



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 10 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.

For more information about the UCSVanguard or how it was designed, go to www.ucsusa.org/UCSVanguard or call 510-843-1872.



“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 relying on lawyers and lobbyists to thwart consumer and government demand for cleaner vehicles. Their strategy—overturning existing laws intended to reduce global warming pollution in California and 10 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 manufacturing and farming jobs that come with them).

Send a message to the manufacturers directly from the UCS website at:

<http://www.ucsusa.org/UCSVanguard>

Just some of the vehicles using components in the UCSVanguard package

Flex Fuel

Buick Terraza
Dodge Caravan
Dodge Durango
Dodge Ram Pickup
Chevrolet Avalanche
Chevrolet Express
Chevrolet Impala
Chevrolet Monte Carlo
Chevrolet Silverado
Chevrolet Suburban
Chevrolet Tahoe
Chevrolet Uplander
Chevrolet Van
Chrysler Aspen
Chrysler Dakota
Chrysler Durango
Chrysler Sebring
Ford Crown Victoria
Ford F-150
GMC Savana
GMC Sierra
GMC Yukon
Jeep Commander
Jeep Grand Cherokee
Lincoln Town Car
Mercedes Benz C230
Mercury Grand Marquis
Nissan Armada
Nissan Titan
Pontiac Montana
Saturn Relay

Chrysler 300
Chrysler Aspen
Dodge Charger
Dodge Durango
Dodge Magnum
GMC Envoy
GMC Sierra
GMC Yukon
Honda Odyssey
Honda Pilot
Jeep Commander
Pontiac Grand Prix

Cylinder Deactivation

Buick Rainier
Chevrolet Avalanche
Chevrolet Impala
Chevrolet Monte Carlo
Chevrolet Silverado
Chevrolet Suburban
Chevrolet Tahoe
Chevrolet Trailblazer

Chrysler 300C
Chrysler 300C
Ford (many vehicles)
GMC Yukon
Honda (most vehicles)
Infiniti G35
Jeep Grand Cherokee
Lexus IS
Toyota (most vehicles)

Variable Valve Lift and Timing

Chrysler 300C
Ford (many vehicles)
GMC Yukon
Honda (most vehicles)
Infiniti G35
Jeep Grand Cherokee
Lexus IS
Toyota (most vehicles)

Stoichiometric Direct Injection

Acura RDX
Audi A3, A4, A6, A8, RS, S6, S8
BMW 760Li
Chevrolet Express
Chevrolet Silverado
Dodge Ram
Ford Econoline
Ford F-Series
GMC Savana
GMC Sierra
Jeep Cherokee
Lexus GS, DI, IS
Mazda CX-7
Mazda Mazdaspeed
Mercedes E320
Pontiac Solstice

Saturn Ion
Saturn Sky
Volkswagen Eos
Volkswagen GTI
Volkswagen Jetta
Volkswagen Passat
Volkswagen Touareg

Turbocharging

Acura RDX
Audi A3, A4
BMW 330
Chevrolet Express
Chevrolet Silverado
Chrysler PT Cruiser
Dodge Caliber
Dodge Ram
Ford Econoline
Ford F-Series (250, 350)
GMC Savana
GMC Sierra
Jeep Grand Cherokee
Mazda CX-7
Mazda Mazdaspeed
Mercedes E320
Mercedes ML320
Mercedes R350
Porsche 911
Saab 9-3 Series
Subaru Forester
Subaru Impreza
Subaru Legacy
Subaru Outback
Volkswagen Beetle
Volkswagen GTI
Volkswagen Jetta
Volkswagen Passat
Volkswagen Touareg
Volvo 40, 50, 60, 70, R Series
Volvo XC70

Automatic Manual Transmissions

Audi A3
BMW M-Series
Volkswagen Eos, GTI, Jetta

6 Speed Transmission

Audi A3, A4, A6, A7, RS, S4, Q7
BMW 3-Series, 5-Series, 7-Series, M-Series, Z4-Series
BMW X5
Cadillac Escalade, SRX
Cadillac STS, XLR
Chevrolet Corvette
Chevrolet Silverado
Chrysler Sebring
Dodge Ram Pickup
Ford 500
Ford Edge
Ford Expedition
Ford Explorer
Ford Fusion
GMC Acadia
GMC Sierra
GMC Yukon
Jaguar S-Type, XJ-Series, XK-Series
Land Rover LR3, Range Rover
Lexus GS, IS, LS460, SC430
Lincoln MKX
Lincoln Mark MKZ
Lincoln Navigator
Mazda6, MX-5 Miata, RX8
Mazda CX-7, CX-9
Mercedes G-Class, GL-Class, M-Class,

