



THE ROAD TO CLEANER & CHEAPER

**A Handbook of Transportation and Related Energy Choices
2009 and Beyond**

*Prepared for Consumer Watchdog
by Judy Dugan*



TABLE OF CONTENTS

EXECUTIVE SUMMARY	3
GRADING THE OPTIONS	3
ENERGY MARKET OVERSIGHT AND REGULATION	3
RENEWABLE FUELS AND CLEAN VEHICLES	4
WHO PAYS, WHO BENEFITS	5
INTRODUCTION	6
BIG-PICTURE POLICY ESSENTIALS	7
REGULATE ENERGY TRADING MARKETS	7
REGULATE U.S. REFINERIES AND FUEL SUPPLIES	8
ALTERNATIVE TRANSPORTATION FUELS AND VEHICLES	11
HYBRID/PLUG-IN HYBRID/ALL-ELECTRIC VEHICLES	11
POLICY RECOMMENDATIONS	12
ETHANOL	14
POLICY RECOMMENDATIONS	15
BIODIESEL	16
POLICY RECOMMENDATIONS	16
NATURAL GAS	18
POLICY RECOMMENDATIONS	18
HYDROGEN	20
POLICY RECOMMENDATIONS	20
COAL-TO-LIQUID FUELS	21
POLICY RECOMMENDATIONS	21
PAY FOR CHANGE FAIRLY	22
END NOTES	26

EXECUTIVE SUMMARY

This handbook offers solutions for the most visible and pervasive sector of the current oil/environmental crisis: transportation by automobile. Americans travel more than 3.5 trillion vehicle miles per year¹ (not even including occasional long-distance drives). They face often-staggering gasoline costs and emit millions of tons of pollutants. Our assessments and recommendations aim at reducing the use of oil as a personal transportation fuel while offering consumers alternatives that are ultimately both cleaner and cheaper.

Consumer Watchdog agrees with proponents of energy efficiency and conservation that both are fast, effective ways to reduce all types of fossil fuel dependence. These solutions are intertwined with vehicle use, and addressed here only in that context, for example in higher CAFÉ standards. Similarly, attention to mass transit is essential. But mass transit will not address the immediate problems of millions of Americans who lack access to robust urban transit systems—meaning most Americans.

In the handbook, we highlight policies aimed at more effectively monitoring and regulating the oil industry and ensuring that the clean fuels and technologies of our automobile future don't become the next energy oligopoly. We also grade the various alternative fuels in order to help policymakers and the public assess the choices for the future of automobile transportation.

*Prepared for Consumer Watchdog
by Judy Dugan
www.ConsumerWatchdog.org*

1. GRADING THE OPTIONS:

In order to spend taxpayer money wisely and make smart choices about our transportation policy, policymakers must distinguish between policies, programs and technologies that have a broad public benefit and those for which the benefits are narrowly accrued by special interests. Consumer Watchdog has graded many of the technologies and fuels being debated in the planning for America's energy future. The details discussed in the handbook are important and offer some caveats to these grades, but in summary:

Grade A – Hybrid, Plug-In Hybrid and All-Electric vehicles

Grade B – Ethanol and Biodiesel fueled vehicles

Grade C – Natural Gas fueled vehicles (higher grade for use in short-haul bus and truck fleets)

Grade D – Hydrogen fueled vehicles

Grade F – Coal-based transportation fuels

2. ENERGY MARKET OVERSIGHT AND REGULATION:

The neglect and demolition of reasonable government oversight of the oil industry has cost motorists billions of dollars and wreaked havoc on the economy and the environment. Energy markets and refinery operations in particular suffer from lack of modern regulation.

There are two crucial sources of unreasonably high pump prices, both tied to the deregulatory focus of national energy policy over the past several decades: rapacious speculation of commodity traders both in and outside of oil companies and market manipulations by oil refiners.

Energy commodity markets require a major regulatory overhaul to distinguish between pure financial speculation and transactions involving actual buyers and sellers. All trading should be far more transparent; financial speculators, including financial trading departments inside major oil companies, should also play by tougher rules. These include putting up more of the value of a trade in each transaction, limits on highly complex trading schemes that can be misused and overall limits on daily trades. In order to protect against a speculation-driven and distorted global commodity market for renewable fuels, regulation of biofuels must be established in concert with the expansion of the biofuels market.

**EXECUTIVE SUMMARY
CONTINUED**

Oil refining has become a tool for oil companies and other large players to manipulate fuel supply to keep prices up. The regional gasoline price spikes accompanying 2008's Hurricane Ike were exaggerated by refiner cutbacks that had already left the nation with its lowest gasoline supply in years. The price spikes after Hurricane Katrina in 2005 were even more dramatic and lasting, needlessly so. The Department of Energy should have power to require an average 30-day national supply of gasoline on hand rather than the recent 20-22 day supply average. Refiners should be required to report their cost of oil and their wholesale prices for finished products, such as gasoline and diesel, to enable regulators to prevent price-gouging at the wholesale level. Refinery industry data should be publicly available down to the level of individual refineries, and ultimately refinery profits should be regulated along the model of public utilities.

3. RENEWABLE FUELS AND CLEAN VEHICLES:

Policy choices can transition our transportation system to more efficient, cleaner and cheaper fuels, without having to pick the exact formula. However, policy should be guided by realistic, consumer-oriented thinking that does not encourage wasteful projects such as transportation fuel from coal.

Hybrid vehicles and the coming generation of plug-in hybrid vehicles have few environmental drawbacks; they can calmly coexist with, and be improved by, biofuels. Electric hybrid-diesel vehicles, for instance, will be able to burn biodiesel without modification and achieve higher mileage than gasoline-electric hybrids. All types of dual-fuel hybrids should be encouraged.

Biofuels' promise is limited today not by the availability of vehicles but by lack of fueling infrastructure and the drawbacks of using crops as feedstocks. Policy decisions should focus on second-generation biofuels and regulated development of fueling stations at existing gasoline stations.

