



# General Motors Corporation Alternative Fuels Product Review

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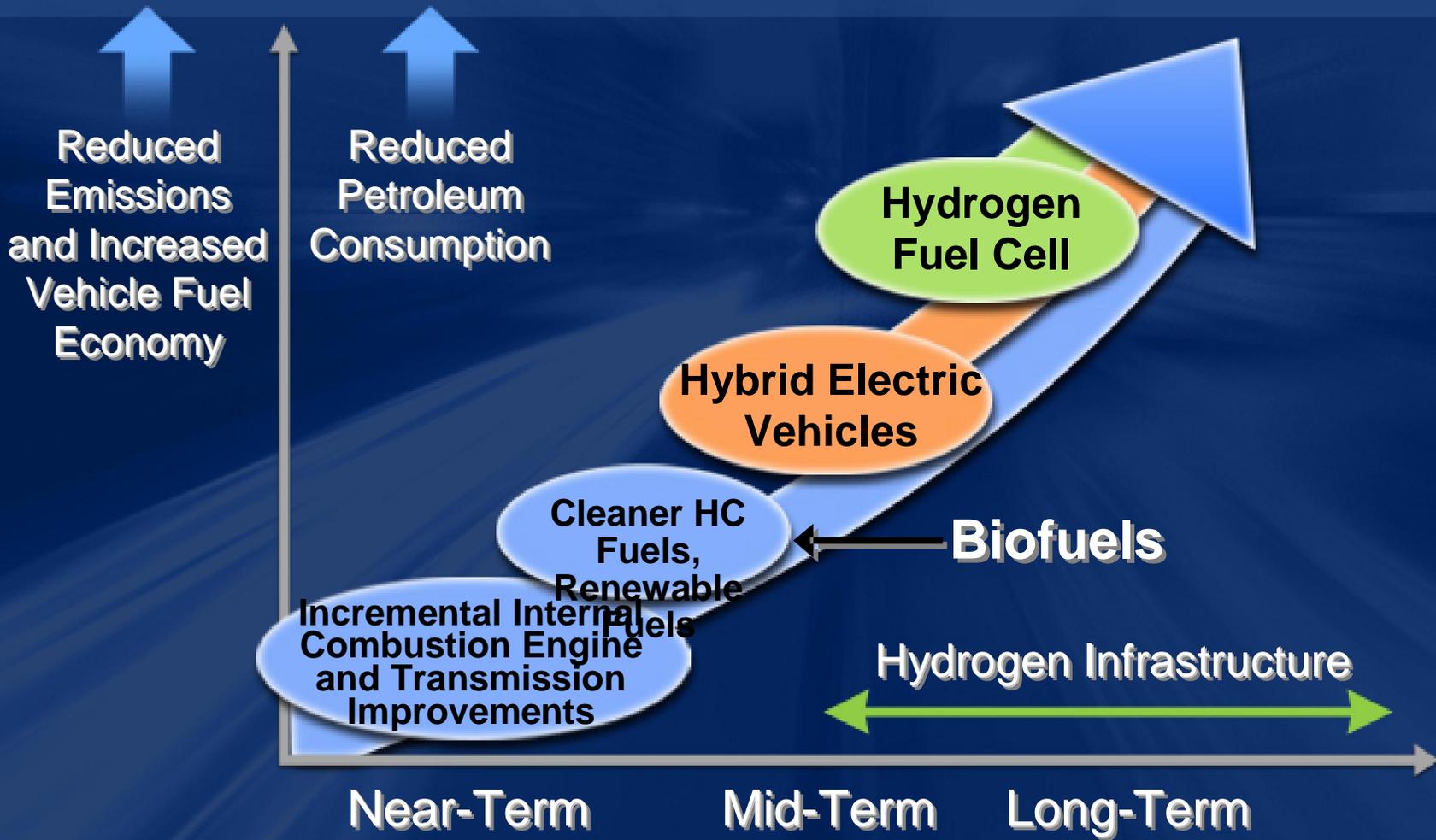
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*“GM is Committed to Removing the  
Automobile from the Environmental  
Equation”*



Brad Beauchamp

# GM's Advanced Propulsion Technology Strategy



# GM 2005 EPA Fuel Economy Leader

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- GM has more vehicles in it's fleet that get 30+ MPG than any other company.
- GM leads in trucks, where it has 41 of 66 fuel economy leaders\* or 62%.
- GM leads in cars, where it has 28 of 53 fuel economy leaders\* or 53%.
- GM leads in combined truck and car comparisons, where it has 69 of 119 fuel economy leaders\* or 58%.

