry. E85 corn ethanol is a climate, food security, and national security disaster, not a climate solution.

WHAT IS IT?:

About 97 percent of ethanol in the US comes from corn, while sugarcane is used as an ethanol feedstock throughout Latin America. Sugars and starches in the corn kernels or sugarcane are fermented and turned into alcohol, which is then used as fuel.

PROS:

- The negative effects of corn ethanol on the climate, environment, and world food prices far outweigh any pros. (For an in-depth analysis of why corn ethanol is not the answer to our climate change and national security woes, see p. 24.)
- Corn ethanol is preferable as an oxygenating gasoline additive (making up 2-10 percent of gas) over MTBE (methyl tertiary-butyl ether), which was once widely used in gasoline. The US Environmental Protection Agency has warned that MTBE is a possible carcinogen, and the danger of pollution from leaking MTBE tanks has prompted many states to ban the use of MTBE in gasoline. In the future, however, it would be better to use an environmentally preferable feedstock, like cellulosic biomass, to make the ethanol needed for this use.

The negative effects of growing corn for ethanol on the climate, environment, and world food prices far outweigh any benefits.

CONS:

- Though ethanol proponents argue that using ethanol in place of gas reduces global warming emissions, and that a switch to a domestic feedstock for fuel would reduce the US dependence on foreign oil, these benefits are largely insignificant when you look at the numbers. There are far better choices when it comes to both the climate and oil independence.
- While the corn used to make ethanol does absorb CO_2 as it grows, ethanol production consumes significant amounts of electricity. When taking into consideration the lifecycle emissions of corn ethanol, including the use of petroleum-based fertilizers and the power used to convert corn into alcohol, David Tilman and Jason Hill of the University of Minnesota found that using pure corn ethanol results in only a 12 percent reduction in life-cycle emissions over gasoline—which becomes 11 percent when you use E85.

Though many current corn ethanol plants are powered by natural gas, the trend for new plants has been to use coal instead, says Bill Freese of the Center for Food Safety. With coal powering ethanol conversion processes, the marginal reduction in global-warming gases virtually disappears, according to University of California researchers.

- Reducing our dependence on foreign oil through corn ethanol use isn't remotely feasible. Switching out the 200 billion gallons of fuel used by US drivers each year for corn ethanol would require 71 percent of our current farmland—an impossible demand on our agricultural system.
- The growing demand for corn ethanol has already affected grain prices on the world market. US dairy farmers and people around the world who depend on corn as a staple of their diet are already feeling the effects of this price increase, which is likely to keep climbing.
- Corn uses large amounts of pesticides, and nitrate runoff from corn fields is already polluting US water sources. Also, most of the corn planted in the US is genetically engineered, and more new breeds are being designed specifically for ethanol production, risking further contamination of nearby fields.
- Sugarcane hasn't proven to be a better substitute for corn. Brazil has begun clearcutting rainforest to plant sugarcane for ethanol—a climate disaster.

CURRENT STATUS:

Many gasoline blends already contain small amounts of ethanol as an additive. To use a higher blend, you'll need a flex-fuel vehicle—which can run on gasoline or ethanol blends up to E85. There are about 1,200 stations around the country offering E85, and dozens of flex-fuel cars are currently on the market.

According to the Renewable Fuels Association, existing and planned ethanol plants will produce 6.3 billion gallons of corn ethanol in the next year, covering three percent of our annual fuel consumption. The government continues to offer many incentives for corn ethanol production and use.

Most experts think that cellulosic ethanol (which uses plant waste, not just seeds) holds more promise for mass production and reaping environmental benefits (see p. 18). Unfortunately, while people are talking big about cellulosic ethanol, the industry continues to move at full speed toward corn ethanol—almost all of the ethanol plants slated for construction are designed to process corn ethanol, and they cannot be used to make cellulosic ethanol.

SHOULD YOU MAKE THE SWITCH?:

No. An ethanol-powered car won't substantially reduce your overall carbon footprint—which is vital if we hope to curb the climate crisis. The potential of creating a world food crisis looms large with corn ethanol. And there are far better choices to achieve oil independence.

Help raise the alarm about the problems with corn ethanol (see pp. 24-27 for more details), and encourage car manufacturers and politicians to support a transition to better fuels, improved vehicle efficiency, and plug-in hybrid technology (use the postcards next to p. 18 and call or visit your representatives).

Honda FCX Fuel Cell Concept Car

Hydrogen Fuel Cells

Verdict: There's no way an energy-intensive hydrogen infrastructure can be scaled up in time to stop a global warming crisis. Other alternatives exist that can be ramped up much more quickly.

WHAT IS IT?:

Fuel-cell vehicles are powered by a chemical reaction of combining compressed hydrogen gas with oxygen from the atmosphere, creating an electric charge that powers the vehicle. As opposed to a fuel, it is considered an energy-carrier that stores power. The power stored by the fuel-cells is then used to run an electric motor.

Hydrogen does not occur naturally and must be manufactured, usually by a process run on natural gas or electricity.

PROS:

- Fuel-cell vehicles produce zero emissions from the tailpipe. The only thing coming out of the back of a fuel-cell vehicle is water vapor.
- If hydrogen is made with renewable power, it can be a low-carbon way to fuel vehicles (although the technology to create hydrogen with renewables is still under development), and is inert in the atmosphere if released.

CONS:

- With today's technology, the greenhouse gas emissions that come from creating hydrogen result in greater lifecycle emissions for hydrogen fuel-cell vehicles than those for conventional gasoline and diesel vehicles.

Scott Samuelsen, director of the National Fuel Cell Research Center at the University of California-Irvine puts it this way: "If we don't generate hydrogen in an environmentally responsible way, we'd be going five steps backward, rather than forward," he told the *San Francisco Chronicle*.

- While car manufacturers are setting their sights on having fuel-cell vehicles in showrooms by 2015, a 2004 study by the National Academy of Sciences predicted that fossil fuels would be the main source of hydrogen generation for "several decades," meaning that hydrogen fuel-cell cars on the market would be worse than gasoline vehicles when it comes to lifetime emissions now and well into the future.
- In addition, fuel-cell technology is prohibitively expensive—experimental fuel cell cars cost about $3 million, according to the Sierra Club—and we currently lack the massive infrastructure needed to provide drivers with hydrogen to fill up their tanks. Creating that infrastructure would be extremely energy-intensive, emitting tons of carbon when we have other, better technologies available.
- A nationwide hydrogen fuel cell infrastructure would also cost "hundreds of billions of dollars," according to Plug In America, a nonprofit advocating for super-low-emission cars (in the form of plug-in hybrids).

CURRENT STATUS:

Hydrogen fuel-cell cars are still in the research and development phase, and they and the infrastructure to support them simply can't be scaled up in time to help mitigate the impending climate crisis.

Before fuel-cell vehicles can be seen as part of a solution to global warming, we must develop better technologies to create hydrogen through renewable energy. Scientists are working to develop ways to create hydrogen using wind, solar, or geothermal power; however, as stated above, these solutions are not expected to become realities for several decades, and scientists agree that we have to start bringing low-emissions solutions to market in a big way within the next ten years.

Hydrogen fuel-cell cars simply can't be scaled up in time to mitigate the impending climate crisis.

SHOULD YOU MAKE THE SWITCH?:

You couldn't even if you wanted to. While some cities have acquired fuel-cell vehicles for their fleets, fuel-cell technology is not yet affordable or sustainable enough for the consumer market. And with the likelihood that fossil fuels will be used to make hydrogen for the next several decades, truly zero-emission fuel cells can't be ramped up quickly enough to mitigate the global warming crisis.

Because they can't be brought online quickly, and because of the carbon cost of building the infrastructure, Co-op America recommends that we put vehicles propelled by hydrogen fuel cells on the back burner and move forward with better low-emissions technologies that can be scaled up at the fast pace we need.

WEB EXCLUSIVE: When we think of moving beyond a petroleum economy, local and government fleets are a logical place to start, as fleet decisions affect many vehicles at once. For more on how to encourage local fleets to go green, visit www.coopamerica.org/go/fuels.

Mercedes Benz E320 Bluetec

Ultra-Low-Sulfur Diesel

Verdict: There are better fuels out there when it comes to clean air and cooling the planet.

WHAT IS IT?:

Conventional diesel is a component of petroleum that is separated out by heating crude oil to high temperatures. It is sometimes called "petrodiesel" to distinguish it from biodiesel.

Ultra-low Sulfur Diesel (ULSD), which contains less than one-tenth of the sulfur than conventional diesel once did, became nationally required by law for on-road diesel vehicles in 2006.

Historically, the sulfur in conventional diesel not only contributed to diesel's bad reputation as "dirty and smelly" but also corroded and clogged pollution-reducing traps, which therefore weren't used in most diesel vehicles. The resulting tailpipe pollution has been implicated in major public health problems, including asthma attacks, respiratory disease and heart attacks, according to the Clean Air Task Force.

While the new ultra-low-sulfur diesel is an improvement over regular diesel and even gasoline, there are better fuels out there when it comes to fostering clean air and a climate-cool planet.

PROS:

- Per mile driven, diesel engines emit fewer greenhouse gases than gasoline engines. The lower greenhouse gas emissions of a diesel car—13 less tons less over the average car's lifetime, according to the Union of Concerned Scientists—reflect the fact that although diesel causes higher emissions per gallon, that gallon can take a diesel car much farther due to better mileage.
- In addition to drastically lowering sulfur emissions, ULSD will allow diesel engines to be equipped with more effective controls for reducing particulates and smog-forming nitrogen oxide emissions.