Compressed natural gas and propane are cleaner than gasoline and are useful transitional fuels for urban bus and commercial fleets, such as short-haul trucks. Policy decisions should encourage these appropriate uses, but not at the cost of increased liquid natural gas imports or higher utility rates.

Hydrogen remains a chimera, because of vehicle cost and the energy cost of producing hydrogen as a fuel. While its promise of emission-free vehicles will continue to entice ad-

herents, the lack of even remotely near-term viability makes it a lower priority approach. Coal-to-liquid fuel is no more than a pork magnet for the coal industry, more polluting than petroleum and a distraction from better alternatives.

4. WHO PAYS, WHO BENEFITS:

Switching to a transportation economy that uses far less petroleum does not come free, but the transition can be fair-softening costs to consumers through direct and indirect subsidy and requiring corporations and shareholders to bear part of the burden.

Congress must first eliminate billions of dollars worth of unjustifiable petroleum subsidies and tax excess petroleum profits, returning some of the proceeds to consumers and investing the rest in renewable energy.

Carbon tax, auction and trade, or cap and trade systems that will be negotiated in Congress will garner billions in federal revenue. While these alternatives are not specifically discussed in this handbook on transportation, offering substantial consumer credits and other direct incentives to offset the initial costs of reducing emissions will be important in reducing transportation use of fossil fuels.

INTRODUCTION

Transportation is the immediate and familiar measure for consumers of the cost and quality of daily life. Every driver knows the cost of a gallon of gasoline. Every family sees the strain of roller-coaster energy costs on its budget, while worries about global warming and pollution grow more important to their daily decisions. Consumers want solutions, but they don't want to be pick-pocketed to get there.

President Obama has stated that, despite the deep recession, a greener energy policy is among his top three priorities. The United States is far more dependent than other developed nations on cars and roads, something that cannot be swiftly undone. But it can become cleaner in affordable ways.

That is the point of this plain-language handbook, which gives grades of A to F for vehicles and fuel choices based on their balance of cleaner and cheaper.

About 70% of the oil consumed in the United States is for transportation, which accounts for 30% of U.S. carbon dioxide emissions, second only to power generation. The U.S. goals of reducing oil dependence and slowing global warming will succeed or fail in large part on decisions by Congress and the president about transportation fuels and vehicles.

The 2008 U.S. financial meltdown was accelerated by oil prices over \$145 a barrel and motor fuels topping \$4.00 a gallon. A temporary, dramatic drop in fuel prices and the serious economic recession will tempt policymakers to delay action. But delay in developing strong transportation policies will further weaken already shaky markets for alternative vehicles and fuels, including new generations of biofuels and plug-in hybrid vehicles. Stability is everything in sustaining new technology and creating the green jobs that go with it.

Wearied by economic recession and greed-driven corporate implosions, Americans will not trust policies that aid only corporate master plans. Government must be visible as a protector against corporate excess and market manipulation, in new "green" markets as well as traditional energy. Policies must create green jobs and cushion the costs of change for individuals.

If government visibly gets oil markets and oil companies under regulatory control, if transition costs are fairly and transparently shared, and if the environmental benefits are clear, consumers will embrace the goal of a cleaner transportation system that ultimately will be cheaper than staying on the petroleum roller-coaster.

1. BIG-PICTURE POLICY ESSENTIALS

Regulation is essential in order to create efficient markets that protect both investors and consumers, as the financial market meltdown so sharply illustrated. In energy markets, oil prices that rose in the summer of 2008 to more than \$145 a barrel, then plunged to less than one-third that price, demolished the excuse that only “supply and demand” were at work. Gasoline prices followed the price of oil up, yet fell more slowly as refiners and marketers sought to recoup profits. Neglect of regulation damaged consumers, the economy and the environment. Roller-coaster pricing also creates start-and-stop development of renewable energy sources.

As U.S. markets in renewable fuels develop, government must oversee and regulate them to prevent the market concentration, gaming and profiteering that surround the petroleum industry.

Consumers also view excessive tax breaks for highly profitable oil companies as a failure of government to balance corporate demands with the common good. Oil company subsidies must be recaptured to fund renewable fuels and energy, as well as direct consumer subsidies for greener technology and reduced energy consumption.

REGULATE ENERGY TRADING MARKETS:

Modernize regulation to account for and curb energy trades that are entirely speculative. Much of the 2008 price spike in crude oil was driven by electronic trading markets in which only a fraction of sales involved physical offer or delivery of products. This financial-only trading, known as “noncommodity trading,” has purely profit-seeking goals, unlike hedges against loss in the physical purchase and sale of energy products including oil and natural gas.²

Require higher margins from financial-only trades.

Margins, meaning the amount of a trade’s value that traders must pay up front, are set as low as 5%-7% in energy futures markets, unlike the 50% of value required upfront from stock traders. The low margins were originally intended to help producers and buyers hedge their own sales and purchases without taking capital out of productive use. Today, low margins and regulatory loopholes allow financial speculators to control too much actual product for too cheap a price. The margins on financial-only trades should be raised to match the stock market’s 50% requirement.

Limit financial-only trades in size and frequency. Regulate and require full disclosure of exotic energy trading schemes that may have the intended or unintended effect of increasing prices and price volatility. Set a hard daily limit (say, 3 million barrels) for holdings of petroleum products by the parent company of any trading entity across all trading platforms, not just those, like the New York Mercantile Exchange (NYMEX), that are currently regulated. The limit must apply to the parent company to prevent a single owner from spinning off multiple funds to evade the limits.