\*combined, city/highway, unadjusted



## 2006 EPA Highway Estimates for GM

2006 MY over 30		Hwy MPG	Displacement	# of Cylinders	Transmissions
<b>Subcompact</b>					
Chevrolet	Cobalt	32	2.2	4	A-4
<del>Chevrolet</del>	<del>Aveo 5</del>	<del>34</del>	<del>1.6</del>	<del>4</del>	<del>A-4</del>
<b>Compact</b>					
Pontiac	G6	34	2.4	4	A-4
Saab	9-3 Sport Sedan	31	2.0	4	A-S5
Saturn	Ion	32	2.2	4	A-4
<b>Small Station Wagons</b>					
Pontiac	Vibe	34	1.8	4	A-4
Saab	9-3 SportCombi	31	2.0	4	M-5
<b>Midsize</b>					
Chevrolet	Malibu	32	3.5	6	A-4
Chevrolet	Monte Carlo	31	3.5	6	A-4
Pontiac	Grand Prix	30	3.8	6	A-4
Buick	LaCrosse	30	3.8	6	A-4
<b>Large Cars</b>					
Chevrolet	Impala	31	3.5	6	A-4
Chevrolet	Malibu Maxx	30	3.5	6	A-4
<b>SUV 2WD</b>					
Chevrolet	HHR	30	2.4	4	A-4

IT ALL ADDS UP!



Automotive Fleet Magazine  
2006 Fleet Car of the Year





**impala**

# 2007 Information

## Engines

3.5L V6 211 HP LS, 1LT, 2LT

LZE E85 approved FE9

50 State Certified

LZ4 Non E85 NE1 & YF5

3.9L V6 240 HP 3LT & LTZ

Active Fuel Management

5.3L V8 303 HP SS

Active Fuel Management

## Operating Costs

Top of the mid-size segment at 31 r



**3.5L V6**



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## Fleet Models

### 1FL standard features

- Built off of LS model (LS Badge)
- 4 cylinder engine
- 15" Steel wheel w full cover
- Standard cloth interior
- AM/FM/CD w 4 speakers
- Side Head Curtain airbags
- Cruise control, Power windows & locks
- Power driver seat height adjuster
- Floor mats and Remote Keyless Entry
- Invoice starts at \$15,994



24 City / 34 Hwy

### 1FL options

- (PCW) ABS, traction control, rear disc brakes
- (AY0) Thorax Air Bags
- (PCY) Heated uplevel LT cloth 6-way power driver seat with lumbar
- OnStar (requires (AY0)thorax air bag & (UN0)uplevel AM/FM/CD w 6 speakers)



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# AVEO Sedan



Best Selling Economy Car  
New Exterior Appearance  
Longer, Wider, Taller  
103 hp 16 valve  
DOHC 4-cylinder  
15" Aluminum Wheels  
NHTSA 5-Star Frontal  
4-Door Pegs 1LS, 1LT



SOP

5-16-06

Invoice starts \$11,104



# AVEO 5

Carryover Appearance

5-Door Pegs 1SV, 1LS

Some '06MY LT features are  
now optional on the 1LS,

(A31) Power windows

15" Aluminum wheels

(CF5) Sunroof

Center armrest is now std

Invoice starts at \$10,915



2008

Major

# Branding



FLEXFUEL SHOULD ALSO BE BADGED

**FlexFuel**  
B-20 Bio-Diesel

# livegreen goyellow



# E85



## Benefits of E85 (Ethanol)



- Ethanol is safe, renewable fuel. It creates a clean fuel cycle ...and it reduces our dependence on foreign oil.
- Ethanol is available as E10-10 percent ethanol with 90 percent gasoline or as E85 - 85 percent ethanol with 15 percent gasoline.
- In 2006 GM will be introducing more than 400,000 E85 flexible fuel vehicles annually into the marketplace.
- There are about four million E85 flexible fuel vehicles on the road today. GM currently has 1.5 million vehicles on the road that are flexible fuel capable.
- E85 could save 45 million barrels of oil per year and reduce Green House Gas emissions by 6.9 million metric tons.