CONS:

- Like gasoline, diesel is derived from petroleum, a non-renewable resource for which the US is dependent on overseas imports. And because it takes more petroleum to produce a gallon of diesel than a gallon of gasoline, diesel engines use up more oil than the high mileage number might lead you to believe.
- The Union of Concerned Scientists concludes that the pollution reductions achieved by diesel engines could be more cheaply achieved by increasing the fuel efficiency of gasoline vehicles.

CURRENT STATUS:

Once diesel engines were more common in US buses and trucks than in passenger cars, but that's changing—diesel passenger car sales have increased more than 80 percent since the year 2000 and are expected to double again by 2012. There are more than 13 million diesel vehicles on the road today.

More than a dozen models of passenger cars already come with an option to purchase them with a diesel engine. And European passenger cars are fully 40 percent diesel.

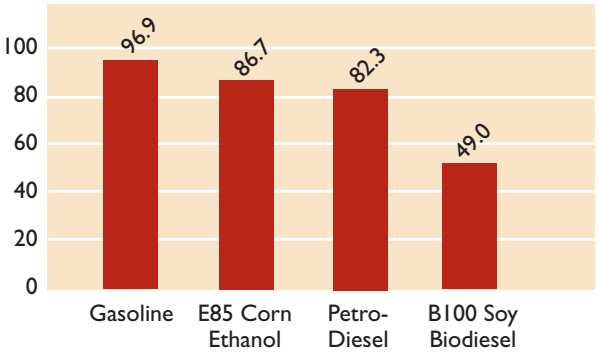
Many conventional gas stations already offers ultra-low sulfur diesel (look for the mandatory-by-law ULSD sticker on the pump to be sure—which should indicate only 15 ppm sulfur rather than the old conventional concentration of 500 ppm), and diesel engine mechanics can be found in every city.

If you already drive a diesel vehicle, contact the manufacturer to find out if it offers or will offer a particulate filter retro-fit to further reduce pollution.

SHOULD YOU MAKE THE SWITCH?

No. It might make sense as a short-term emissions-reduction strategy for a large fleet of trucks or buses, but if you're looking to reduce the global warming emissions from your passenger transportation, there are better fuels out there than ULSD. If you already own a diesel vehicle, consider running it on biodiesel, instead, to really cut down your emissions (see p. 20 and the chart below).

Lifecycle Greenhouse Gas Emissions*
(grams/megajoule)



** Net GHG emissions (as grams of CO_2 equivalent gases) released during production and combustion of the above four fuels, relative to the energy released during combustion.*
Chart based on a 2006 University of Minnesota study by Jason Hill, David Tilman, et al. (www.pnas.org/cgi/doi/10.1073/pnas.0604600103)

Honda Civic GX

Natural Gas

Verdict: While natural gas can be a viable short-term emissions-reducing strategy, especially for fleets, as we work toward zero-emission cars, there are much better fuels available now, in terms of environmental impact and personal convenience.

WHAT IS IT?:

The same gas that comes through pipes to heat two-thirds of American homes, light stoves, and power water heaters becomes a vehicle fuel when it is squeezed into cylinders as "compressed natural gas" (CNG) or chilled until it forms "liquified natural gas" (LNG). Natural gas is found underground and is mostly methane, with small amounts of other gases and water vapor. It is formed over centuries when animals and plants decompose while sealed off from oxygen.

PROS:

- Natural gas is capable of burning more completely and cleanly than gasoline, letting out less particulate pollution. Greenhouse gas emissions are 25 percent lower than gasoline, and each fill-up is currently cheaper than gasoline.
- Drivers of cars that are equipped to take CNG can skip the gas station and refuel at home: A "Phill" unit, which can be purchased currently in 17 states for about $2,000 and mounts on a garage wall, allows customers to fuel their cars directly from the natural gas pipes that heat their homes. (Liquified natural gas, by contrast, is used almost exclusively for large industrial vehicles.) As for the safety of Phill units, the manufacturer, FuelMaker Corp. of Toronto, says they have safety mechanisms that will shut them down if they're not connected properly or if the system senses a methane leak or other malfunction.
- Natural gas is a commodity extracted primarily here in North America, not imported from overseas. (Increased demand could change this situation, however.)
- For fleets of buses and trucks, natural gas historically was a much cleaner choice than diesel. Now, natural gas is losing its edge as cleaner diesel technologies close the gap between the two fuels, according to Don Anair at the Union of Concerned Scientists. Today, new ultra-low-sulfur diesel makes it possible to bring particulate matter pollution from diesel engines down to levels as low as natural gas engines, though older diesel vehicles require a retrofit filter for this improvement. For the next few years, natural gas engines still have lower emissions of nitrous oxides than diesel vehicles, though diesels are expected to reduce that pollutant to equally good levels by 2010.

CONS:

- Natural gas, like petroleum, is a finite, non-renewable resource.
- Natural gas stations aren't all that easy to find—and there's only one model of CNG car currently on the market.
- The CNG storage tank takes up about half of the traditional trunk space in a CNG passenger vehicle.
- Though a climate improvement over gas and a climate tie with ultra-low-sulfur diesel, it's still not the best fuel available when it comes to reducing emissions.

CURRENT STATUS:

The US Department of Energy estimates there is a 60-year supply of natural gas from conventional sources in the US, and more than a 200-year supply from advanced technologies and new discoveries.

The Honda Civic GX is the only current passenger car designed to run on CNG (a previous Ford model was discontinued).

Some experiments are underway to use the methane that rises up from landfills, sewage, or manure as renewably generated "biogas." This technique is used widely in developing countries, including India and Costa Rica, but is still experimental on a municipal level in the US.

If you're looking to be part of a long-term solution that's renewable indefinitely, natural gas isn't it.

SHOULD YOU MAKE THE SWITCH?:

No. You can get better mileage and lower emissions more with other fuels—and better convenience, too. Plus, if you're looking to be part of a long-term environmental solution that's renewable indefinitely, CNG isn't it.

Natural gas might be a good intermediate emissions-reduction step for truck and bus fleets.

Planes, Trains, and Automobiles

While our transportation recommendations in this issue focus mainly on passenger cars, trains and planes are definitely part of our climate-changing mix as well.

Most trains in US are fueled by diesel. They produce about 0.4 lbs. of CO_2 per passenger, per mile, making them the most climate-friendly way to travel long distances. As for other pollutants, the EPA recently announced new rules that will reduce annual nitrogen oxide emissions (a key ingredient in smog) from diesel locomotives by 80 percent, and annual soot emissions by 90 percent.

Airplanes are powered by jet fuel, a petroleum-based fuel that is similar to kerosene. The climate-changing news here is bad: One international round trip flight emits nearly as much CO_2 per passenger as an entire year of driving.

In terms of looking for fuel alternatives, the outlook is more hopeful for trains than airplanes. Biodiesel blends have been used successfully in some diesel locomotives, and a greater use of electric trains promises to reduce emissions (though they need more renewable energy to power them). For airplanes, most alternatives being explored for cars, i.e. biodiesel, ethanol, and hydrogen, are thought to be out of the question due to the cold, harsh conditions in the upper atmosphere.

Bottom line: Reduce your need for air travel as much as possible, and consider taking a train instead of driving or flying. Consider reducing your carbon footprint by offsetting your travel emissions, no matter what mode of transportation you choose. See our *Real Money* article, "Carbon Offsets Demystified," at www.coopamerica.org/pubs/realmoney/articles/carbonoffsets.cfm for more information.

Chrysler Sebring Flex-Fuel

Cellulosic Ethanol

Verdict: Great at emissions reduction, but powerful agri-corporations could keep the focus on not-so-great corn ethanol. For more immediate climate benefits, biodiesel is a better bet.

WHAT IS IT?:

Like corn ethanol, cellulosic ethanol is made by fermenting the sugars in plant matter. It is chemically identical to corn ethanol, but is derived from biomass—i.e. plant waste matter, like paper pulp and corn stalks—or fast-growing plants, like switchgrass. Whereas corn ethanol uses only the seed of the plant, cellulosic ethanol can be processed from the entire plant, meaning cellulosic processing gets more ethanol from less plant matter, including the parts we don't use for food.

Many fear that agribusiness giants heavily invested in corn and corn ethanol will stand in the way of any real movement forward for cellulosic ethanol.

PROS:

- Cellulosic ethanol produced from plant waste (like corn stalks) and industrial waste (like paper pulp), would make fuel out of matter that would otherwise be composted, burned, or landfilled. The US Department of Energy and Department of Agriculture estimate that forest and agricultural waste could provide 1 billion tons of biomass for cellulosic ethanol production each year, or enough to displace 30 percent or more of the nation's current fuel usage.
- Cellulosic ethanol takes far less energy to produce than corn, in part because a by-product of cellulosic breakdown is lignin, which can be used as an energy source, and in part because it can be made from agricultural waste and crops that take less energy to grow then corn.
- Because it is less energy-intensive to grow, cellulosic ethanol produces less greenhouse gases; Argonne National Lab estimates that ethanol from cellulosic biomass results in an 87 percent emissions reduction over gasoline. This benefit only improves when cellulosic ethanol is made from waste.
- University of Minnesota scientists David Tilman and Jason Hill argue that cellulosic feedstocks could provide ecosystem benefits, because farmers could grow native grasses and plants that would benefit wildlife and soil, and reduce water use. Because such feedstocks could grow on less-fertile land, they would compete less for food land than corn ethanol.