Support dispersed markets for biofuels. Oil and gasoline operate as a worldwide integrated market because gasoline is made from a single, capital intensive feedstock. That model alone will not nurture new generations of environmentally superior and cheaper biofuels, in which a variety of relatively bulky competing feedstocks with relatively low capital requirements, (such as cornstalks, algae, wood waste and switchgrass) can keep the new “crude” fuels’ prices lower. The 2008 federal farm bill made a step in the right direction in favoring small biodiesel producers (less than 150 million gallons) for certain subsidies.³ That creates more local jobs in the green economy and would tend to establish pricing on actual regional cost of production. Fuel refining and distribution must be integrated and centralized enough to reach consumers efficiently, with a watchful

1.
**BIG PICTURE POLICY
ESSENTIALS CONTINUED**

regulatory eye for market abuse as the systems grow.

REGULATE U.S. REFINERIES AND FUEL SUPPLIES:

A transition to cleaner, cheaper fuels should not be an excuse for oil companies to reduce supplies and make higher profits from selling less gasoline and diesel.

Even as the oil industry is demanding the right to drill in more coastal waters, the refining end of the industry has reduced production of fuels, keeping national supplies low in historic terms and thus subject to sudden price spikes in the event of any interruption of production. In recent years, the oil industry has often exported fuels or reduced refining in order to maintain or increase upward pressure on gasoline and diesel prices.⁴ And, with virtually no regulatory oversight, the price of gasoline is easily disconnected from the price of crude, which is why as oil prices fell from their \$145 a barrel peak in the autumn of 2008, gasoline prices dropped much more slowly.

Low supplies of refined product make fuel prices excessively vulnerable to sharp price spikes in the event of natural disaster or refinery outages. The aims of public policy should be to:

- Make more refinery data available to the public. The Energy Information Administration (EIA) already gathers substantial detailed information on refinery operations, company by company. The EIA publishes days of supply of gasoline available nationally but not regionally,⁵ as it does with the rate at which refineries in aggregate are utilized.⁶ Such information should be available by state, by region, by company and individual refinery. Currently, there is no requirement that refineries even report outages, which swiftly affect prices.⁷ In an industry as concentrated and uncompetitive as petroleum and refining, this detailed information should not be shrouded as a “trade secret.”
- In the event of low supplies and in the absence of natural disaster, the Secretary of Energy should have the power to require refiners to produce fuels at a rate that keeps a 30-day average supply of gasoline and ethanol-blended gasoline on hand nationally. This would return supplies to the average of the early 1990s⁸ and greatly reduce price volatility, under both normal conditions and during natural disasters. The current average supply is 20-22 days and usually less in the West. Refineries nationwide have recently operated at well below their stated capacity, according to EIA data, even in periods of high prices, particularly in 2006 and 2007.

1.
BIG PICTURE POLICY
ESSENTIALS CONTINUED

- Oversee refinery operations to prevent unjustified and unnecessary shutdowns. Inspect facilities more frequently to assure adequate maintenance and safety and diminish accidental shutdowns.
- Require refineries to report their raw material and operating costs, to prevent de facto price-gouging. The public and policymakers should know refineries' actual cost of fuel production and have the right to protest excess profit margins.
- Oversee imports and exports of transportation fuels. The Energy Secretary should have the power to slow fuel exports or increase imports in times of price or supply emergency. For instance, as diesel fuel prices were spiking in 2008 to records near \$5.00 a gallon in the West, refiners raised their exports of finished diesel fuel.⁹ Government had no mechanism to curtail these exports to protect the U.S. economy.
- If greater transparency and oversight of the fuel supply do not prevent refiner gaming of supplies, institute utility-style regulation of refining. Instead of requiring regulatory approval of consumer prices, regulation should be aimed at refinery profit margins. While regulated refineries would not suffer long-term losses, they also could not increase margins above a set long-term average. Consumers would benefit from greater price stability. Refiners, both independent and integrated, would reap an average profit based in part on their reinvestment in environmental upgrades.
- Eliminate underground tanks that still hold midgrade fuel at some stations. Midgrade is the lowest-demand fuel, and eliminating a separate midgrade storage tank at stations that still have them would have the effect of increasing available supply and/or freeing up a storage tank for biofuels. Stations could still blend midgrade gasoline with a pump that mixes from two underground tanks, as many already do.
- Closely oversee markets for finished biofuels, such as E85 and B90, as fueling infrastructure is developed and market share increases. Encourage regionalized production and distribution.
- Protect clean fuels from price wars. Use spot subsidies at the pump if necessary to keep renewable fuel prices competitive with petroleum and suppress deliberate price undercutting by oil refiners.

1.
BIG PICTURE POLICY
ESSENTIALS CONTINUED

- Prohibit any contract between major branded oil companies and fuel retailers that discourages the addition of biofuel pumps under the same canopy as the branded fuels. Current contract restrictions make the addition of biofuel pumps costly and often require the building of new tanks, new fueling areas and new canopies. Major oil companies say they are merely trying to prevent the sale of fuels that they did not produce under their branded canopy; the regulatory removal of contract restrictions would thus encourage major brands to produce their own biofuels.

2. ALTERNATIVE TRANSPORTATION FUELS AND VEHICLES

Any successful effort to reduce petroleum dependence in the U.S. will depend on cutting our use of petroleum fuels—gasoline and diesel. Here’s an evaluation of alternative fuel and vehicle possibilities—what’s good, what’s bad, what’s possible, and how to get there.

Alternative Fuels – Hybrid/Plug-In Hybrid/All-Electric Vehicles

Hybrid-electric vehicles run on conventional gasoline or diesel engines that are boosted or partially replaced by electric batteries that are more advanced than the familiar lead-acid batteries in conventional autos. They are recharged while driving, especially when the car brakes or slows. The more powerful the battery in relation to engine size, the greater the fuel savings. Plug-in hybrids, which are nearing commercial introduction, run for at least tens of miles on battery alone, further reducing fuel usage and nearly eliminating fuel use for average urban commuters. Batteries are recharged during driving and with an exterior plug. All-electric vehicles skip the conventional engine and run on rechargeable batteries alone, but for a limited number of miles before recharging.