# E85 Ethanol Fuel contains 85% ethanol and 15% gasoline

## Gasoline Saved with E85 vehicles vs. the competition\*

GM E85 gasoline savings vs:	Toyota Camry	Toyota Sequoia	Honda Insight	Honda Accord
 Annual Gallons of Gasoline saved with E85 Impala vs:	<b>419</b> gallons gasoline saved per year with Impala E85	<b>784</b> gallons gasoline saved per year with Impala E85	<b>165</b> gallons gasoline saved per year with Impala E85	<b>419</b> gallons gasoline saved per year with Impala E85
 Annual Gallons of Gasoline saved with E85 2006 4WD Yukon vs:	<b>356</b> gallons gasoline saved per year with 4WD Yukon E85	<b>721</b> gallons gasoline saved per year with 4WD Yukon E85	<b>102</b> gallons gasoline saved per year with 4WD Yukon E85	<b>356</b> gallons gasoline saved per year with 4WD Yukon E85
 Annual Gallons of Gasoline saved with E85 2006 2WD Silverado vs:	<b>376</b> gallons gasoline saved per year with 2WD Silverado E85	<b>741</b> gallons gasoline saved per year with 2WD Silverado E85	<b>122</b> gallons gasoline saved per year with 2WD Silverado E85	<b>376</b> gallons gasoline saved per year with 2WD Silverado E85

\*Using EPA composite MPG estimates driving 15,000 miles a year. (source: www.fueleconomy.gov) EPA Estimated Fuel Economy (Highway): Chevrolet Impala-23, Chevrolet Tahoe/Avalanche/Suburban/Silverado 4WD-14, Silverado 2WD-16, Camry-28, Sequoia-17, Insight-57, Accord-29. Mileage figures assumes GM products used only E85 fuel for one year.



# GM Hybrid Strategy

- Target highest fuel-consuming vehicles first
- Provide the broadest portfolio of products
- Offer hybrids on our highest-volume car and truck models
- Three distinct hybrid propulsion systems
- No compromises in performance





**impala**

# 2007 Information

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**3.5L V6**



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# 2007 Chevrolet Tahoe/Suburban/Avalanche

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- E85 5.3L V8 320 HP
- Active Fuel Management
- 4-Speed Automatic
- Segment-leading fuel economy ... 22 mpg hwy.
- 2WD or 4WD



# 2007 Tahoe PPV Police Package



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# 2007 Chevrolet Tahoe





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# 2007 Chevrolet Suburban



# 2007 Chevrolet Suburban



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# 2007 Chevrolet Avalanche

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# 2007 GMC Yukon





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# 2007 GMC Yukon XL





# Uplander

## 2007 2FL Cargo Van

SOP

5-15-06

### New for 2007

- LZ9 3.9L engine std.  
240 hp
- LGD E-85 3.9L engine  
available after SOP



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# Uplander

## 2007 2FL Cargo Van

- FWD only (CU12216)
- Fleet peg 2FL
- 136.5 cubic foot capacity
- 100.0 inch load floor
- Payload of 1674 lbs

### New for 2007

- New Liner package standard in 2007
- (JL4) Stabilitrak & (NW9) std.
- (R8E) JL4 delete Fleet option
- Interior partition & bin packages from Adrian



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# Express / Savana Vans

New for 2007 Model Year

- E85 Capable 5.3L Engine
  - RPO (L59)
  - 1500 Series only
  - RWD & AWD
  - Unique “Flex Fuel” badging
  - Not available with LH Door (E26)
- RPO (KL5) CNG Capable Engine is no longer offered
- Inner door panels will become optional (Cargo only)
  - RPO (PPC)
  - MSRP \$95
  - All hinged doors behind passenger compartment
  - Sliding door retains inner panel