R-Class, C-Class, CL, CLK, CLS, E-Class, S-Class, SL, SLK
Mercury Milan
Mercury Montego
Mercury Mountaineer
Mitsubishi Outlander
Saab 9-3 Series
Saturn Aura
Saturn Outlook
Toyota Camry
Volkswagen Beetle
Volkswagen Jetta
Volkswagen Passat
Volkswagen Touareg
Volvo 80 Series, R-Series
Volvo XC90

Electric Power Steering

Acura NSX
Fiat (most vehicles)

Protecting Families from Global Warming Using Today’s Technology



A new vehicle design from the Union of Concerned Scientists




www.ucsusa.org
Berkeley, CA: 510-843-1872
Cambridge, MA: 617-547-5552
Washington, DC: 202-223-6133

By applying the Vanguard's features to each of these vehicle classes, we can save money while reducing our global warming emissions.

UCSVanguard: Performance. Safety. Affordability. Lower emissions. We can have it all—with technologies available today.

Minivan* (UCSVanguard)




Example Vehicle: Chrysler Town & Country

Flexible fuel: E85
Stoichiometric direct injection
Dual cam phasing
Turbocharging
Automated manual transmission
Electric power steering
Improved efficiency alternator
Improved efficiency, low leak AC

Increase in Purchase Price \$299
Lifetime Consumer Savings \$1,333
Payback Time 1.6 Years

Global Warming Emission Reduction 43%

Small Car*




Example Vehicle: Chevrolet Cavalier

Flexible fuel: E85
Discrete variable valve lift
Dual cam phasing
Automatic manual transmission
Electric power steering
Improved efficiency alternator
Improved efficiency, low leak AC

Increase in Purchase Price \$180
Lifetime Consumer Savings \$809
Payback Time 1.6 Years

Global Warming Emission Reduction 42%

Large Car*




Example Vehicle: Ford Taurus

Flexible fuel: E85
Continuous variable valve lift
Dual cam phasing
Automated manual transmission
Electric power steering
Improved efficiency alternator
Improved efficiency, low leak AC

Increase in Purchase Price \$543
Lifetime Consumer Savings \$552
Payback Time 5 Years

Global Warming Emission Reduction 42%

Compact Pickup Truck*




Example Vehicle: Toyota Tacoma

Flexible fuel: E85
Cylinder deactivation
Discrete variable valve lift
Coupled cam phasing
Automated manual transmission
Electric power steering
Improved efficiency alternator
Improved efficiency, low leak AC

Increase in Purchase Price \$298
Lifetime Consumer Savings \$1,317
Payback Time 1.7 Years

