



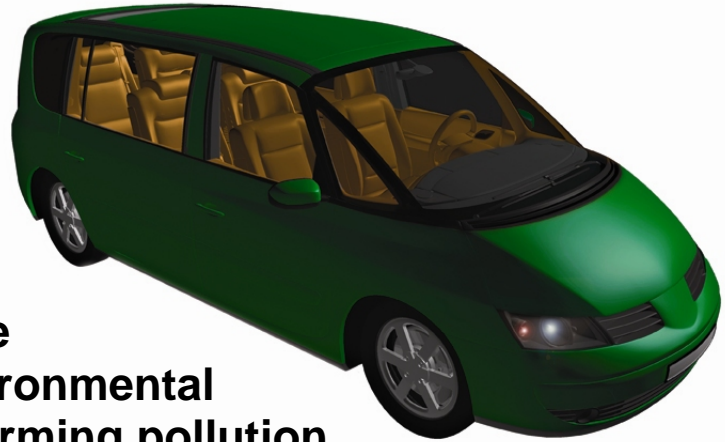
Union of Concerned Scientists  
Citizens and Scientists for Environmental Solutions

# fact sheet

## UCS Vanguard 2009

Everything you want in a car...and less (global warming pollution)

**From families to farmers, drivers across the nation have been waiting for “no compromises” vehicles—cars and trucks that can help keep America running strong while countering the health, economic, and environmental threats posed by global warming pollution.**



Existing technology and fuels make it possible for us to enjoy cleaner but still affordable cars, pickup trucks, SUVs, and minivans today. The global warming emission reduction law for vehicles adopted by California and 14 other states actually requires automakers to start making these cleaner vehicles. Unfortunately, automakers are attempting to block these laws, and refuse to make the clean and affordable vehicles Americans want. That's why the vehicle engineers at the Union of Concerned Scientists set out to show what you're missing.

The Vanguard is a minivan blueprint developed by UCS engineers that meets California's global warming emission standards simply by using existing technologies and fuels, saving money at the pump while maintaining the levels of safety and performance that drivers expect. Many cars and trucks on the road today already use at least one of the climate-friendly components used in the Vanguard, but none come close to matching the potential benefits of the full Vanguard package.

# UCS Vanguard 2009

**Performance. Safety. Reliability. Lower Emissions.**  
**We can have it all—with technologies available today**

## ENGINE

- **Cylinder deactivation** shuts down some of the cylinders in a large engine when full power is not needed.
- **Turbocharging** uses the waste heat from the vehicle's exhaust to compress the air entering the engine's combustion chamber. This boosting of the inlet air pressure results in higher engine power output, which allows the vehicle designers to select a smaller engine with less global warming emissions.

## FUEL SYSTEM

- **Stoichiometric direct injection** places the gasoline directly into the combustion chamber, thereby allowing better mixing of the fuel and air and improved control over the combustion process.
- **Variable valve lift and timing** reduces engine losses by better controlling the flow of the air and fuel into the engine—leading to more efficient combustion and better performance.