HYBRID/PLUG-IN HYBRID/ALL-ELECTRIC VEHICLES: Grade A

PRO: Hybrid vehicles are the quickest path to higher mileage and lower petroleum use on the road. Conventional hybrids’ established consumer popularity paves the way for plug-in hybrids, dual-fuel hybrids and possibly for all-electric vehicles.

The current Toyota 46-50 mpg Prius and the 43-mpg Honda Civic hybrid cost up to a few thousand dollars more than similar conventional cars. But in times of high gas prices, as in 2007 and much of 2008, the time needed to “pay back” the buyer through gasoline savings is as short as two to three years, even without federal tax incentives.¹⁰ Even the new Ford Fusion hybrid, larger than the Prius, will get near 40 mpg.¹¹

Commercial plug-in hybrids are expected to get up to double the miles per gallon of conventional hybrids.

Diesel-electric hybrids engines get higher mileage than gas-electric hybrid engines (all diesel engines get comparatively higher mpg than gasoline engines) and would have the added environmental advantage of being able, without modification, to run on high-percentage blends of biodiesel, or 100% biodiesel. Manufacturers currently see diesel/electric passenger cars as too expensive for broad consumer production,¹² but diesel-electric engines are now being produced by at least one heavy-equipment maker, Komatsu.¹³

The next-generation lithium-ion battery for plug-in hybrids is expected to reduce the size, weight and cost of hybrid batteries. Lighter and smaller lithium batteries, as a bonus, are also showing crossover promise as power storage medium for solar and wind power: Lithium battery storage at power plants could thus recharge lithium car batteries at night.¹⁴

Hybrids and electric vehicles will likely have lower lifetime engine maintenance costs because the engine design has fewer moving parts, which reduces wear. This is an anecdotal observation and a ripe subject for study.

The life-cycle environmental benefits of electric motors and batteries will continue to improve as more electric generation comes from wind and solar, and less from coal and other fossil fuels.

2.
ALTERNATIVE TRANSPORTATION
FUELS AND VEHICLES
CONTINUED

Hybrid and Electric Vehicles

CON: The clean-air and greenhouse benefits of electric and plug-in hybrid vehicles are diminished to the extent that their recharging power comes from coal and other fossil fuel-burning power plants.

Plug-ins and all-electric vehicles at this point carry a hefty price premium, which may fall with larger production.

Large vehicles, including SUVs, that are marketed as hybrids offer a low percentage improvement in mpg because of small battery size in comparison to engine size. They are a marketing tool used as greenwash for carmakers' overall low mpg and an excuse for often ridiculously higher sticker prices.

While plug-ins will recharge off of conventional household current, and run on gasoline as necessary, all-electric vehicles face a dearth of public or corporate charging stations. One pilot commercial project may set up electric-car "battery swap" stations in Northern California and Israel, but most major auto manufacturers have so far declined to participate, limiting the stations' reach.

Hybrid-vehicle batteries, if disposed of improperly, could pose an environmental threat. However, current hybrids' nickel-metal-hydride batteries pose substantially less threat than conventional autos' lead-based batteries.¹⁵ The next generation of lithium-ion batteries will pose even less environmental threat, according to Environmental Defense.

POLICY RECOMMENDATIONS:

Consumer tax credits. Restore purchaser tax credits and carpool-lane incentives for the highest-mileage current hybrids. A \$1,500 credit would make the current crop of hybrids competitive with gasoline engines. Transfer the credits to plug-in hybrids as they become widely available. Develop consumer education about the longer-term gasoline savings that would pay back any remaining differential in initial price.

Federal incentives. Stabilize and extend federal incentives for U.S.-based hybrid vehicle development and production. In turn, require defined mpg goals for subsidies, and agreements to create extensive "green-collar" job training and hiring.

Battery disposal. Follow Toyota's lead. Toyota has the most comprehensive battery recycling program, including a \$200 bounty payment for batteries that slip through the recycling net.

2.
**ALTERNATIVE TRANSPORTATION
FUELS AND VEHICLES
CONTINUED**

Hybrid and Electric Vehicles

Diesel hybrids. Encourage diesel-electric hybrid engine development for public transit, heavy equipment and, as cost-appropriate, for passenger cars. Diesel hybrids get higher mileage than gasoline hybrids, and ultra-clean low-sulfur diesel fuels make such hybrids desirable even without biofuels.

Higher MPG standards. Further increase U.S. fleet mileage requirements (CAFE standards) to at least 40 mpg over the next 15 years to push development of better hybrids and lower-cost electric/plug-in vehicles.

2. ALTERNATIVE TRANSPORTATION FUELS AND VEHICLES CONTINUED

Alternative Fuels – Ethanol

Ethanol is an alcohol fuel, lighter than gasoline, that can be produced from all kinds of plant sources and even household waste sources. It's the fuel equivalent of moonshine, and is by nature high-octane. Most gasoline engines, with modifications to increase the compression ratio, can run on ethanol. It produces far less tailpipe emissions, particularly of the greenhouse gas carbon dioxide, than petroleum fuels. Ethanol's overall emission reductions, however, depend in large part on what feedstock (crop or other biological source) is used to produce it.

ETHANOL: Grade B

PRO: Ethanol, which is made in the U.S. primarily from corn, can also be made from multiple renewable plant and even waste sources.

Ethanol displaces petroleum and increases U.S. energy independence. The 2008 energy price crisis would have been even more painful without the small percentage of ethanol that is already blended into conventional gasoline.

Gasoline blended with up to 10% or 15% ethanol produces a cleaner-burning fuel for use in any gasoline-powered vehicle. Commercially produced "flex-fuel" vehicles run on either gasoline or a blend of 85% ethanol and 15% gasoline known as E85.

The corn ethanol industry has created skilled U.S.-based industrial jobs, infrastructure and a business model for future cellulosic ethanols made from more desirable feedstocks, including agricultural and forest waste, even algae.