CONS:

- The National Resources Defense Council predicts that as cellulosic ethanol production becomes more efficient, the amount of ethanol made from each acre of biomass could more than double; however, this assumption is based on a heavy use of genetically modified plants (see p. 24 for more on the problems with GMOs).
- As with other biofuels, an emphasis on converting acres of food into feedstock for fuels runs the risk of raising food prices in the US and abroad; any large-scale attempt to make cellulosic ethanol must focus on waste and native plants that can grow in infertile and desertified land.
- Although cellulosic ethanol is more efficient than ethanol made from corn, development is still in the research phase. Many fear that agribusiness giants like Archer Daniels Midland (ADM), which currently controls 40 percent of the corn ethanol market, will stand in the way of any real movement forward for cellulosic ethanol. The corn ethanol infrastructure currently being ramped up by ADM and others—and supported by federal subsidies—can't switch over, because making ethanol from cellulosic feedstock requires a different process than making it from corn.

CURRENT STATUS:

Cellulosic ethanol is still in the research phase. Michael McElroy, professor of environmental studies at Harvard, wrote in *Harvard Magazine* that the benefits of cellulosic ethanol, "assuming they exist, surely lie a decade or more in the future."

In his 2006 State of the Union address, President Bush set a goal of making cellulosic ethanol production cost-competitive by 2012, but the government continues to offer subsidies to growers and producers of corn ethanol. Doug Koplow of the International Institute for Sustainable Development estimates that total government support for corn ethanol comes to between $820 million and $1.4 billion per year.

There are currently only about 31 pilot and demonstration cellulosic plants either functioning or being built around the world, with 80 corn ethanol plants being added in 2007 alone to the hundreds that exist in the US.

"Changing course from corn ethanol as the 'it' fuel of the day to cellulosic is going to require a drastic shift in gears on the part of our politicians—a challenge if they're easily swayed by the powerful corn lobby," notes Alisa Gravitz, Co-op America's executive director.

SHOULD YOU MAKE THE SWITCH?:

It's not possible yet. Corn ethanol is the only type of ethanol that is currently available on the market—and it's a terrible alternative to gasoline in terms of environmental impact and global warming mitigation.

If we do move forward with cellulosic ethanol, we need to first move away from corn ethanol and then ensure that we manufacture cellulosic ethanol from waste, not crops—and that we don't use farm or forest land.

Toyota Prius

Gas-Electric Hybrids

Verdict: Top-mileage hybrids are one of the best current options for emissions reduction, as we wait for better technologies to become available.

WHAT IS IT?:

A gas-electric hybrid has both an internal combustion engine and an electric motor. The electric motor is charged by the turning of the wheels and through regenerative braking, and it's used to assist the car in accelerating and going up hills, as well as running the car on low speeds. The electric motor also allows the combustion engine to stop running while the car is stopped.

PROS:

- Hybrid cars emit about 30 percent less CO_2 than conventional vehicles, and also put out 20 percent fewer volatile organic compounds. In addition, the Union of Concerned Scientists estimates that hybrid cars can achieve a 90 percent reduction in smog-forming pollutants over conventional cars.
- Hybrids are generally about 20-35 percent more efficient than gasoline cars, depending on the model, with the most efficient hybrid on the market achieving up to 60 miles per gallon—the closest we can get to the fuel economy goals in our 12-step plan to curb climate change (see p. 9). Higher fuel economy means that drivers require less gasoline—for example, driving a Toyota Camry hybrid will save 200 gallons of gasoline each year compared to a conventional Toyota Camry (based on fuel economy for city driving and 12,000 miles driven each year).

Though a study by CNW Marketing concluded that a Prius uses more energy in its lifetime than a Hummer, don't believe the hype—the study has been found by the Union of Concerned Scientists, among others, to be based on incorrect assumptions and vague methodology. Most experts agree that the Prius is a far better choice than a Hummer, and, with fully utilized manufacturing efficiencies, other gasoline models as well.

CONS:

- Fuel-efficiency for most models isn't yet up to where we need it to be; the 2007 Toyota Prius, with a best estimated city-driving fuel economy of 60 miles per gallon, is the only hybrid currently going far enough when it comes to fuel efficiency (see p. 23 for a reminder of our fuel economy goals to combat climate change).
- A 2005 study by *Consumer Reports* found large disparities between actual hybrid fuel economy and the ratings put out by the Environmental Protection Agency (EPA). As a result, the EPA mileage estimates across the board are being downgraded, with high-mileage hybrid vehicles getting a large hit here (see p. 22 for more details).
- Although most hybrid-electric vehicles outperform conventional vehicles, they still rely heavily on carbon-spewing gasoline.
- The tax credits that were put in place to encourage consumers to purchase hybrids, which tend to be a few thousand dollars more expensive than conventional cars, are being phased out as more hybrids are sold. The credit was originally worth up to $3,400 for those eligible, but begins phasing out after car manufacturers sell 60,000 hybrids total. After September 2007, Toyota and Lexus hybrid vehicles will no longer be eligible for the full tax credit. To find the status of the tax credit, visit www.irs.gov/newsroom/article/0,,id=161076,00.html.

CURRENT STATUS:

Currently, hybrids are only about two to three percent of the vehicle market, a number that needs to significantly increase in coming years if we are to curb our fuel-related emissions and the global warming crisis. While there are 13 hybrids on the market in 2007, only two models achieve the 40 mpg threshold that experts say we need the majority of cars on the road to hit by 2012 if we're to have a chance of combatting the coming global warming crisis.

A top-mileage hybrid like the Toyota Prius is one of the best current options for reducing greenhouse gas emissions from your driving.

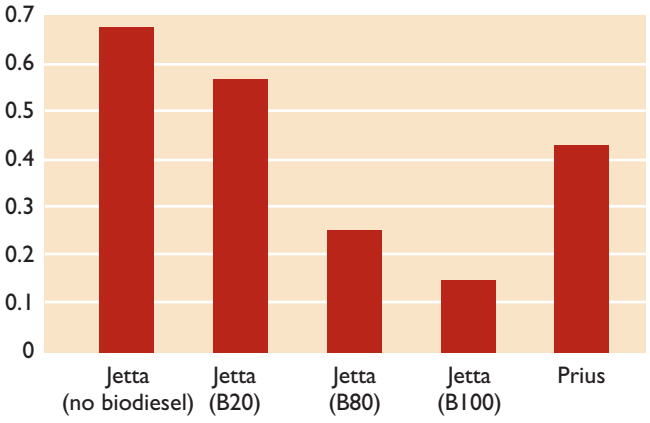
Many in the automotive world think that plug-in electric hybrid vehicles (PHEVs) are the next step in building low-emission vehicles (see next page and p. 28).

SHOULD YOU MAKE THE SWITCH?:

If you're buying a new car, running a diesel car on locally produced B100, or even B80, will result in a greater emissions reductions than switching to a hybrid (see chart below).

If biodiesel isn't an option, investing in a hybrid car is the next best choice available today. To help curb climate change, all new vehicles purchased by 2012 need to get at least 40 mpg (and by 2054, we need to get to 60 mpg). Look past the "hybrid" label and find a car with the highest possible fuel economy close to these targets—which right now are the Toyota Prius or the Honda Civic Hybrid.

Jetta vs. Prius: CO_2 Emissions (pounds per mile)



** Based on the 2006 VW Jetta, now discontinued. VW will bring a diesel New Beetle to 2008 showrooms, which is comparable. (Graph by Andrew Korfhage)*

Mercedes-Benz E320 Bluetec

Biodiesel

Verdict: Recommended as a short-term strategy until zero-emission cars powered by renewables become widely available. If we can make biodiesel from waste, this fuel becomes a best option.

WHAT IS IT?:

In 1925, Rudolf Diesel, inventor of the diesel engine, actually ran his diesel engine regularly on peanut oil. Any organic oil can be easily converted into fuel for any unmodified diesel vehicle, though most manufacturers use soybean or vegetable oil.

PROS:

- When it comes to global warming emissions, 100 percent biodiesel (B100) outperforms just about every fuel available, reducing vehicle emissions by 41 percent compared to diesel and 52 percent compared to gasoline, even when you factor in soybean production, according to recent research by the University of Minnesota. Those statistics only improve when biodiesel is made from waste.
- Diesel vehicles run on B100 biodiesel have 10- to 20-percent higher fuel economies than comparable gas-powered automobiles, according to the US Department of Energy.
- Biodiesel is biodegradable and considered nontoxic by the Environmental Protection Agency. It's also a good lubricant, which helps keep fuel lines from clogging.
- Biodiesel helps reduce US foreign oil imports.

A car run on B100 or B80 biodiesel emits fewer greenhouse gases than even a hybrid Prius.

CONS:

- Americans use more than 40 billion gallons of diesel a year, and shifting just that amount to biodiesel would make impossible demands on our agricultural land. Displacing food crops with biodiesel crops could cause major spikes in world food prices, which would be disastrous for the world's poor.
- Since the majority of the soybeans grown for US consumption are genetically modified, we'd likely see a proliferation of GMO crops if we ramped up biodiesel from soy or other foodstocks.
- News recently broke that biodiesel imported into the European Union from Indonesia, Malaysia, and Thailand came from palm trees planted on clearcut rainforest lands, states the *New York Times*, negating any emissions reduction associated with its use. However, many drivers circumvent the GMO and deforestation issues by making biodiesel from waste vegetable oil collected from local restaurants, says Josh Tickell, author of *Biodiesel America* (Yorkshire Press, 2006), which has a further benefit of keeping that oil from entering the waste stream.

WEB EXCLUSIVE: For the story of how several groups are working to make biodiesel production truly sustainable, visit www.coopamerica.org/go/fuels. For even more info on biodiesel, see our *Real Money* article at www.coopamerica.org/pubs/realmoney/articles/biodiesel.cfm.