## TRANSMISSION

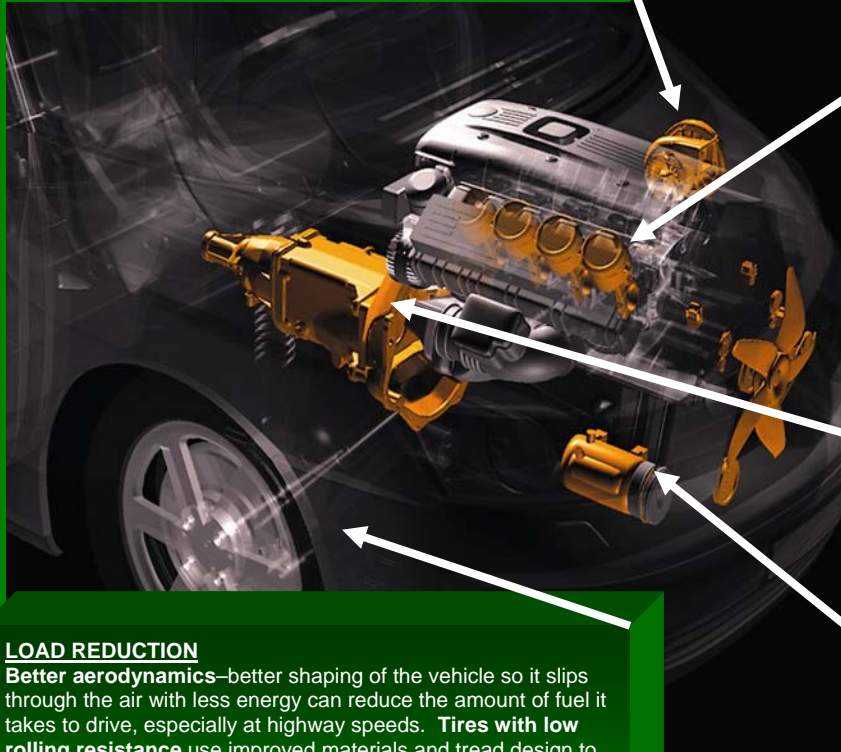
The transmission propels a vehicle forward by transferring power from the engine to the wheels. The addition of **more gears** allows the engine to operate near its optimal performance level a greater percentage of the time. **Automatic manual transmissions** allow the direct transfer of power from the engine to the transmission without interruption, combining the efficiency of a manual transmission with the convenience of an automatic transmission. **Continuously variable transmissions** essentially have an infinite number of gears allowing the engine to run at its optimal speed all of the time.

## IMPROVED A/C

**Improved hoses and better connections** can significantly reduce the amount of hydrofluorocarbons—concentrated global warming pollutants—that leak from a vehicle's air conditioning system. Switching to a **less harmful refrigerant** will also help; HFC-152a, for example, has a much lower global warming potential than common hydrofluorocarbon refrigerants.

## LOAD REDUCTION

**Better aerodynamics**—better shaping of the vehicle so it slips through the air with less energy—can reduce the amount of fuel it takes to drive, especially at highway speeds. **Tires with low rolling resistance** use improved materials and tread design to reduce the amount of energy wasted as a vehicle's tires roll down the road. Upgrading mechanical components such as power steering with more **energy-efficient electrical components** can reduce engine load and, in turn, global warming emissions. When this electrification of components is coupled with a high-efficiency advanced alternator, global warming emissions can be reduced even further.



# UCSVanguard 2009

By applying the Vanguard's features to each of these vehicle classes, we can meet the clean car standard while saving money and reducing our global warming emissions.



**Small Car\***  
**Example Vehicle: Volkswagen Jetta**  
Fuel: Gasoline  
Increase in Purchase Price \$1,410  
Lifetime Consumer Savings \$2,043  
Payback Time 3.6 Years



**Midsize Car\***  
**Example Vehicle: Chrysler Sebring Sedan**  
Fuel: Gasoline  
Increase in Purchase Price \$1,352  
Lifetime Consumer Savings \$2,338  
Payback Time 3.1 Years



**Minivan\* (UCSVanguard)**  
**Example Vehicle: Honda Odyssey**  
Fuel: Gasoline  
Increase in Purchase Price \$696  
Lifetime Consumer Savings \$1,769  
Payback Time 2.3 Years



**Midsize SUV \***  
**Example Vehicle: Chevrolet Trailblazer**  
Fuel: Gasoline  
Increase in Purchase Price \$809  
Lifetime Consumer Savings \$2,262  
Payback Time 2.1 Years



**Fullsize Pickup Truck\***  
**Example Vehicle: Ford F-150**  
Fuel: Gasoline  
Increase in Purchase Price \$829  
Lifetime Consumer Savings \$2,385  
Payback Time 2.1 Years

\* Other models in these vehicle classes could expect similar savings with the Vanguard package. The calculations in this analysis use \$2.50 per gallon gasoline prices. Vehicle technology packages, their global warming emission reductions, and associated costs are based on studies published by the Union of Concerned Scientists and the California Air Resources Board. Specified emissions reductions reflect targets that average to the 2016 clean car standard.

# UCS Vanguard 2009

“So why can’t I get a Vanguard right now?”