Such second-generation ethanols, which are in development in the U.S., have a higher fuel efficiency and a cleaner-than-corn environmental life-cycle profile—what's called in the petroleum industry a well-to-wheels emission assessment. For instance, Brazilian ethanol made from sugar cane produces more and cleaner ethanol per pound of feedstock than corn.

CON: Corn ethanol uses a major world human and animal food crop (though the byproduct left after ethanol is made can be blended with animal feed). Corn ethanol's life-cycle environmental benefit, if it includes emissions from plowing new cropland and industrial agriculture practices, is low. However, this can be a deceptive measurement in that it usually omits comparison with the dirtiest oil sources, such as tar sands.

There is little fueling infrastructure for E85 ethanol fuel. There are more than 1 million flex-fuel vehicles on the road¹⁶ but only 1,200 to 1,800 E85 fueling stations out of 140,000 filling stations in the U.S. Many of the E85 stations, however, are private or for fleet cars only. Public stations are heavily concentrated in the Midwest corn belt. In California, for instance, there are only three public E85 stations.¹⁷

Major oil companies have curbed the installation of biofuel pumps at their branded stations with harsh restrictions in

2.
**ALTERNATIVE TRANSPORTATION
FUELS AND VEHICLES
CONTINUED**

Alternative Fuels – Ethanol

their contracts with dealers--for instance forcing stations seeking to test the alternative fuel market to erect separate (and costly) fueling areas for biofuels, including E85.¹⁸ Most U.S. flex-fuel E85 vehicles run largely on gasoline for lack of a convenient place to fuel up with ethanol.

Ethanol gets up to 25% fewer miles per gallon than gasoline, though this depends on how the engine is tuned: Ethanol burns most efficiently at higher engine compression than gasoline. Because flex-fuel vehicles are tuned primarily for gasoline, their mileage on ethanol is markedly poorer.

POLICY RECOMMENDATIONS:

Federal credits: Continue and extend federal funding for cellulosic ethanol technologies, but continue corn ethanol tax credits at a level that preserves infrastructure and green jobs. Shift funding from corn to cellulosic technologies as they prove commercial scalability. Increase assistance provided in the 2008 farm bill to help corn ethanol companies retool for new feedstocks, preventing plant closures. Don't try to pick a winner, which would repeat the market distortion caused by backing corn ethanol exclusively in the 1990s.

Fueling stations: Build fueling infrastructure for E85. Require that oil companies remove contractual barriers to sale of biofuels at branded gas stations. Offer incentives, low-cost loans and grants to station operators.

Flex-fuel vehicles: As fueling infrastructure increases, allow and encourage factory and owner re-tuning of flex fuel vehicles to favor more efficient use of E85. This may require modest Environmental Protection Agency and state-level changes in emission regulations.

MPG standards: Increase U.S. vehicle fleet mileage standards (CAFE standards), while continuing mileage allowance for ethanol.

Cane ethanol: In the short term, consider lifting tariffs for limited imports of more efficient Brazilian cane ethanol. Establish limits that prevent rainforest destruction and protect domestic cellulosic technologies. Also consider more ethanol imports from Caribbean Basin nations. The federal Caribbean Basin Initiative already allows substantial imports without tariff, and transport costs would likely be lower than from Brazil.

2. ALTERNATIVE TRANSPORTATION FUELS AND VEHICLES CONTINUED

Alternative Fuels – Biodiesel

Biodiesel fuel is usually a processed vegetable oil, and in fact most diesel engines will run on Costco-sized cans of any cooking oil. Engines run better on refined biodiesel, which is simple enough to make that internet recipes for biodiesel are numerous. It can also be produced in large industrial quantities. The original diesel engines ran on peanut oil, until petroleum diesel took over the market.

BIODIESEL: Grade B

PRO: The diesel engines that run almost all heavy trucks and trains get substantially higher mpg than gasoline engines, and biodiesel is the cleanest renewable fuel. Almost any diesel engine will run on a biodiesel mix up to B90.

Like ethanol, biodiesel replaces petroleum, increasing energy independence.

There is promising research on producing biodiesel from algae, which would ease pressure on soybeans, currently the chief commercial feedstock for biodiesel. The fuel can also be produced from animal fat waste from meat production, recycled used cooking oil or any plant-based oil.

The production of biodiesel is less complicated than for ethanol, simple enough that make-it-yourself instructions for the dedicated and thrifty are copious online.

CON: Virgin diesel made from soybeans, while simplest from an industrial-production viewpoint, displaces a food crop. Higher soybean use in fuel, high oil prices and planting of corn in former soybean acreage all affect price.

Soybean prices in spring of 2008 had near-tripled from a year earlier, making soy diesel uneconomical to produce despite high diesel fuel prices. Biodiesel's price remained uncompetitive with petroleum diesel fuel at the end of 2008, though the price of soybeans had dropped far off its high point.

Biodiesel has a variably lower energy content than conventional diesel.

Truckers are wary of variable fuel quality and biodiesel's higher "gelling temperature," which makes it a difficult fuel in cold climates.

POLICY RECOMMENDATIONS:

Encourage B20 Use: The 2008 farm bill encourages use of 20% biodiesel fuel in government vehicles. Even when biodiesel's price is above that of diesel, such blending is a clean-air boon and should be encouraged with long-term tax credits. A B20 mileage credit extension in the 2007 energy bill should not, however, be construed to extend CAFE standard credits to all diesel passenger cars and light trucks,

2.
**ALTERNATIVE TRANSPORTATION
FUELS AND VEHICLES
CONTINUED**

Alternative Fuels – Biodiesel

any more than use of 10% or 15% ethanol would extend such mileage credits to gasoline vehicles.