- Any blend of biodiesel can gel in cold weather, at higher temperatures than diesel will gel. Drivers get around this problem with tank heaters or winterizing additives.
- Pure biodiesel (B100) is not as widely available as petrodiesel-biodiesel blends. The environmental benefits of biodiesel are diluted, naturally, in blends like the commonly found B20 (20 percent biodiesel, 80 percent petrodiesel).
- Using biodiesel may void your vehicle warranty. According to the National Biodiesel Board, "most major engine companies have stated formally that the use of blends up to B20 will not void their parts and workmanship warranties." If you use a blend higher than B20, however, you may have problems with getting manufacturers to honor your warranty.

CURRENT STATUS:

Biodiesel is more accessible than ever, with the number of US public fueling stations rising from zero in 1997 to 1,432 today.

The concerns associated with converting land from food production to biodiesel production remain an obstacle to scaling up this alternative fuel. However, several promising developments may soon surmount that problem.

In 2004, University of New Hampshire physicist Michael Briggs noted that aquatic farms could be used to grow crops for biodiesel production. With high oil content, rapid growth rates, and far fewer land requirements, some aquatic crops like algae may make sense as future sources of biodiesel.

Biodiesel can be made from waste tallow and other agricultural waste products, says the Sustainable Biodiesel Alliance.

And John Rivera, CEO of the United States Sustainable Energy Corp. (www.ussec.us), has pioneered a new process for making biodiesel from soybeans that is about two-thirds more efficient than standard biodiesel processing, meaning he requires fewer crops and less farmland.

In the meantime, many drivers make biodiesel from waste vegetable oil, the most sustainable option now available.

SHOULD YOU MAKE THE SWITCH?:

Yes. If you are thinking about your next vehicle purchase or already own a diesel vehicle, see if you have access to B100 biodiesel or could make your own. You'll help create demand for biodiesel that could spur scientists and companies to advance sustainable ways to expand production of this fuel.

Cars run on B100 and B80 emit fewer greenhouse gases than even a hybrid Prius (see chart, p. 19). You can make your own biodiesel alone or with a cooperative (see p. 27 for how Eric Henry of T.S. Designs[m] formed a biodiesel co-op), order it from a supplier, or, if you have pumps near you, buy it locally.

If you do not have easy access to biodiesel or ingredients to make your own, a hybrid car is currently your best choice.

[m] designates Co-op America Business Network Member

Chevy Volt Concept Car

Electricity/ Plug-in Electric Hybrids

Verdict: When plugged into green energy, plug-ins are our brightest hope for curbing global warming while matching the performance of today's cars.

WHAT IS IT?:

Electric vehicles (EVs) have electric motors that are powered by rechargeable batteries; EVs are plugged into a standard outlet to charge, a process that can take up to eight hours.

Many envision plug-in electric vehicles (PHEVs) as the future of the electric vehicle (see p. 28 for more details). Like conventional gas-electric hybrids, PHEVs have a fuel engine and an electric battery. The difference is that PHEVs have a bigger, better battery than current hybrids, allowing users to plug the car in and charge the battery, so that the car can run solely on electricity more often than gasoline. The gasoline engine kicks in once the battery is drained, increasing the range of the car so it's comparable to today's gas-powered automobiles.

PROS:

- Since the average American drives 30 miles per day, the battery range of most EVs and PHEVs (up to 100 miles between charges) would enable most Americans to do all of their daily driving on electricity, thereby greatly reducing emissions as well as our overall need for fuel.
- EVs and PHEVs powered by electricity from clean energy sources, like wind or solar, are pollutant- and emission-free.
- EVs charged with coal power still produce about 30 percent fewer greenhouse gases than conventional gasoline or diesel vehicles. PHEVs charged on the current grid mix would produce 42 percent fewer emissions.
- PHEVs appeal to a wide spectrum of consumers, because they allow for long-range driving.
- PHEVs cost less per mile to "fuel." A PHEV runs on the equivalent of 75 cents per gallon, assuming $3/gallon gasoline and 8.5 cents/kwh electricity.
- EVs and PHEVs can be a reality now. Current technology has been proven to work. The US electrical grid already has the capacity to power the daily commutes of 73 percent of our light-duty passenger vehicles; by charging them at night, we could switch millions of cars, trucks, vans, and SUVs to PHEVs tomorrow without building a single power plant. .

CONS:

- While EVS and PHEVS don't put out emissions while they're running on electricity, they do rely on being plugged into the grid. Currently, about half of the electricity in the US is generated by coal-fired power plants, which are the largest source of CO_2 emissions in the country.
- Standard EVs have limited ranges—up to 100 miles—before the battery needs to be recharged, reducing their appeal on the mass market. (PHEV technology provides a way around this concern.)
- EVs and PHEVs are not widely available; most have either been converted by their owners or, in the case of EVs, are relics of a short attempt made by car manufacturers to put EVs on the market in the 1990s.

CURRENT STATUS:

Few manufacturers currently sell EVs, and none sell PHEVs, which are still in the development stage. While PHEV conversion kits are being developed on a limited basis (see p. 28 for details), they are, for now, not available to most people.

While Chevy has put out a concept PHEV, it hasn't set a firm date to start producing it. Other car manufacturers claim to to be pursuing PHEVs, though none have plans to bring them to market. Most car companies claim to be waiting for better battery technology, but demonstration vehicles around the country, which consistently achieve over 100 miles per gallon, have proven that PHEVs are possible now.

Consumers need to pressure the car companies to wake up and start pursuing low-emissions vehicles like PHEVs; raise your voice with others by mailing our postcards next to p. 18.

Also, for EVs and PHEVs to be truly green, they need be to powered by renewable energy—encourage your local utility to make renewable energy an option for you, and ask your representatives to support legislation that offers incentives for solar and wind power.

PHEVs plugged into renewable energy are our brightest hope for curbing transportation-related emissions while matching the performance of today's cars.

SHOULD YOU MAKE THE SWITCH?:

If you purchase green power through your utility or have a solar-powered home already, then an electric vehicle is a terrific option for bringing down your emissions even further.

Tesla Motors (www.teslamotors.com) released its all-electric Tesla Roadster in 2007, and is accepting reservations for the 2008 model. You can look for used EVs for sale through the Electric Vehicle Association at www.eaaev.org/eaaevsforsale.html. It's also possible to convert your conventional car to run on electricity, though it can be expensive and technically difficult.

Many companies are working on building kits to help mechanics convert gasoline-electic hybrids to plug-in hybrids (see p. 28 for more information).

WEB EXCLUSIVE: For more on how Felix Kramer became the first person in the US to own his own personal plug-in electric hybrid car, visit our Web site at www.coopamerica.org/go/fuels.

AP Wide World/PAUL SAKUMA-ASSOCIATED PRESS

With gas prices hitting all-time highs, coupled with growing concerns about climate change and our dependence on foreign oil, it makes sense to build cars that use much less fuel.

In this issue, we discussed several possible automobile fuels—some that are great choices for the environment, some not so great. Because creating cars that use far less fuel than today's average automobile could immediately reduce our fuel needs, we call efficiency the best "fuel" of all for cars.

Unfortunately, lawmakers' enthusiasm for biofuels, especially corn ethanol, contrasts with their apparent disinterest in requiring cars to use less fuel in the first place. It's up to us to push them to act.

GOING FURTHER ON A GALLON

According to Co-op America's 12-step plan to curb climate change, we need to increase cars' average fuel economy to 40 mpg by 2012, then 60 mpg by 2054, after which we need to move towards zero-emission transportation options. Sadly, we're far from that benchmark right now, with the average car in the US achieving only 27.5 mpg.

In 1975, Congress first passed Corporate Average Fuel Economy Standards (CAFE), which require car manufacturers to keep up that 27.5 mpg average, with a lower minimum for trucks. Technology available today could bring cars to 41 mpg for less than the cost of the gas saved, according to the American Council for an Energy Efficient Economy.

Such a mileage improvement offers the biggest near-term "bang for the buck" for climate change and oil independence—it would reduce pollutants and greenhouse gas emissions, save consumers $80 billion at the pump, and lighten US oil demand by five million barrels a day, according to USPIRG—more than twice the amount of oil the US imports daily from Iraq. It would also make an eventual conversion to biofuels more feasible: biofuels would compete less for food crops, for example, if those fuels only had to displace half the gasoline used today.

Cars that run on less fuel seem like a no-brainer in terms of curbing climate change and solving our dependence on foreign oil.

It's time to start making them.

Efficiency: *The Best Fuel*

Despite this potential, CAFE standards haven't increased meaningfully in more than a decade. National leaders need to hear from their constituents that a significant improvement to CAFE is overdue. One of the biggest steps we can take to curb climate change and reduce our dependence on foreign oil is to make cars go further on a gallon of gas.

WHAT YOU CAN DO: At press time, the House of Representatives was considering a bill that would increase CAFE standards for cars to 35 mpg by 2019 (which isn't enough). And 11 states have taken the Environmental Protection Agency (EPA) to court over loopholes in the efficiency standards for SUVs and light trucks.

Unfortunately, too many lawmakers have let the US auto industry intimidate them from raising CAFE standards over the past decade—make sure this doesn't happen again. Let your representatives know that CAFE must require 40 mpg by 2012—anything less and we're kidding ourselves about curbing climate change. Write, call, or visit them to let them know this is a top priority. To start, mail the postcards next to p. 18 to your representatives and to auto companies.

BUILDING MORE EFFICIENT CARS

As discussed on p. 28, prototypes of plug-in hybrid cars hold tremendous promise as a low-emission, lower-pollution, sustainable vehicle. Somewhat inexplicably, federal legislation has not included plug-in hybrid technology on its lists of endorsed "alternative fuels." Given the promise of these powerful rechargeable battery cars to reduce emissions immediately (and bring emissions to zero with a renewable energy charge), public policy should get behind this technology in a bigger way.