Instead of employing their talented engineers to install the Vanguard's full complement of cost-effective global warming reduction features on their own vehicles, automakers are spending millions on lawyers and lobbyists to thwart consumer and government demand for cleaner vehicles, all while taking billions in taxpayer dollars. Their strategy—overturning existing laws intended to reduce global warming pollution in California and 14 other states—would deny drivers the “no compromises” vehicles we all desire. It’s time for automakers to stop spinning and suing, and instead create safe, affordable, and cleaner cars and trucks (and the jobs that come with them).

## Here are just some of the vehicles that use some cleaner car components

### Electric Steering

Chevrolet Malibu  
Chevrolet HHR  
GMC Yukon Hybrid  
Honda Civic Hybrid  
Honda Fit  
Honda S2000  
Nissan Altima Hybrid  
Nissan Rouge  
Nissan Sentra  
Nissan Versa  
Pontiac G5, G6  
Saturn Vue Greenline  
Saturn Aura Greenline  
Toyota Camry Hybrid  
Toyota Corolla  
Toyota Highlander  
Toyota Highlander Hybrid  
Toyota Prius  
Toyota RAV-4  
Toyota Yaris

### Direct Injection

Audi A3, A4, A6, A8  
Audi R8, RS4  
Audi S5, S6, S8  
BMW 335  
Cadillac CTS  
Cadillac STS  
Chevrolet Express  
Chevrolet Silverado  
Chevrolet Avalanche  
Chevrolet Suburban  
Chevrolet Tahoe  
Chevrolet Trailblazer  
Dodge Ram  
Dodge Sprinter  
GMC Sierra  
GMC Savana  
Jeep Grand Cherokee  
Lexus GS 350  
Lexus IS 250  
Mazda CX-7  
Mercedes-Benz GL330  
Pontiac Solstice  
Saturn Astra  
Saturn Sky Redline  
Volkswagen EOS, GTI

Volkswagen Passat  
Volkswagen Tourag  
Ford F250/F350

### Cylinder Control

Buick LaCrosse  
Chevrolet Impala  
Chrysler 300C  
Chrysler Aspen  
Dodge Charger  
Dodge Durango  
Dodge Magnum  
GMC Envoy  
GMC Sierra  
GMC Yukon  
Honda Accord  
Honda Odyssey  
Honda Pilot  
Hummer H3  
Jeep Commander  
Jeep Grand Cherokee  
Pontiac Grand Prix

### Variable Valve Timing

Buick LaCrosse  
Cadillac Escalade  
Cadillac STS, SRX, XLR  
Chevrolet Impala  
Chevrolet Tahoe Hybrid  
Chrysler Sebring  
Dodge Avenger  
Dodge Caliber  
Dodge Viper  
Ford Escape  
Ford Escape Hybrid  
GMC Sierra Denali  
GMC Yukon  
GMC Yukon Hybrid  
Honda Accord  
Honda Civic  
Honda Civic Hybrid  
Honda CR-V  
Honda Element  
Honda Fit  
Honda Odyssey  
Honda Pilot  
Honda Ridgeline  
Honda S2000

Jeep Compass  
Jeep Patriot  
Mercury Mariner  
Mercury Mariner Hybrid  
Nissan Altima  
Nissan Altima Hybrid  
Nissan Armada  
Nissan Frontier  
Nissan Maxima  
Nissan Pathfinder  
Nissan Quest  
Nissan Rouge  
Nissan Sentra  
Nissan Titan  
Nissan Versa  
Nissan Xterra  
Pontiac G5  
Pontiac Solstice  
Pontiac Vibe  
Saturn Astra  
Saturn Aura Greenline  
Saturn Sky  
Saturn Vue Greenline  
Toyota 4Runner  
Toyota Avalon  
Toyota Camry  
Toyota Camry Hybrid  
Toyota Camry Solara  
Toyota Corolla  
Toyota FJ Cruiser  
Toyota Highlander  
Toyota Highlander Hybrid  
Toyota Land Cruiser  
Toyota Matrix  
Toyota Prius  
Toyota RAV-4  
Toyota Sequoia  
Toyota Sienna  
Toyota Tacoma  
Toyota Tundra  
Toyota Yaris