Require that vehicle warranties extend to use of biodiesel blends. Currently, manufacturer warranties are construed to forbid use of a blend above B5 in diesel passenger vehicles without breaking the warranty. Legislation is necessary to require that new-vehicle warranties remain in effect with at least B20 blends immediately, with a brief phase-in for higher biodiesel blends.

New sources: Intensive publicly funded university and other efforts are needed to determine if completely renewable and nonfood sources, including algae, can be a successful commercial feedstock for biodiesel. Feedstocks not linked to farm and energy commodity prices would tend to stabilize fuel prices.

Other sources: Animal fat biodiesel lags in commercial production. Private commercial projects, such as a much-trumpeted but now dormant deal between chicken producer Tyson Foods and oil company Conoco Phillips, appear to be based entirely on the availability of \$1.00-a-gallon federal credits. These credits are now uncertain. Such joint ventures' research and production results should be made available to government and university researchers on the basis of federal subsidies already provided.

Waste oil from restaurant fryers, once free for the taking, remained at about half the cost of soy feedstock in 2008. But localized refining facilities need encouragement in areas where this waste oil, known commercially as yellow oil, remains underused. Las Vegas, Nev., for instance, has a municipal policy to reap and refine this yellow oil from casino restaurants, and uses it to help run a school bus fleet.¹⁹

**2.
ALTERNATIVE TRANSPORTATION
FUELS AND VEHICLES
CONTINUED**

Alternative Fuels – Natural Gas

The natural gas that powers electricity production and household stoves can also be compressed and used as a vehicle fuel, in special high-pressure vehicle tanks. Some proponents, including natural gas fuel producer T. Boone Pickens, are urging widespread use of compressed natural gas (CNG) to reduce petroleum imports.

NATURAL GAS: Grade C

PRO: Natural gas is more abundant domestically than petroleum; 80% of current U.S. usage is domestically produced.

Compressed natural gas (CNG) is much cleaner at the tailpipe than gasoline or diesel for smog-causing pollutants.

CNG is a suitable cleaner-air alternative for certain large diesel fleets. This includes urban package delivery trucks, municipal buses and short-haul trucking, for instance at ports and grocery distribution centers, where gas compression and vehicle fueling are easily centralized.

CNG, while highly variable in price even within regions, is often cheaper per gallon-equivalent than diesel fuel.

CON: Natural gas is a fossil fuel and releases more carbon emissions than other alternatives including current gas-electric hybrid vehicles.

The use of natural gas as a transportation fuel will compete with its use in electric generation, increasing the potential for a new dependence on foreign energy sources. U.S. natural gas imports are already increasing year over year.

Increased CNG use will raise natural gas prices (which hit records in 2008) and increase pressure for imports of high-sulfur, less-clean liquefied natural gas. Such imports would require building controversial industrial LNG terminals and storage along coastlines.

Higher prices for natural gas will raise consumers' electric bills. This could press utilities to turn back to coal.

There are few public CNG filling stations nationwide. Fueling requires special tanks and complex high-pressure safety connections that are incompatible with current gas stations. Home fueling for private cars requires a costly compressor that takes up to 16 hours to fill an auto tank with a 200-mile range.

POLICY RECOMMENDATIONS:

Encourage compressed natural gas as a transitional fuel for large engines. Shift appropriate bus and truck fleets to compressed natural gas as wind and solar utility power generation increases, freeing natural gas supplies.

**2.
ALTERNATIVE TRANSPORTATION
FUELS AND VEHICLES
CONTINUED**

Alternative Fuels – Natural Gas

Control vehicle use of CNG to prevent natural gas price spikes. A controlled shift will also reduce pressure to build new liquefied natural gas import terminals, which undercut the goal of increased energy independence.

Discourage production of private autos and light trucks that run on CNG. The commercial CNG fueling apparatus, which requires large compressors, is largely incompatible with current fueling infrastructure, unlike that for renewable ethanol and biodiesel.

**2.
ALTERNATIVE TRANSPORTATION
FUELS AND VEHICLES
CONTINUED**

Alternative Fuels – Hydrogen

While California Gov. Arnold Schwarzenegger is a big fan of hydrogen fuel, and even has a Hummer custom-converted to run on hydrogen, he can't drive it outside Los Angeles for lack of fueling stations. Hydrogen, if it fueled a commercially competitive vehicle and was produced without fossil fuel energy, would truly be a zero-emission fuel. But that goal is distant.

HYDROGEN: Grade D

PRO: Hydrogen fuel produces zero tailpipe emissions in fuel-cell vehicles.

Researchers see promise in producing hydrogen from water with solar power.

CON: The prediction of a "hydrogen highway" is mostly hot air, deflecting attention from more developed and affordable alternatives.

Commercial hydrogen production currently requires natural gas as feedstock, requires copious energy and high-temperature steam, and emits CO₂. The process requires nearly two times the energy that the hydrogen fuel will produce.

The technology required for current hydrogen production favors large corporate infrastructure, as in vertically integrated oil companies. A concentrated production infrastructure may lead to an uncompetitive, high-cost market.

The cost of the engine is prohibitive. Hydrogen vehicles are currently handed out for "testing" to celebrities, or on money-losing leases with complicated servicing agreements.

Fueling stations are rare and hydrogen vehicles' range remains somewhat limited.

POLICY RECOMMENDATION:

Continue research, particularly of solar- or wind-powered production of hydrogen fuel from water. Put further incentives on hold.

**2.
ALTERNATIVE TRANSPORTATION
FUELS AND VEHICLES
CONTINUED**

*Alternative Fuels – Coal-To-Liquid
Fuels*

The production of liquid fuels from coal is a longstanding technology; such fuel was intensively produced by Germany during World War II when its oil imports were curbed. However, even the costly process of turning coal into fuel releases about half of the coal's CO₂ into the atmosphere.

COAL-TO-LIQUID FUELS: Grade F

PRO: U.S.-produced, replaces petroleum as a fuel.

CON: Coal-to-fuel production emits substantial greenhouse gases even before the fuel is used.²⁰

The fuel itself is not cleaner than gasoline.