## Owners Manual Info – Biodiesel

In the United States, for best results use Number 2–D diesel fuel year-round (above and below freezing conditions) as oil companies blend Number 2–D fuel to address climate differences. Number 1–D diesel fuel may be used in very cold temperatures (when it stays below 0°F or -18°C); however, it will produce a power and fuel economy loss. Avoid the use of Number 1–D diesel fuel in warm or hot climates. It may result in stalling, poor starting when the engine is hot and may damage the fuel injection system.

At a minimum, the diesel fuel you use should meet specifications from the latest version of ASTM D975, Standard Specification for Diesel Fuel Oils (Grade No. 1-D or 2-D S15 Low Sulfur) in the United States. In addition, the Engine Manufacturers Association (EMA) has identified properties of an improved diesel fuel for better engine performance and durability. Diesel fuels corresponding to the [EMA Recommended Guideline on Premium Diesel Fuel \(FQP-1A\)](#) could provide better starting, less noise and better vehicle performance. If there are questions about the fuel you are using, contact your fuel supplier.

### Biodiesel B5

It is acceptable to use diesel fuel containing up to 5% biodiesel (B5), but the final blended fuel must meet the same specification, ASTM D975 (Grade Low Sulfur), as other fuels used in your vehicle, and the biodiesel used for making this fuel must meet the ASTM D6751 specification. Biodiesel is produced from vegetable oils or animal fat that have been chemically modified to reduce the possibility of damage to your fuel system and engine. Higher concentration (i.e., greater than B5) biodiesel-containing fuels have additional restrictions that must be followed. The use of unmodified bio-oils blended into diesel fuel at any concentration is not recommended and could damage your fuel system and engine. Such damage would not be covered by your warranty. If there are questions about the biodiesel-containing fuels you are using, contact your fuel supplier.

### Biodiesel B20 (Fleets Only)

For fleets requiring compliance to Executive Order 13149 (EPA credit mandate), a minimum B20 biodiesel blend is needed to qualify. For these users only it is acceptable to use diesel fuel containing up to 20% biodiesel (B20) after the fuel has been approved by GM. Do NOT use biodiesel blends in excess of 20% (B20). The biodiesel portion used to make the blend must meet the latest version of ASTM D 6751, Standard Specification for Biodiesel Fuel (B100) Blend Stock for Distillate Fuels. Raw or refined vegetable oil, or recycled greases that have not been processed into biodiesel, are not biodiesel and should not be used. The use of unprocessed oil and greases blended into diesel fuel or degraded (aged) biodiesel could damage your fuel system and engine. Such damage would not be covered by your warranty. If there are questions about the biodiesel-containing fuels you are using, contact your fuel supplier.

Some points you should be aware of when using up to B20 blends are:

Biodiesel has less energy content than standard diesel fuel. If you are using B20, power, torque, and fuel economy should be between 1% and 2% lower compared to standard diesel fuel. As the percent biodiesel in the blend is lowered, any differences in energy content become diminished.

Biodiesel has a cleaning effect on accumulated sediments in tanks, and filter plugging may be experienced during the use of B20.