### Turbocharging

Acura RDX  
Audi A3  
Audi A4  
Audi TT  
BMW 135, 335, 535

Chevrolet Cobalt  
Chevrolet Express  
Chevrolet HHR  
Chevrolet Silverado  
Chevrolet Veyron  
Chrysler PT Cruiser  
Dodge Ram  
Dodge Sprinter  
Dodge Caliber  
Ford F250  
GMC Savana  
GMC Sierra  
Jeep Grand Cherokee  
Mazda CX-7  
Mercedes-Benz ML320  
MINI Cooper, Clubman  
Mitsubishi Lancer  
Pontiac Solstice  
Porsche Cayenne  
SAAB 9-3, 9-5  
Saturn Sky  
Subaru Forester  
Subaru Impreza  
Subaru Legacy  
Subaru Outback  
Volkswagen EOS  
Volkswagen GTI  
Volkswagen Jetta  
Volkswagen Passat  
Volkswagen Touareg  
Volvo C30, S80, V50

### Continuously Variable Transmission

Audi A4  
Audi A6  
Chevrolet Tahoe Hybrid  
Ford Escape Hybrid  
GMC Yukon Hybrid  
Honda Civic Hybrid  
Jeep Compass  
Jeep Patriot  
Lexus RX 400H  
Mazda Tribute Hybrid  
Mercury Mariner Hybrid  
MINI Cooper  
Mitsubishi Lancer  
Mitsubishi Outlander

Nissan Altima  
Nissan Altima Hybrid  
Nissan Maxima  
Nissan Rogue  
Nissan Sentra  
Nissan Versa  
Toyota Camry Hybrid  
Toyota Highlander Hybrid  
Toyota Prius

**Automatic Manual  
Transmission**

Acura MDX, RDX, TL  
Audi A3, A4, A5, A6, A8  
Audi Q7, R8, S4, S5, S6  
Audi TT  
BMW 128, 135, 335  
BMW 528, 535, 550  
BMW 650, 750, 760  
BMW Alpina B7  
BMW M3, M5, M6  
BMW X3, X5, X6, Z4

Cadillac CTS  
Cadillac SRX  
Cadillac STS  
Cadillac XLR  
Chevrolet Corvette  
Chevrolet Equinox  
Chevrolet Malibu  
Honda Fit  
Infiniti EX35  
Infiniti FX45  
Infiniti G35  
Infiniti G37  
Infiniti M35  
Infiniti M45  
Murcielago  
Land Rover LR2, LR3  
Lexus ES 350  
Lexus GS 350, 450h  
Lexus IS 250, 350  
Mazda 3, 5, 6  
Mazda CX-7, CX-9  
Mazda MX-5

Mazda RX-8  
Mercedes-Benz C63  
Mercedes-Benz E63  
Mercedes-Benz S63, S65  
MINI Clubman  
MINI Cooper  
Mitsubishi Eclipse  
Mitsubishi Endeavor  
Mitsubishi Galant  
Mitsubishi Outlander  
Nissan 350Z  
Nissan Pathfinder  
Pontiac G6, G8  
Pontiac Grand Prix  
Pontiac Torrent  
SAAB 9-3, 9-5  
Saturn Aura  
Saturn Vue  
SMART Fortwo  
Subaru Impreza  
Subaru Legacy  
Subaru Outback Sport

Subaru Tribeca  
Suzuki XL7  
Toyota Avalon  
Toyota Camry  
Toyota Highlander  
Toyota Land Cruiser  
Toyota Scion  
Toyota Sequoia  
Toyota Solara  
Toyota Tundra  
Volkswagen Eos  
Toyota GTI  
Toyota Jetta  
Toyota New Beetle  
Toyota Passat  
Toyota R32  
Toyota Rabbit  
Toyota Touareg  
Volvo C30, C70  
Volvo S40, S60, S80  
Volvo V50, V70  
Volvo XC 70, XC 90

**The UCS Vanguard 2009 technology package puts these cost-effective components together in a way that could give Americans cleaner cars in every vehicle class. It is time for the automakers to do the same.**