Global Warming Emission Reduction 42%

Large Truck*



Example Vehicle: GMC Sierra

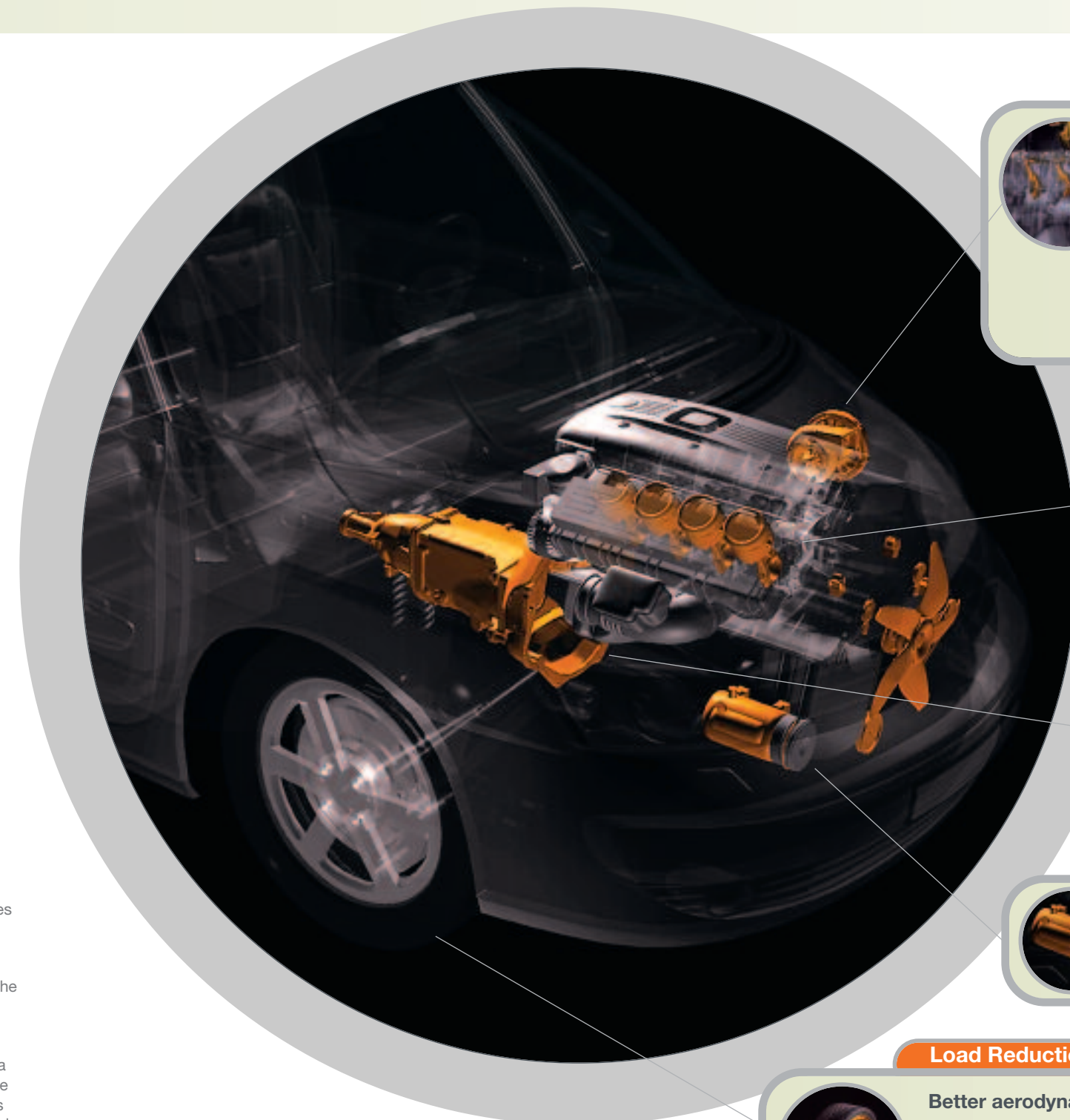
Flexible fuel: E85
Cylinder deactivation
Discrete variable valve lift
Coupled cam phasing
Automated manual transmission
Electrohydraulic power steering
Improved efficiency alternator
Improved efficiency, low leak AC

Increase in Purchase Price \$670
Lifetime Consumer Savings \$1,096
Payback Time 3.7 Years

Global Warming Emission Reduction 42%

* Other models in these vehicle classes could expect similar savings with the Vanguard package

The calculations in this analysis use the October 2006 retail prices for regular gasoline sold in California (\$2.55 per gallon) and E85 produced in the Midwest and transported to California (\$2.11 per gallon). These prices come from the U.S. Department of Energy's Energy Information Administration and Alternative Fuel Price Report. Vehicle technology packages, their global warming emission reductions, and associated costs are based on studies published by the California Air Resources Board.



Engine



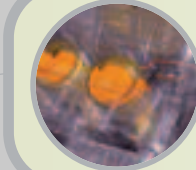
Cylinder deactivation shuts down half the cylinders in a large engine when full power is not needed.

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.

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.

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.

Fuel System



Flexible fuel components allow the vehicle to run on either pure gasoline or a mixture of gasoline and ethanol up to 85% ethanol. Using 85% corn-based ethanol instead of gasoline can reduce global warming emissions about 10% to 20% per unit of energy delivered. Using more environment-friendly, higher-yield "cellulosic" ethanol sources could potentially deliver as much as an 80% to 90% reduction in heat-trapping emissions for the same amount of energy.

Transmission



The transmission propels a vehicle forward by transferring power from the engine to the wheels. The addition of more gears (six in this case) 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.

Improved Air Conditioning



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

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.