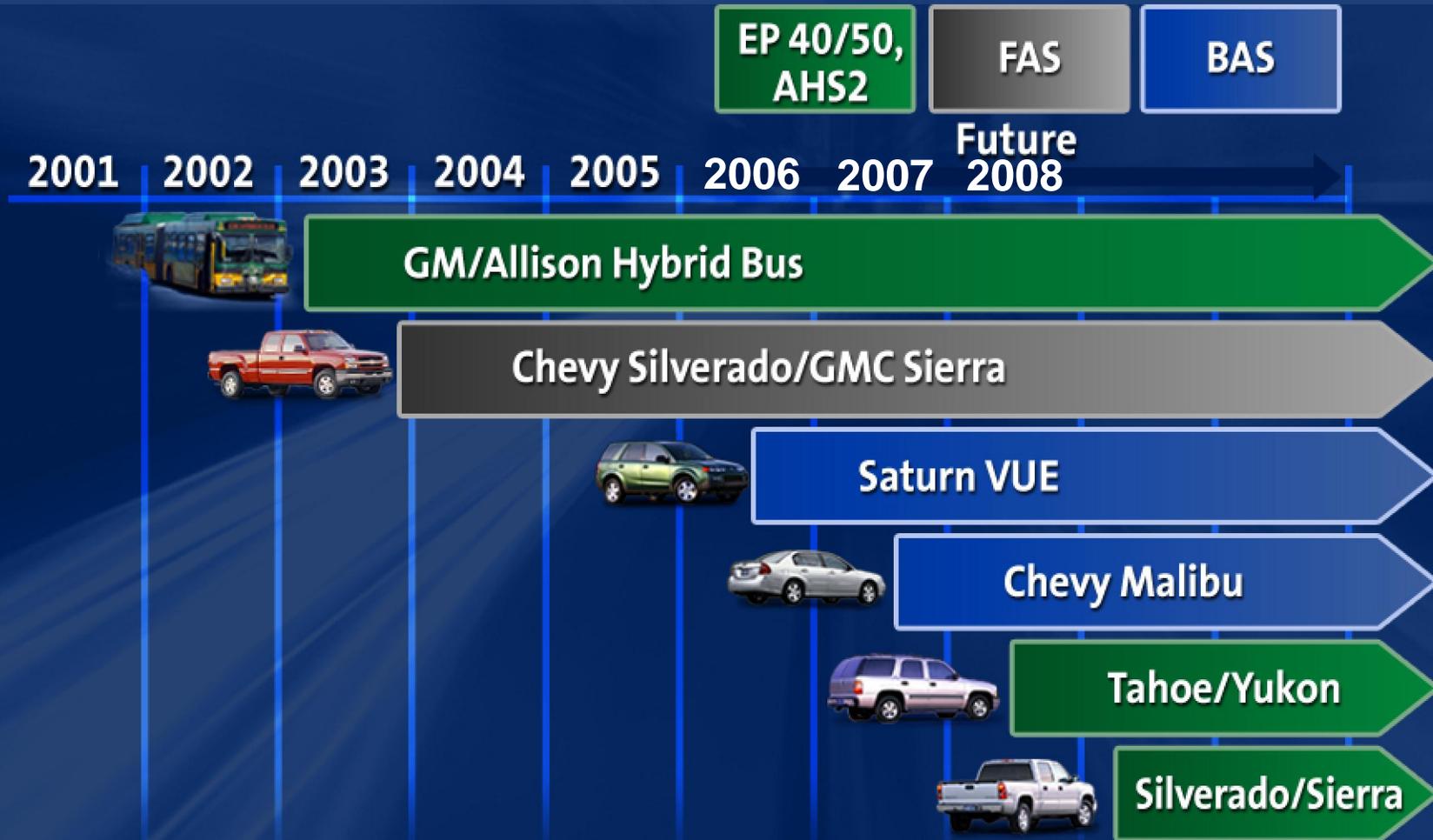
Biodiesel has a greater tendency to oxidize than standard diesel fuel and, thus, has a shorter storage life than standard diesel fuel. Frequent turnover of fuel in the tank is recommended to minimize problems.

Biodiesel reduces the surface tension of the blended fuel, which results in the water separator coalescing element in your vehicle's fuel filter to be ineffective. Any water in the fuel will pass through the filter and may cause corrosion damage to the fuel system.