With a move toward standardizing plug-ins, low-emission biofuels made from waste start to make more sense as a promising strategy for reducing global warming emissions and fossil fuel use on our way to a zero-carbon future.

WHAT YOU CAN DO: Fill out the postcards next to p. 18 to send a message to US automakers demanding PHEVs be brought to market soon.

MILEAGE: IN SEARCH OF REAL NUMBERS

To truly scrutinize the efficiency of our cars, we also need to ask—how accurate are the EPA fuel economy estimates?

For years, *Consumer Reports* (*CR*) magazine has challenged the real-world validity of the EPA's mileage tests, because they are done in a laboratory at slower-than-normal speeds, with no wind resistance, with the air conditioning off, and far away from any of the situations that force drivers to idle or go slowly. To obtain their own mileage numbers, *CR* researchers borrow cars from dealerships and test them in real-world conditions. Their assessment of vehicles' efficiency generally registers five to 20 percent lower than EPA estimates. This is bad news, because how cars perform when they are actually driven is the mileage that's relevant for the climate.

However, the EPA announced in December that it's changing the way it comes up with mileage numbers. It will conduct new tests aimed at better reflecting real-world driving on all models for 2008 and beyond. The expected result is that consumers will see a significant decrease in fuel-economy estimates on vehicle window stickers.

WHAT YOU CAN DO: It is too early to determine how the revised EPA estimates will compare with *CR*'s numbers, but David Champion, senior director of *CR*'s Auto Test Center predicts they'll "go a long way toward giving the consumer realistic fuel economy figures that they can use to make a wise purchasing decision." For pre-2008 numbers that are closer to reality, check *Consumer Reports*' fuel economy estimates at: www.consumerreports.org.

STEP ONE: OUR PLAN TO CURB CLIMATE CHANGE

We need to move the global fuel efficiency of cars from 30 mpg to 60 mpg by 2054. This means:

- by 2012, we need to achieve a 40 mpg average.
- by 2020, we need to achieve a 55 mpg average.
- by 2054, we need to hit 60 mpg.

And by 2100, our cars must be emission-free!

BIKE & TRANSIT FRIENDLY COMMUNITIES

True efficiency also demands that we personally make decisions that reduce our car use (see p.11 for "drive less" strategies). Co-op America's prescription for climate action is so dramatic, though—cutting car miles driven in half by 2054—that it will require not only individual decisions but large-scale community commitments to walkable urban design, increased mass transit options, bike-friendly roads, robust carpool and car-share systems, and increased telecommuting.

WHAT YOU CAN DO: When Congress is making transportation decisions, speak up in support of car-reducing projects and against car-promoting projects. (Lobby for better public transportation policy at the American Transportation Association's Web site: www.apta.com/transitaction.) At the local level, support promising transit projects, and advocate for pedestrian, bike, and transit considerations to be included in development plans. CAQ

—Joelle Novey

TRUE TALES

How Robert and Barbara go car free—with children.

ROBERT CLEAR AND BARBARA JUDD, BERKELEY, CA

Living without a car might be feasible for a single person or a couple, but what about families with children? Robert Clear and Barbara Judd of Berkeley, California, found themselves facing that very question in 1986, when their first son was born. They'd first developed their car-free lifestyle before they had children. They chose a home close to the places they went most often, as well as public transportation. To get to and from work and their activities, they would bike, walk, or take public transportation.

But after baby Charles arrived on the scene, most of their friends thought their car-free life would be history.

"Everyone assumed that we would need a car once we had children, and we were rather pleased as we slowly discovered that we really didn't," says Robert. "A lifestyle is something you learn. And we learned how to live without a car—where to look for housing and jobs, where to ride, and where and how to shop. Once we figured that out, we wondered why anyone would want to learn how to live *with* a car."

Robert says he was initially drawn to biking from a financial perspective, in addition to the fact that he and Barbara simply enjoyed their bikes. "Biking is more affordable," he says. "That extra money in the bank from no car insurance, no gas, no car maintenance, and no depreciation, is a nice reward."

But as the years have passed, he has grown increasingly proud that his family's lifestyle doesn't contribute to the air pollution and resource depletion caused by cars.

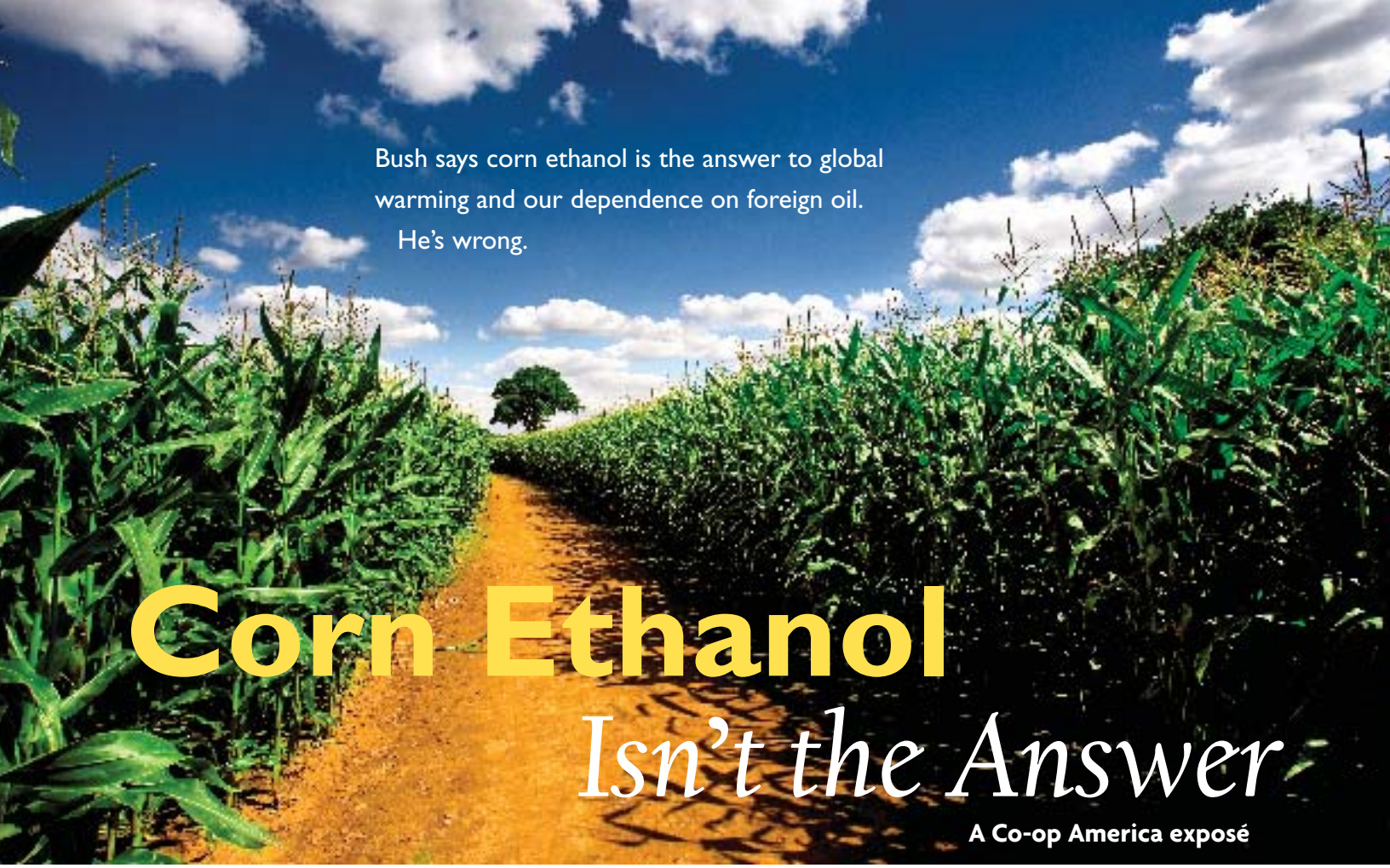
The family uses their bikes for almost all of their needs. Both Robert and Barbara commute to work, do their grocery shopping, and accompany their children to and from after-school activities by bike. The Clears' sixteen-year-old daughter Emily bikes ten miles each way to cello lessons, with one of her parents towing the cello using a bike trailer (illustrated by Barbara in the photo above).

"Having a bike trailer is obviously a major factor in making things work," says Clear. "My wife has hauled kittens (she does foster care for the Humane Society), watermelons, a harp, homework posters, a candlemaking kit, or two kids in a child-trailer with one *in utero*. I have hauled tile, three 30-inch 'King Kong' pizzas, an unassembled desk and other assorted hardware and building materials, and tons of groceries."

Life on bicycles can be frustrating when faced with insensitive drivers or inclement weather, but for the most part, Clear revels in his ability to slow down and enjoy the world around him.

"My lifestyle is not so much car-free as it is bike- and walk-full," he says.

—Sarah Tarver-Wahlquist



Bush says corn ethanol is the answer to global warming and our dependence on foreign oil. He's wrong.

Corn Ethanol *Isn't the Answer*

A Co-op America exposé

Back before Al Gore's *An Inconvenient Truth* sparked a firestorm of public concern about global warming, the Bush administration was content to sit back and proclaim that it was waiting for "science" to determine whether climate change really existed. Now that scientists worldwide have stepped up and left no doubt in the minds of most Americans, the administration can no longer ignore global warming and hope it'll go away. So it's come up with a way to save the day—corn ethanol. And everyone from car manufacturers to farmers to everyday citizens seem to be jumping on ethanol's bandwagon.