The mining of coal causes wide environmental damage, including mountaintop removal, stream destruction, water pollution and even more CO₂ emissions.

POLICY RECOMMENDATION:

Forget it as a transportation fuel. Coal-to-liquid has no benefit to equal its environmental damage. Continue research on carbon sequestration for coal-fired electricity generation, but make realistic decisions about whether the technology can be commercially viable.

Eliminate all federal subsidies and incentives for research on and production of liquid fuel from coal.

3. PAY FOR CHANGE FAIRLY

The shift from a petroleum-based transportation economy to a cleaner mix comes with start-up costs, including subsidies for new technologies and fuels. The end result could be big savings for the majority of Americans compared to a petroleum-based transportation future if:

- Speculative energy markets are intelligently regulated and made more transparent;
- Energy market prices are stabilized to dampen the boom and bust cycle in green energy investment;
- Current fossil fuel subsidies are redirected to green technologies and to individual consumers;
- Subsidies for development of greener fuels and vehicles are funded through broad-based federal and state revenues rather than markedly higher fuel taxes, which proportionately burden the middle and working classes;
- Green fuel markets are kept honestly competitive and domestic job creation is emphasized; and
- Subsidies for politically popular but unpromising technologies, such as hydrogen vehicles and coal-to-fuel, are eliminated.

Subsidies: Elimination of federal oil royalty relief, particularly contracts issued in error in the late 1990s without oil-price thresholds for royalty payment, would cut taxpayer aid to the oil industry by up to tens of billions of dollars over 25 years, depending on oil prices, according to the Government Accountability Office.²¹ Royalty contracts are currently under litigation in federal courts, but should be settled more quickly by Congress with forced renegotiation. President Obama has also proposed a new tax on Gulf of Mexico oil production to offset the unjustified royalty relief. Elimination of other subsidies, including production and depletion credits and research and development credits that have not produced visible results, would reap in the single billions. The record profits reported by major integrated oil companies since 2003 have left them with cash hoards that obviate any need for taxpayer funds. Petroleum subsidies should be redirected to green fuels and vehicles, including direct purchaser subsidies.

Market Regulations: Price stability for fossil-fuel energy sources, particularly petroleum, is key to keeping up momentum for greener vehicles and fuels. Futures markets that rose to \$145 for a barrel of crude oil, then dropped to \$35-\$40 in a matter of months are unhinged from supply and demand. At the bottom end, crashing prices cut off investment in renewable fuels and energy sources, and even fuel deflation. At the top end, high energy prices damage consumers and the economy.

3.
PAY FOR CHANGE FAIRLY
CONTINUED

Effective futures market controls, including transparent reporting of trades in real time and limits on the trading of parent companies, would cut off the top and the bottom of the oil price/energy price roller coaster, with more taken off the top than the bottom. Relative price stability would result in lower average fuel prices but also allow more stable investment in both traditional and green markets.

Regulation has little direct cost. It requires smart design, resistance to financial lobbies and commitment to enforcement. Futures market enforcement will require added staff at the Securities and Exchange Commission, the Commodity Futures Trading Commission and other bodies, proposals that are already before Congress.

Refining Regulation: Regulation of petroleum refining would also dampen roller-coaster profits. Recently, as in much of 2006 and 2007, refiners have deliberately cut production faster than demand has dropped, to increase their profit margin. Federal law should set a baseline for regulation and allow the states to carry it out, with locally specific variations. In highly concentrated markets like the Western states, full utility-style regulation of refining, like that of electric utilities, could produce the best outcome for both consumers (who would pay more stable and overall lower prices) and refiners, who could earn a lower but more stable profit margin.

VEHICLES AND FUELS

Hybrid and electric: Direct but temporary costs to taxpayers and government in subsidies for development of high-mpg plug-in hybrids and electric vehicles will be temporary. Conventional hybrid vehicle prices are stable or dropping, and a renewed purchaser tax credit would keep the market viable during the current recession and its lower fuel prices. In times of higher fuel prices, hybrids' higher purchase costs are recouped in a few years through fuel savings, and owners save substantially more over the life of the vehicle.

The longer-term cost of encouraging plug-in hybrids and all-electric vehicles is in reducing use of fossil fuels, particularly coal, for generating the electricity that will run the cars. Switching to green-generated power is a broader issue than auto battery recharging, but electric cars cannot reach their potential without clean power.

The simplest saving is reduction or elimination of lavish direct coal subsidies, including nearly \$2.9 billion in the

3.
PAY FOR CHANGE FAIRLY
CONTINUED

2007 energy bill. (See Coal section below) Such subsidies for the dirtiest power source make coal appear cheaper than it actually is, and make green power look “too expensive.” The barrier to recouping these subsidies is not logic or necessity but the power of the coal-states lobby, particularly in the Senate.

The costs of coal-plant replacement will be high but one-time costs, and subsidies now given to the industry should largely be redirected to utility customers to offset their higher utility costs.

Wind power is already competitive with natural gas; thin-film solar may be price-competitive at commercial scale. The use of small-scale solar generation in and close to urban centers would also save billions of dollars on the building of costly new transmission lines.²²

In almost any scenario, however, electric recharging of vehicles would remain cheaper than purchasing gasoline or diesel fuel.

Ethanol and biodiesel: “Flex-fuel” vehicles capable of running on E85 ethanol fuel are generally priced the same as gasoline models. E85 is also generally cheaper than gasoline—in agricultural states like Iowa, often 20% or more cheaper, offsetting any loss of mpg. Virtually any diesel engine can run on biodiesel, but the price of pure soy biodiesel at the pump has generally been a few to tens of cents higher than petroleum diesel. This price gap should diminish if all fuel prices are stabilized and biodiesel availability increases.

Thus the costs associated with ethanol and biodiesel are mostly related to research, development of non-crop feedstocks for the fuels, direct subsidies to producers and increasing retail availability.