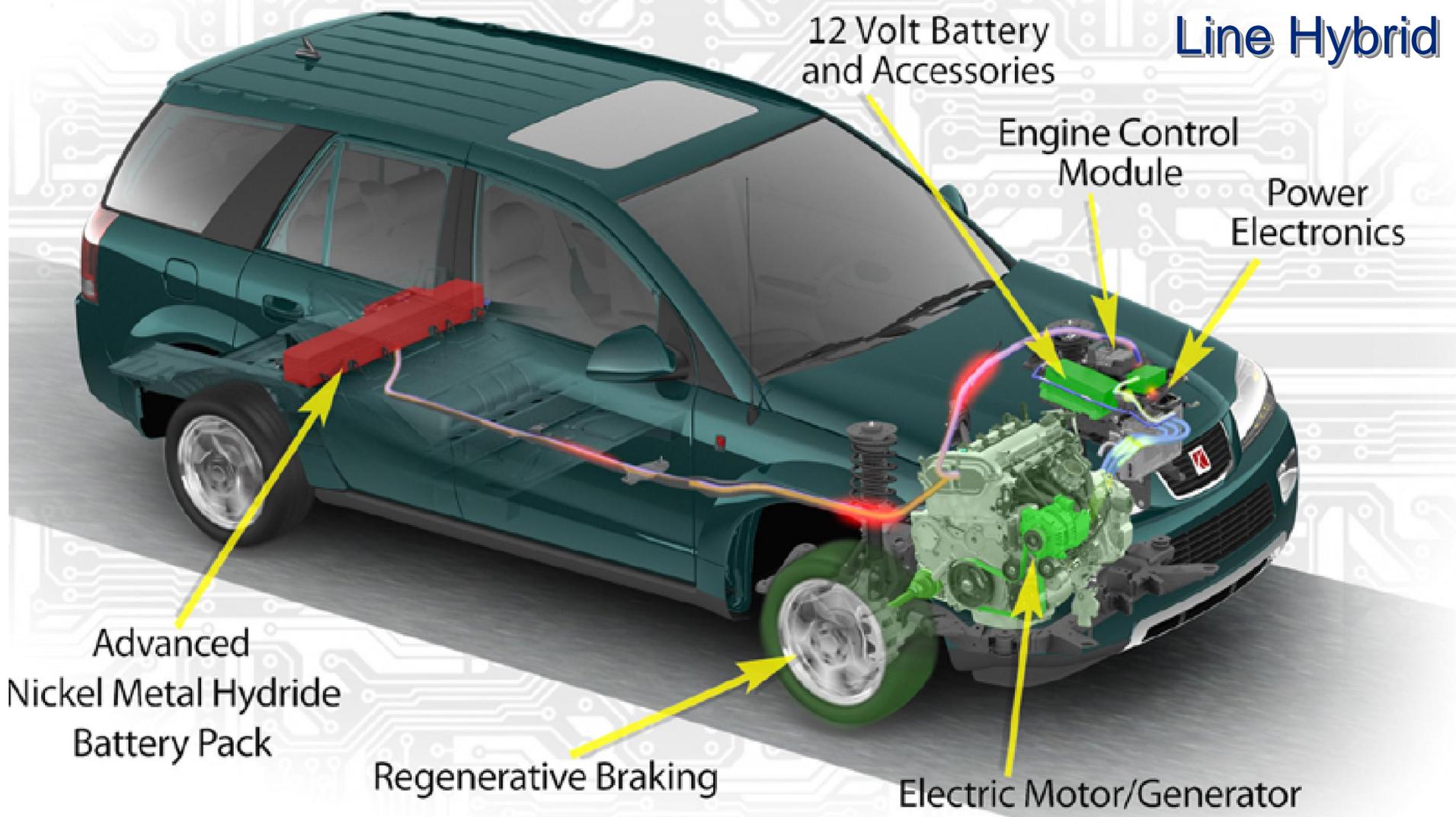
-WARNING, any damage caused by the fuel is NOT covered by your warranty.

Diesel fuel may foam when you fill your tank. This can cause the automatic pump nozzle to shut off, even though your tank is not full. If this happens, just wait for the foaming to stop and then continue to fill your tank.