But is corn ethanol truly the cure-all for everything from the climate crisis to air pollution to US dependence on foreign oil?

We at Co-op America say it's not even close.

NO PANACEA FOR THE CLIMATE CRISIS

While corn-based ethanol has been touted as a way to solve the climate crisis, it simply isn't a major improvement over gasoline when it comes to reducing our greenhouse gas emissions.

In the US today, about 97 percent of our ethanol is derived from corn kernels. Because corn is such an energy-intensive plant to grow, and because the methods to process corn into ethanol are also energy-intensive, it takes seven barrels of oil to grow and produce eight barrels of corn ethanol, according to research by the traditionally right-leaning Cato Institute. So when you factor in production, pure corn ethanol curbs climate-changing vehicle emissions by a mere 12 percent over gasoline, according to a 2006 University of Minnesota study by Jason Hill and David Tilman. (With the more common E85—85 percent ethanol, 15 percent gas—that emissions reduction is 11 percent.) Though many current corn ethanol plants are powered by natural gas, the trend for new plants has been to use coal instead, says Bill Freese, science policy analyst at the Center for Food Safety. With coal powering ethanol processing, the marginal reduction in greenhouse gases virtually disappears, according to University of California research.

An earlier study published in *BioScience* in 2005 concurs with Hill and Tilman's findings. The researchers looked at the carbon dioxide (CO_2) emissions, cropland area requirements, and other environmental consequences of growing corn and sugarcane to produce fuel ethanol, and found that "the environmental impacts far exceed any value in developing this energy resource on a large scale."

Even a 12 percent emissions reduction is rather poor in comparison with other biofuels such as biodiesel, which cuts emissions by 41 percent over diesel (51 percent over gasoline)—including soybean production, say Tilman and Hill. While not an ideal fuel source, soybeans can be grown with much less energy and far fewer chemicals than corn.

NO SOLUTION TO OIL INDEPENDENCE

One of ethanol's main selling points is that it supposedly would heighten US security by reducing our dependence on oil imports from countries potentially harboring terrorists. But the fact is, growing that much corn for ethanol would make impossible demands on our agricultural land.

The USDA estimates that 90.5 million acres of corn will be planted in 2007 (up 12 million from 2006), but even if all of this corn were used for ethanol, it would only satisfy about 16 percent of our annual fuel needs. Any attempt to replace the 200 billion gallons of fuel used by US drivers

each year with corn ethanol would require that 675 million additional acres, or 71 percent of America's current farmland, be used to grow corn, according to *Popular Mechanics*.

All told, these statistics reveal that corn ethanol could never hold out the prospect of energy independence.

CREATING A GLOBAL FOOD CRISIS

Experts are sounding the alarm that boosting corn ethanol production could pose a grave danger to the world's food supply. Remember, corn isn't just the corn-on-the-cob or canned corn we pick up at the market. It gets turned into animal feed to provide meat and dairy products. It's in nearly every processed food in the form of high-fructose corn syrup, as well as corn-based foods like tortillas.

The price of yellow corn on the world market has already hit a ten-year high, in part due to ethanol's rising popularity, says the BBC.

But while having the price of Doritos and hamburgers go up in the US hardly seems like a crisis, consider the domino effect. The US corn crop accounts for 40 percent of the global harvest, supplying 70 percent of the world's corn exports and about 25 percent of total world grain exports, according to the Earth Policy Institute (EPI). Substantially reducing this export flow to make corn ethanol for our cars "would send shock waves throughout the world economy," says Lester Brown, EPI's founder.

Corn prices are tied to other grain prices, so as the cost of corn rises, world grain prices will likely follow suit. While US consumers, particularly low-income families, will see significant hikes in food prices, the world's poor, who rely heavily on imported grain, will be hit the hardest. In May, Ian Cherret, head of the United Nations Food and Agriculture Organization, warned that people in Guatemala were facing a hunger crisis, due in large part to the rising cost of corn. The average benchmark price for corn in Guatemala rose almost 30 percent in the last year.

"The increase in the price of maize has left this sector of the population much more vulnerable than they were before," Cherret told Reuters.

And while the world's poorest would be sent reeling by exorbitant grain prices, we in the US wouldn't even gain all that much: Converting the entire US grain harvest to corn for ethanol would satisfy 16 percent of our fuel needs, while the corn used to fill a 25-gallon vehicle tank with ethanol one time could feed one person for an entire year, says Brown.

A DANGER TO OUR HEALTH AND THE EARTH

Growing corn at the scale required to switch a significant amount of fuel in the US to ethanol could have devastating environmental effects. Corn is treated with larger quantities of toxic pesticides and fertilizers than any other US food crop, according to the *New York Times*. Chlorpyrifos, the most commonly applied insecticide on corn, is banned by the US Environmental Protection Agency (EPA) for household use, and EPA studies have linked chlorpyrifos to brain damage in rats. The EPA has also classified atrazine, the most commonly used herbicide on corn, as a possible carcinogen. Nitrogen, a main ingredient in corn fertilizers, encourages algae growth in saltwater, creating oxygen-starved "dead zones"—including a 12,000-foot dead zone in the Gulf of Mexico—that threaten aquatic life and water quality in coastal regions.

Nitrogen runoff from farms is also contaminating water wells around the country. A 1998 study by the National Center for Environmental Health found that 13 percent of the domestic drinking-water wells in the Midwest contained unsafe levels of nitrates, which can cause birth defects.

In addition, groups like the Sierra Club note that ethanol produces even more smog than gasoline, contributing to the poor air quality that's behind increased instances of childhood asthma and adult lung problems. A recent study by Stanford University atmospheric scientist Mark Z. Jacobson concluded that "a high blend of ethanol poses an equal or greater risk to public health than gasoline," as widespread use could cause possible increases in respiratory-related deaths and hospitalizations.

Archer Daniels Midland (ADM) is the main player in the ethanol sector, responsible for about 40 percent of US ethanol production—and its environmental record is nothing to be proud of. According to the nonprofit Corpwatch, ADM is currently under investigation for approximately 25 violations of Superfund laws. ADM has been cited several times by the EPA for flouting the Clean Air Act, including 52 plant violations resulting in a $351 million settlement with the EPA and US Department of Justice in 2003, one of the largest such settlements on record. In 2002, ADM landed in the top ten of the Political Economy Research Institute's Toxic 100 index, which ranks the nation's largest companies based on its pollution levels. And in 2006, Ceres measured how 100 leading global companies are responding to global warming, looking at board oversight, public disclosure, emissions accounting, and strategic performance. On a 0 to 100 scale, ADM scored a dismal total of 12 points.

The corn used to fill a 25-gallon vehicle tank with ethanol one time could feed one person for an entire year.

ADM and its competitors Cargill and Dunge are also behind 60 percent of the financing of soy production in Brazil, which has resulted in the deforestation of 1.2 million hectares of Amazon rainforest, says Greenpeace International.

AN INCREASE IN GM CORN CROPS

In the 2005-2006 growing season, 61 percent of corn planted in the US was genetically modified in some way, and that percentage increases every year. Ramping up corn production to make ethanol means a greater increase in the use of genetically modified organisms (GMOs), because it's industrial agri-corporations that will dominate the sector, argue Miguel Alitieriof the University of California–Berkeley, and Elizabeth Bravo of Red por una America Latina Libre de Transgénicos (Transgenics-Free Latin America Network).

As demand for corn increases, biotechnology companies are developing new breeds of corn intended specifically for conversion into ethanol. These agribusiness giants are already using their GMO technology to get a stranglehold on the booming ethanol industry. Corporate behemoth Monsanto

has teamed up with Cargill to form Renessen, a biotechnology and processing company that is designing a new breed of GM corn for ethanol production. The MAVERA "high value" corn plant is genetically engineered to increase starch content, and it can only be processed in a specific manufacturing plant designed by Renessen. Likewise, because the Renessen plant is engineered to produce ethanol from MAVERA corn, farmers who want to sell to Renessen will have to purchase corn from Renessen.

GMO critics point out that GM crops pose risks to human health and the environment that government regulators are largely ignoring. "The unintended effects of genetic engineering are hard to predict, but they include increasing the level of natural toxins in the crop, creating novel toxins through mutations that genetic engineering causes, and lowering nutritional content," says Bill Freese of the Center for Food Safety. GM crops often contaminate conventional crops through cross-pollination or seed dispersal, which Freese says threatens biodiversity and harms farmers through rejection of contaminated crops in export markets.

Because most GM crops are designed to be herbicide-tolerant, farmers can put massive amounts of chemicals on their crops without killing them. In 2004, a Benbrook Consulting study found that the use of GM crops resulted in an additional 122 million pounds of pesticides being applied to farmland between 1996 and 2004.

In addition, a 2007 study commissioned by Greenpeace found that rats fed for 90 days on Monsanto's "MON863" maize—a GMO variety authorized for human and animal consumption—showed "signs of toxicity" in the liver and kidneys. While more studies are needed to confirm these findings, it's clear to many food safety experts that we need to be growing fewer, not more, GM crops.

"Anyone can see by looking at the characteristics of the different biofuels that corn ethanol isn't green."

A SUCKER PUNCH FOR FAMILY FARMERS

Ethanol proponents argue that higher corn prices are good for small-scale farmers. Indeed, the price of corn rose 55 percent in 2005 alone. But there's more to the story than that statistic reveals.

When corn prices rise, animal feed prices for dairy and meat farmers rise along with it. So far this year, these US farmers have been hit hard by a 25 percent rise in feed costs.

And though corn farmers are being paid more for their harvest, they don't stand to profit nearly as much as those who turn that corn into ethanol, and processing plants are being increasingly consolidated into the hands of agribusiness giants like ADM.