Research and development subsidies already are focused on non-corn ethanol, though commercial development has slowed due to the sagging economy and the lower price of oil and fuels. Stabilization of energy futures markets and fuel prices through oversight and regulation will encourage private investment in clean fuels, reducing direct public costs.

Compressed natural gas: Taxpayers should not subsidize development of CNG-fueled personal vehicles or mass-market fueling stations. Temporary subsidies should be limited to urban public transit and short-range truck

3.
PAY FOR CHANGE FAIRLY
CONTINUED

fleets that can fuel at central yards. Wider subsidies for CNG vehicles would raise natural gas utility rates, tempt utilities to buy more coal power, increase production of environmentally destructive coalbed methane and encourage imports of dirtier-burning liquid natural gas. CNG, as an automobile fuel, is not on the path to cleaner and cheaper.

Hydrogen: The high dollar cost of hydrogen fuel cells and the environmental cost of producing hydrogen fuel from fossil fuels should rule out subsidies for hydrogen vehicles, which are not much closer to market-competitive commercial production than they were in the 1970s. Taxpayer dollars would be better spent on less splashy but cheaper and more immediate fuels and technologies.

Coal: Fuels derived from coal are all cost and no benefit, the purest definition of industrial pork. Federal coal subsidies--not just for coal-to-fuel but for coal production and coalbed methane --should be redirected to consumers and to environmentally safer fuels and technologies. Current subsidies are driven by the coal industry in the same way that corn-only ethanol subsidies were driven by industrial agriculture.

- 1** Bureau of Transportation Statistics. National Household Travel Survey, 2001, Table 8.
http://www.bts.gov/publications/highlights_of_the_2001_national_household_travel_survey/html/table_a08.html
- 2** Commodity Markets Oversight Coalition, Letter to President-elect Barack Obama, Dec. 3, 2008
<http://www.stopoilspeculators.com/PDF/120308-CMOCLtrObama2008DEC03FINAL.pdf>
- 3** Biodiesel.org, Biodiesel provisions in 2008 farm bill, undated
<http://www.biodiesel.org/resources/legissues/farmbill/pdfs/Issue%20Brief%20-%20Biodiesel%20and%20the%202008%20Farm%20Bill.pdf>
- 4** \$5 Diesel Fuel, the Economy-Killer, Tim Hamilton, July 2, 2008 for Consumer Watchdog
<http://www.consumerwatchdog.org/resources/Diesel0608pricereport.pdf>
- 5** U.S. average days of gasoline supply since 1990. U.S. Energy Information Administration (EIA).
http://tonto.eia.doe.gov/dnav/pet/hist/w_epm0_vsd_nus_days.htm
- 6** Refinery utilization and capacity. EIA,.
http://tonto.eia.doe.gov/dnav/pet/pet_pnp_unc_dcu_nus_m.htm
- 7** Refinery Outages Can Impact Petroleum Product Prices, but No Federal Requirements to Report Outages Exist GAO-09-87 October 7, 2008
<http://www.gao.gov/new.items/d0987.pdf>
- 8** U.S. average days of gasoline supply since 1990. EIA, above.
- 9** Tim Hamilton, "The Causes and Effects of the Record-Breaking Price of Diesel," July 2, 2008, page 10, chart 5
<http://www.consumerwatchdog.org/resources/Diesel0608pricereport.pdf>
- 10** Hybrid vehicle payback time and gasoline prices, USA Today, May 11, 2008
http://www.usatoday.com/money/autos/environment/2008-05-11-hybrids-gas-prices_N.htm
- 11** 2010 Ford Fusion Hybrid: 52 mpg and the darkness before dawn, Los Angeles Times, December 19, 2008
<http://www.latimes.com/classified/automotive/highway1/la-fi-neil19-2008dec19,0,2503132.story>
- 12** Volkswagen Golf Turbo-Diesel Hybrid Too Expensive for Production, Treehugger.com, April 25, 2008
<http://www.treehugger.com/files/2008/04/vw-golf-turbo-diesel-hybrid-dead-tsi.php>
- 13** Australian Mining, World first hybrid excavator debuts, June 23, 2008
<http://www.miningaustralia.com.au/Article/World-first-hybrid-excavator-debuts/174710.aspx>
- 14** Lithium battery will reduce hybrid payback time, create possible storage solution for solar power, CNET.com
http://news.cnet.com/8301-11128_3-9960585-54.html
- 15** Hybrid vehicle comparative battery toxicity. Hybridcars.com
<http://www.hybridcars.com/battery-toxicity.html>
- 16** Light-Duty Vehicle Stock by Technology Type, 2009. EIA
http://www.eia.doe.gov/oiaf/aeo/supplement/pdf/suptab_48.pdf
- 17** E85refueling.com, interactive
<http://www.e85refueling.com/locations.php?state=CACalifornia>
- 18** Chevron Talks Green, Yet Prevents Retailers From Selling Renewable Fuels. March 29, 2007, OilWatchdog.org
<http://www.oilwatchdog.org/articles/?storyId=4117>
- 19** National Renewable Energy Laboratories Clean Cities report. June 2004, U.S. Department of Energy
<http://www.nrel.gov/docs/fy04osti/35773.pdf>
- 20** "Coal to Liquid Fuels: Carbon," Robert H. Socolow, June 2005 Scientific American (as quoted by the Montana Environmental Information Center,)
<http://www.meic.org/energy/coins-to-liquid-fuels/coal-to-liquid-fuels-carbon>
- 21** The Federal System for Collecting Oil and Gas Revenues Needs Comprehensive Reassessment GAO-08-691 September 3, 2008
<http://www.gao.gov/new.items/d08691.pdf>
- 22** Think Solar, Think Small, Craig D. Rose, Feb 16, 2009. Nation Magazine
<http://www.thenation.com/doc/20090216/rose>