# Hybrid Portfolio

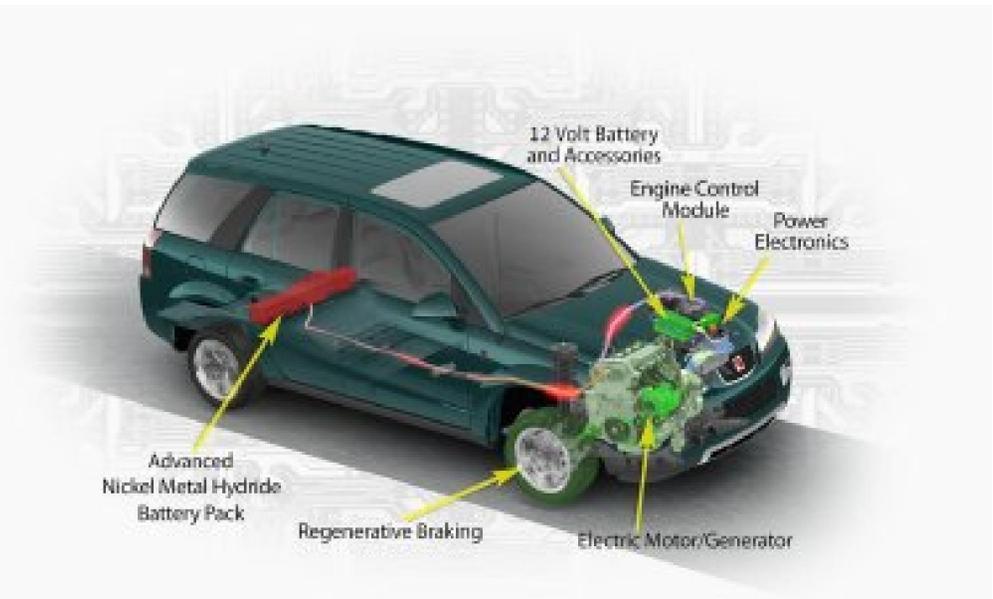


# 2007 Saturn Vue Green Line Hybrid



# GM's Mild Hybrid Models

- 2004 Silverado
- 2007 Saturn Vue
- No Electric Motor



# 2007 Aura Green Line Hybrid



- 170 HP 4 cylinder Hybrid
- Similar powertrain to Vue Green Line
- SOP Spring 2007

# 2007 Saab 9-5 Sedan & Combi



The future direction  
of E85 Powertrains

- 2.3L I-4 Turbo with 260 hp
- BioPower is Coming 2007 and represents E85 with the same fuel economy as Gasoline with better HP, Torque and Emissions levels.



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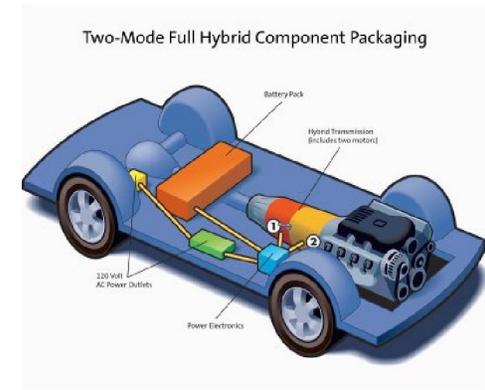
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# GM's Advanced Hybrid System – 2 Mode

- Builds on GM's two-mode full hybrid electric system for buses
- Leverages GM's leadership in automatic transmission and electronic controls with integrated, powerful and compact electric motors
- Provides full hybrid capability and efficiency as well as Superior acceleration and continuous power
- Cost effective full hybrid solution for multiple configurations

## Benefits

- 25% composite fuel economy improvement for full-size SUV
- Uncompromised performance and trailering/towing capability





2007

## Model Line up

2 Fleet models

1FL, 2FL

Retail models

LS, LT, LTZ, SS

Note: 0LT dropped

SOP 6-12-06

5 Star/ 5 Star Front Rating

19 out of 20 Stars

2008 Major (Fall 07)

Hybrid will be offered in 2008



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# GM Hybrid and Environmental Technology Roll-Out Plan