"In 2000, about 80 percent of all new ethanol plants were farmer-owned," David Morris of the Institute for Local Self Reliance told Minnesota Public Radio. "In 2006, of those ethanol plants that are now planned and will be operational in the next 12 to 24 months, only 20 percent were farmer-owned."

As corn prices continue to rise, Tom Philipot of Maverick Farms, an organization supporting sustainable agriculture, predicts that farmer-owned cooperatives are likely to be forced to sell to "deep-pocketed" corporations like ADM. In addition, corporations also dominate the biotechnology used to grow much of the corn, as noted above. Companies like Monsanto and Cargill are likely to increase the cost for ethanol "breeds" of corn, such as MAVERA, squeezing out any advantage to family farmers.

istockphoto

Family farmers don't stand to benefit from the corn ethanol boom as much as some ethanol proponents would have you think.

"So you have farmers who are going to be forced to grow a specific breed of corn if they want to be able to sell their harvest," says Eric Holt-Gimenez of the FoodFirst Institute, "and even if they choose not to, and to sell elsewhere, there's a high probability that their crops will be contaminated by GM corn. So what you've got is the consolidation of industry down to specific technology, which hurts small farmers."

STANDING IN THE WAY OF CELLULOSIC ETHANOL

While they show no signs of curtailing the massive subsidies to corn farmers and corn ethanol producers, politicians are beginning to talk about the promise of cellulosic ethanol. A switch to cellulosic ethanol, which could be made from plant waste matter including corn stalks, grass, and woodchips, would result in an 80 percent reduction in emissions compared to gasoline—far preferable to corn ethanol's paltry 12 percent. Plus, most studies have shown cellulosic ethanol to be about 80 percent more efficient than corn ethanol (see p. 18).

However, even while people speak about the future of cellulosic ethanol, ADM and other corporations continue to move full steam ahead toward a corn ethanol infrastructure, supported by continuing government corn and corn ethanol subsidies. In fact, the Energy Policy Act of 2005 and the Renewable Fuels Standard, which offer various supports and incentives for "alternative" fuels, promote corn ethanol above other fuels, because more cars can already accept it and more plants are currently producing it. And 45 states have laws encouraging corn ethanol use and production. Doug Koplow of the International Institute for Sustainable Development estimates that total government support for corn ethanol comes to between $820 million and $1.4 billion per year.

With ADM and the powerful agri-corp lobby building corn ethanol infrastructure as fast as they can, it's going to be very difficult to make a meaningful shift to more climate-friendly cellulosic ethanol. The methods used to make corn ethanol

differ so widely from those for cellulosic ethanol, that the 80 new corn ethanol plants slated for production in 2007 alone will be useless for making cellulosic ethanol.

"We're committing ourselves to decades of dependence on corn ethanol," says Freese. "Once you build that infrastructure, you pen yourself in. We can't use those same corn ethanol plants to produce ethanol from cellulose."

STOP THE ETHANOL INSANITY

Environmental and food advocates agree—the full-throttle movement towards corn ethanol has to come to a halt, fast. Holt-Gimenez sees consumers and activists playing an important role: "If we want to stop this current trend toward monoculture and corporate domination, we need people to urgently mobilize around this issue."

In the face of congressional enthusiasm for corn ethanol, it's up to us to sound the alarm that this is the wrong direction for our country (start by sending the postcards next to p. 18 to auto companies and your representatives). There are far better solutions to the climate crisis and oil dependence.

"Anyone can see by looking at the characteristics of the different biofuels that corn ethanol isn't 'green,'" says Alisa Gravitz, Co-op America's executive director. "You don't have to crunch numbers very long to conclude that ethanol isn't a fuel solution for people or the planet. As a country, we should be moving towards driving less, improving fuel economy, and advancing plug-in hybrids powered by electricity from renewable, green sources." CAQ

—Sarah Tarver-Wahlquist and Tracy Fernandez Rysavy

TRUE TALES

How Eric Henry helped formed a biodiesel cooperative to make this alternative fuel easier to obtain where he lived.

ERIC HENRY, BURLINGTON, NORTH CAROLINA

Running your vehicle on B100 is one of the best ways to cut your personal global warming emissions using current technologies (see p. 20). And if you can't find B100 in your area, the easiest way to obtain biodiesel is to make it yourself. While many do-it-yourselfers simply use an old blender and a handful of other supplies, investing in a biodiesel processor helps ease the process. Most processors cost around $3,000 and will make about 45 gallons in each batch.

Eric Henry, owner of Co-op America business member T.S. Designs™—and a new Co-op America board member, elected by our business members—bought his own Fuelmeister processor in 2003, after having his interest in biodiesel piqued at Solfest, a two-day gathering of people interested in learning about and using renewable energy.

"I knew that the driving you do in your car is one of the biggest impacts you have on the environment, so I was excited about what I was learning about biodiesel," he says. "When people found out what I was planning on doing, they all said, 'There's no way you're going to make fuel out of french fry grease.'"

But Henry refused to let the naysayers curb his enthusiasm, and he bought a diesel Volkswagen to go with the Fuelmeister. In short time, he was making 45 gallons of biodiesel fuel a month. Running on biodiesel, Henry's VW Golf got about 45 miles to the gallon, and people's doubts about running a car on vegetable oil started disappearing. His wife soon caught on and bought a diesel car, followed shortly by his business partner. Soon they were all fueling their diesel vehicles with biodiesel made from waste vegetable oil, but the Fuelmeister couldn't process enough biodiesel to meet all of their needs.

"We were making 45-gallon batches a couple times a week, but we couldn't keep up with our demand," he says. "So we sold the Fuelmeister to a local university and built a larger one ourselves, while we formed the Burlington Biodiesel Cooperative."

As more of their friends started catching on to the benefits of biodiesel, forming a cooperative made more and more sense. "By bringing in other people, we were able to share the expense, share the work, and share the fuel," he says.

By forming a cooperative, members can pool their resources to purchase the required equipment and ingredients to make biodiesel. In addition to sharing costs, forming cooperatives helps give more people access to biodiesel without being subject to laws regarding commercial sale.

The Burlington Biodiesel Cooperative has ten members, all of whom assist in the production of biodiesel. Each member promises at least three hours of work each week. Together, the ten members make about 300 gallons of biodiesel each week, made from waste vegetable oil they gather from local restaurants.

"We think we have the perfect community model," says Henry. We're getting our oil locally, brewing it locally, burning it locally, and improving local air quality."

The Piedmont Biofuel Cooperative in Piedmont, North Carolina, has a different model, notes Henry; rather than being a working cooperative, where each member promises to work a certain number of hours each week, members pay a fee to belong to the co-op. This membership gives them access to the cooperative's biodiesel, even if they didn't help to make it themselves. This model allows the sale of biodiesel to grow commercially.

"Even though that's not our model, because we aren't interested in producing more than we're using ourselves, we support this as a way to get fuel to more people," says Henry. In fact, the Burlington co-op is installing a Piedmont Biofuels pump on their property, so that Piedmont members can fuel up when they're in Burlington.

For those interested in sharing biodiesel among friends, Henry says, "We are open source on all our developments and have helped people around the world start similar co-ops."

To that end, Burlington Biodiesel has put its cooperative agreement and other information on its Web site, www.burlingtonbiodiesel.org. Henry says people can also find out how others across the country are using similar cooperative models at the Biodiesel Co-ops Conference, which will take place July 13-15, 2007 in Golden, Colorado. Visit www.b100.org for more information.

"Biodiesel is not the total solution to our oil addiction, but is an important part of the solution for our country to become energy independent," says Henry.

—Sarah Tarver-Wahlquist

To help curb climate change, we need to make cars that achieve 60 mpg by 2054. Today's plug-in hybrids get 100+ mpg, and their emissions are lower than those of any other vehicle on the road today.

Plug-In Hybrids:

Our Best Hope

CalCars.org

In January of this year, auto manufacturers showed their wares at the North American International Auto Show. Standing tall in the showroom was the H3, produced by General Motors (GM). This smaller version of the Hummer SUV gets about 15 miles to the gallon.

Just across the showroom, a head's turn away, GM was showcasing another vehicle: the Chevrolet Volt, the first proposed plug-in hybrid electric vehicle (PHEV) to come out of the world's largest auto manufacturers. The Volt is still a concept car, but the technology behind it has many hoping that the cars of the future will use ten times less gas than the H3, getting around 150 miles to the gallon (plus electricity).

PHEVs are like the current gasoline-hybrid cars on the market, but with a larger battery capacity and a plug that allows drivers to recharge that battery from any conventional electrical outlet. The bigger, better battery allows the car to get power by plugging in, unlike a regular hybrid, resulting in a cleaner-burning car with far fewer greenhouse gas emissions and increased fuel efficiency. PHEVs turn the gas tank into a backup fuel source, which kicks in when the electric battery is drained, means that drivers can effect those environmental benefits while still enjoying the long-distance range of a conventional gas-powered car.

GM predicts that the Chevy Volt will be capable of getting 150 mpg—well above the 60 mpg fuel economy goals for 2054 set out in Co-op America's 12-Step Plan to curb climate change (see p. 9). PHEVs look especially attractive from a global warming perspective when the electricity

comes from renewable sources—then, their total emissions go way down.

Better yet, we have what it takes to make the switch to PHEVs now, without waiting around for unproven technology while the climate crisis deepens. Demonstration cars built and driven by PHEV aficionados regularly get 100 mpg in city driving and lower mileage on the highway—overall mileage remains an impressive 80–150 mpg.

So why aren't they here yet, and what can we do to get the big automakers to start making them? Read on to find out.

THE NEXT STEP IN EFFICIENCY

For many, the development of the plug-in hybrid, or PHEV, is the answer to the decades-old problem of bringing emissions-free electric vehicles to the mass market. Even with a range of 100–150 miles for every five hours of charging, electric cars have proven a difficult sell to the average US consumer, despite their fuel savings and environmental benefits.

Some US drivers would use little to no gas between charges with a PHEV, which could get between 80–150 miles per gallon of gasoline.

"For most people, having a car that puts out zero emissions isn't enough," says Dave Goldstein, president of the Washington Area Electric Vehicle Association. "People want to know whether or not the car will meet their daily needs, and whether it will be able to carry their family to the beach. So to appeal to the mass market and bring down emissions, we need to focus on increasing the range of the electric vehicle. The plug-in hybrid is the next step."

Because of the increased battery capacity, PHEVs could run on electricity much of the time—the Chevy Volt, for instance, would have a 40-mile electric range before the combustion engine would kick in. The US Department of Transportation estimates that the average American drives 29 miles a day, so most drivers would be able to use little or even no liquid fuel between charges.

"Well-to-wheels" analysis (which considers the energy used to extract and process fuel and power a vehicle) by Argonne National Labs show that PHEVs run on conventional gasoline emit 40 percent less CO_2, 35 percent less carbon monoxide, and almost 50 percent fewer volatile organic compounds (VOCs) than standard internal combustion engines. A paper put out by the National Renewable Energy Lab (NREL) confirms Argonne's findings, stating that even given the current mix of electricity in the US grid, the use of PHEVs would emit an average of 42 percent fewer CO_2 emissions than vehicles with standard engines.

While other fuel alternatives, like ethanol from corn, produce little net energy and require a vast new production and delivery infrastructure, we could switch the majority of cars to PHEVs tomorrow without building a single new power plant. A 2007 study by NREL concludes that the current US electrical grid has enough off-peak power for the daily commutes of 73 percent of the US light duty fleet (all cars, trucks, SUVS, and vans), if they were PHEVs. The remainder could easily come from renewable solar or wind energy.

In fact, EVs and PHEVs are the only personal vehicles currently available that can be run on electricity generated by renewable resources. If your home runs on green power right now, plugging a PHEV into one of its outlets would enable you to drive nearly emission-free until you drain your battery and the combustion engine kicks in.

As Sherry Boschert points out in *Plug-in Hybrids: The Cars That Will Recharge America* (New Society Publishers, 2006), PHEVs make wind power use even more attractive. The problem with wind power has been that it is most abundant during

From Vehicle to Grid

In addition to the increased efficiency and lower emissions of plug-in hybrid electric vehicles (PHEVs), many experts say that PHEVs can also support renewable energy and strengthen the US electrical grid. It's all possible through vehicle-to-grid technology (V2G), a new development that links PHEVs with renewable energy storage.

"One of the weaknesses of solar and wind is that the sun doesn't shine and the wind doesn't blow 24-7," says Sherry Boschert, author of *Plug-in Hybrids: The Cars That Will Recharge America*. V2G technology solves that issue by using PHEV batteries as green energy storage systems. Here's how it works: Parked PHEVs would plug into a network owned by their local utility, which would use the car batteries to store power and later draw it from them—much like utilities draw extra power from solar homes in net metering arrangements—during peak demand hours.

"The average car is driven for three hours a day and parked for 21 hours," says Boschert. "One million vehicle-to-grid EVs would put power into the grid equal to 20 average power plants."

The National Renewable Energy Lab estimates that the use of V2G technology in PHEVs could help double the use of wind power by 2050.

It'd be a win for the PHEV-owner's pocketbook, too. Dr. Andrew Frank of the University of California–Davis, the inventor of the modern PHEV, predicts that if PHEVs were mass-produced, they'd cost a few thousand dollars more than a conventional hybrid, and V2G technology would add only $400 to that price.

Jon Wellinghoff, of the Federal Energy Regulatory Commission, adds that by "renting" their batteries back to their utilities when their cars are parked, V2G PHEV owners could actually earn money. While the average owner of a standard car pays $1,200 a year in fuel costs, a V2G PHEV owner could make anywhere from $425 to $2,790 per year by helping to make the grid more efficient, he says.

Though it sounds like something out of a science fiction novel, experts say we have the technology to start bringing V2G PHEVs online today. In fact, some cities are already planning ahead for V2G cars. Will Wynn, mayor of Austin, Texas, says that the City Council has set aside $1 million for rebates for the first residents who purchase PHEVs—and the city intends to change building codes to require plugs in municipal parking lots, with Internet connections to Austin Energy. In northern California, the Bay Area Rapid Transit System (BART) is looking into setting up a V2G system for tapping into PHEV car batteries in commuter parking lots.

nighttime off-peak hours, when most people are sleeping rather than using electricity—and power storage for later use isn't a technology that's readily available. However, most car owners would plug in their PHEVs at night, giving utilities a market for peak wind power.

The few PHEVs on the road now use gasoline as their fuel source, but PHEVs could be designed to run on biodiesel or cellulosic ethanol. Because PHEVs mostly use electricity for daily driving, switching to PHEVs on a large scale would help resolve much of the food vs. fuel debate swirling around biofuels (see p. 24). Boschert notes that widespread use of PHEVs would reduce the need for liquid fuel in the US to a small fraction of the 200 billion gallons we use per year, making a switch to a sustainable biofuel easier to achieve—and then the net emissions of a PHEV would get even better.

And it's not just the environment that would benefit from the use of PHEVs, but consumers' wallets as well. Calculations by the Electric Power Research Institute show that PHEVs cost the equivalent of 75 cents/gallon to run—which, assuming $3/gallon gasoline and 8.5 cents/kwh electricity, is a 75 percent reduction in the cost of fueling a vehicle with gasoline alone.

WHAT'S STOPPING US?

While GM is the only car company to present a concept plug-in hybrid, other manufacturers say they are looking into the technology. However, none has a production schedule to get these cars on the road. Car manufacturers claim they're waiting for lithium-ion batteries that last the lifetime of the car and have a 40-mile range, before they can bring a reliable and affordable PHEV to US showrooms.

But PHEV advocates argue that car makers already have the technology—and they've proven it by converting standard hybrids to plug-ins themselves. Felix Kramer of the California Cars Initiative (a.k.a. CalCars.org), a group dedicated to promoting PHEVs, drives a PHEV converted from a 2004 Toyota Prius. Kramer's souped-up Prius averages over 100 mpg, puts out half the CO_2 emissions of a conventional non-hybrid, and costs less than half as much per mile to drive.

"The sticking point is that carmakers don't want to do this yet, and they cite batteries as a reason," says Kramer. "We say that we have batteries now that are good enough, and the world can't wait. If we get a first version out there, the product will continue to evolve, and by the time the car companies are in mass production, batteries will be far better."

But even while the car manufacturers drag their feet, several companies have emerged that will convert gasoline-electric hybrids to PHEVs. The process costs between $10,000–$15,000 per vehicle. Most conversions so far have been for utilities and municipal fleets, except for a few pioneers like Kramer, who was the first consumer to own a PHEV.

Toyota, maker of the Prius and Camry hybrids, surpassed US automaker GM in world sales for the first quarter of 2007, and Lee Iacocca, former CEO of Chrysler, sees US automakers' reluctance to move forward with hybrid technology as the center of their sale problem.

"The 'big three' is not the 'big three' anymore," Iacocca told National Public Radio, referring to the falling sales of General Motors, Ford, and Chrysler. "[They] didn't adapt quickly enough to the energy problem in this country [and were] not ready with the right kind of cars."

CalCars.org

The CalCars team began converting Toyota Priuses to PHEVs in 2004 mainly to demonstrate to the public and to car manufacturers that PHEVs are possible now. From left: Ron Gremban, Felix Kramer, Marc Geller, Kevin Lyons, Andrew Lawton.

He now sees the future in PHEVs. "I've become a real fan of plug-in hybrids," he said, adding that he believes PHEVs will be the "wave of the next five years, big time."

Fortunately, the support base for PHEVs is starting to gain some serious momentum. Kramer notes that the list of universities, utilities, and government officials from across party lines supporting PHEVs (available at www.calcars.org/partners.html) shows how broad it has become. In fact, former CIA Director James Woolsey, who advocates for PHEVs for national security reasons, refers to the diverse interests lining up behind PHEVs as the "coalition between the tree-huggers, the do-gooders, the sod-busters, the cheap hawks, and the evangelicals."

But it's up to all of us to pressure the car manufacturers to put PHEVs on the market sooner, rather than later. "Before we get Detroit to really take this seriously, we'll have to send them the message that this is what consumers want," says Dave Goldstein. "We need to generate excitement and confidence, so people will start walking into their dealerships and saying, 'I'm not buying a car until it plugs in.'" CAQ

—Sarah Tarver-Wahlquist

Take Action for PHEVs

PHEVs represent our best hope for creating cars that use less fuel, and produce fewer emissions, while matching the range of cars on the road today. It's up to us to stop the corn ethanol insanity and help get these high-mileage cars on the road.

Send the postcards next to p. 18 to Ford, GM, Toyota, and your congressional representatives, telling them that you want your next car to plug in. We're also asking them to stop the unsustainable progression toward corn ethanol and to up the mileage of our US fleet to help curb the climate crisis.

Then, go online to PluginPartners.org to sign another petition demanding that car manufacturers move forward with PHEV technology.

For a list of companies that are planning to offer PHEV conversions and conversion kits in the future, visit CalCars at www.calcars.org/howtoget.html.

And for more on Felix Kramer, CalCars, and the PHEV story, see our Web exclusive at www.coopamerica.org/go/fuels.