<u>CY</u>	<u>Vehicle</u>	<u>Tech. Engine</u>
3/'04	Chevrolet / GMC 1500 Pick-up	Hybrid FAS - Vortec
6/'04	Trailblazer / Envoy (8/'04) Rainer	Act. Fuel Mgt. - Vortec 5300
6/'04	Avalanche	E85 - Vortec 5300
6/'05	Chevrolet Impala / Monte Carlo	E85 - 3500 V6
6/'05	Grand Prix, impala, Monte Carlo (7/'05)	Act. Fuel Mgt. - Vortec 5300 V8
4/'06	Suburban / Yukon XL (6/'06)	Act. Fuel Mgt. - Vortec 5300 V8
6/'06	U-vans	E85 - 3900 V6
6/'06	Express / Savana Vans	E85 - Vortec 5300
6/'06	Impala	Act. Fuel Mgt. - 3900 V6

FAS = Flywheel Alternator Starter Hybrid

BAS = Belt Alternator Starter hybrid

E85 = 85% Ethanol (Alcohol Fuels)

# GM Hybrid and Environmental Technology Roll-Out Plan

<u>CY</u>	<u>Vehicle</u>	<u>Tech. Engine</u>
7/06	Saturn VUE	Hybrid BAS - Ecotec
3/07	Saturn Aura	Hybrid BAS - Ecotec
6/07	Van	Act. Fuel Mgt. - Vortec 6000
8/07	Malibu	Hybrid BAS - Ecotec
10/07	GMT319 (Next Gen VUE)	Hybrid BAS - Ecotec
11/07	Tahoe / Yukon	Hybrid 2 Mode - Vortec
1/08	Silverado / Sierra	Hybrid 2 Mode - Vortec
6/08	Malibu / G6 / Impala / Monte Carlo	Act. Fuel Mgt. - 3500 V6

FAS - Flywheel Alternator Starter Hybrid  
 BAS = Belt Alternator Starter hybrid  
 E85 = 85% Ethanol (Alcohol Fuels)



# HYDROGEN *Fuel Cell Vehicles*



# Fuel – Cell Propulsion Vehicles

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- The technology to produce GM's Sequel is two years old, and advances have since been made to produce fuel-cell vehicles more efficiently.
- And although the cost of producing hydrogen for use in vehicles is 1.3 times that of gasoline, GM thinks entrepreneurs who develop more efficient ways of producing hydrogen could solve cost problems as the auto industry continues moving toward fuel-cell vehicles.
- Another apparent problem is infrastructure in the distribution of hydrogen. GM has done a study showing that building about 12,000 hydrogen filling stations throughout the country's metropolitan areas would put a station within easy access of every driver of a fuel-cell vehicle. A hydrogen station every 25 miles on the interstate could also be established.
- The technology and fuel exist. The challenge now becomes the infrastructure and affordability of the products.

## Websites Available for Alt Fuels and Advanced Technology

[onlygm.com](http://onlygm.com) - E85 website

[livegreengoyellow.com](http://livegreengoyellow.com) - E85 website

[gmability.com](http://gmability.com) - Adv Tech Vehicle Information

[gmtalfuel.com](http://gmtalfuel.com) - Alternative Fuel Information

- E85
- Fuel Cells
- Hybrids
- Advanced Technology



# Our Commitment To America



•GM leads the auto industry in our commitment to the American economy. We're building the best vehicles we've ever built and we're investing in America.



## •U.S. Capital Investment

•**GM \$18.1 Billion\***

- Toyota \$10.7 B\*\*
- Honda \$5.6 B\*\*
- Nissan \$2.8 B\*\*

•\*GM data (1999 – 2002)

•\*\* Honda, Toyota, Nissan data (1980 – 2003)



## •Jobs per 100 vehicles sold in the U.S.

•**GM, DCX, Ford 23.4**

•Japanese Cos. 14.5

•Source: U.S. Labor Statistics, 2004 AALA Report

## •Domestic parts content for new vehicles sold in North America

•**General Motors 82%**

- Honda 49%
- Toyota 41%
- Nissan 38%
- BMW 11%
- Infiniti 5%
- Kia 4%
- Lexus 3%
- Hyundai 1%

• Source: 2003 AALA

Report,

•Automotive News Data Center



We believe we can help your organization meet it's "green" objective

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Would you like to work with GM to meet our common objectives?

Despite losing 10 Billion \$ in 2005 We are here and stronger than ever!

What is the manufacturer of your vehicle doing to support this effort globally?

# THE END

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