Electric cars are back

ABOUT A YEAR AGO, the United States was coming off a gasoline price shock, hybrid electric vehicles were the state of the art in production-car technology, and so-called plug-in hybrids were something only a few garage hackers and green extremists did for fun. The world's largest car company, General Motors Corp., was locked in a boardroom fight while its North American products withered on the vine.

Ah, what a difference a year makes.

Today, the state of the art has passed beyond hybrids to technologies that seemed dead or ridiculously exotic even a year ago: pure electric-drive cars, including fuel-cell vehicles; and plug-in hybrids, which give the option of charging the hybrid's batteries directly from a wall socket. Don't look for such cars in showrooms any time soon, but notice that some pretty specific ideas about how they will enter the market are starting to emerge. And some of those ideas come from an unlikely source: GM itself.

But first, a reality check. Nearly 50 million cars and light trucks were sold by major manufacturers worldwide last year. None of those vehicles were pure electrics, and only 350 000—less than 1 percent—were hybrids of one sort or another. By 2025, says Philip Gott, a market forecaster at industry analyst Global Insight, 12 percent of light vehicles sold globally will be hybrids. Another 12 percent, he says, will be diesels.

Few analysts will even hazard a guess about when the first pure electrics will show up in the showrooms of major manufacturers. But GM is clearly striving to be the company that puts them there. The auto giant announced several concepts and test fleets last year, all based on a common set of components using electric motors to power the wheels.

Even as GM struggled to regain the high ground in tech, it took more than its share of public relations hits. There was the news that it will almost certainly have to cede to Toyota its crown as the world's largest automaker, either this year or next. It's a title GM has held for 70 years. The company shed more than 30 000 employees in North America last year (it pledged to reinvest some of the saved cash in technology).

Many observers remain skeptical of GM's goals, pointing to the three decades the company spent aggressively battling any and all regulation in the fields of safety, emissions, and energy usage, while a litany of GM innovations languished in laboratories. There was the company's romance with hydrogen, for example, exemplified by Hy-wire, GM's 2002 fuel-cell car. Cars powered by hydrogen fuel cells remain in GM's vision, but they've been recast as a piece of a larger strategy involving electric-drive vehicles.

Several other manufacturers have unveiled fuel-cell concept cars, including Honda with its latest FCX, which made our list this year. And there's more than one way to spin wheels with hydrogen: BMW and Mazda each released roughly 100 production vehicles with the ability to burn hydrogen in their internal-combustion engines.

One of the biggest obstacles to hydrogen-powered cars is the lack of global hydrogen production and distribution infrastructure. But the auto industry was jolted by increasing speculation last year that as China builds a network of filling stations, it might possibly use them to distribute hydrogen as well as gasoline—jump-starting the global fuel-cell vehicle industry in a way impossible in more developed markets.

Such a strategy would assuage fears, as China goes mobile, of a vast greenhouse gas upsurge. The Chinese middle class is finding out what others learned decades ago: cars are bulwarks of personal freedom and, in the larger picture, of economic growth. Fortunately, cars today are cleaner, safer, more capable, and more reliable than ever.

That trend will go on, probably forever. Meanwhile, our collective vision of what constitutes a car is evolving with the technology that makes it go—and feeds our fantasies. ■

TOP 10 TEC

TESLA 2007 Roadster

POWER PLANT
- 185-kW electric motor

TRANSMISSION
- 2-speed electrically actuated manual
- Rear-wheel drive

CLAIMED RANGE
- 400 km

MORE
Among the car's buyers are the usual eco-celebs. Actors George Clooney and Dennis Haysbert have plunked down deposits.

A new kind of car from a Silico

It has lithium-ion batteries and comes with a charging cable, just lik your cellphone. Unlike your phone, however, it can go from zero t 100 kilometers per hour in less than 4 seconds, pinning you agains the back of your seat like a fighter pilot. And it'll do it with a lot les noise—and for US $70 000 less—than a Ferrari F430.

Created by Tesla Motors, a Silicon Valley start-up in San Carlos, th Tesla Roadster is powered by 6831 mass-market lithium-ion batterie and costs about $100 000. Want one? Fine, just put down $75 000 no and wait until summer 2008 to take delivery.

The Tesla was engineered by England's Lotus, renowned for its sma light sports cars. The car weighs just 1100 kilograms (2425 pounds), near a third of that battery weight. With its 185-kilowatt motor, it has a top spee of 210 km/h (130 mph).

As with any pure electric car, the key parameters are the batterie recharge time, energy density, and useful life. The point of referenc

HCARS

BY JOHN VOELCKER

Valley start-up

is the only recent electric vehicle from a major manufacturer, the late, lamented General Motors EV1. When the EV1 was introduced in 1996, it ran on lead-acid batteries, had a maximum range of 95 km (60 miles), and took up to 12 hours to recharge. The Tesla uses the same lithium-ion batteries found in laptops and digital cameras. Their energy density can be as high as 160 watt-hours per kilogram—or at least four times that of typical lead-acid cells. So the Tesla has a 400-km range and, best of all, it can recharge in as little as 3.5 hours.

Unresolved at the moment is the issue of battery life. Laptop batteries usually don't last the 10 years required of major automotive components. And Tesla has indicated it expects its battery pack's power to degrade up to 30 percent in as few as five years or 200 000 km. More than a dozen companies are trying to develop lithium-ion batteries in sizes and packages suitable for automotive use. When one of them succeeds, the tactic of lashing together many small cells bolstered by instrumentation to monitor and accommodate the power or thermal variances among them probably will end.

Tesla Motors is hardly the only new EV maker these days, though its $40 million in venture funding puts it at the top of the list. Globally, more than two dozen companies are offering electric cars of all different sorts, from drab econo-boxes to supercars like the Tesla Roadster.

Meanwhile, as of January, Tesla had sold more than 250 cars—a tidy sum at $100 000 each. The first cars are supposed to be delivered in September, if crash-test analyses and other U.S. government-certification requirements go smoothly.

Tesla also has plans for a second car, a sporty four-seat sedan code-named White Star. The company hopes to launch that car by 2010, at a price of $50 000. To do so, it has set up an engineering center in Rochester Hills, Mich., and plans to staff it with more than 50 engineers. ■

TESLA MOTORS

HONDA
FCX / Concept

POWER PLANT
■ 100-kW hydrogen fuel cell

CLAIMED FUEL EFFICIENCY
■ 435 km from 171 liters of hydrogen, stored at 350 atmospheres

MORE
Honda let journalists take the car out on the banked test track at its R&D center in Japan, at speeds up to 140 km/h (87 mph).

GMC
2008 Yukon Two-Mode Hybrid

POWER PLANT
■ Vortec V8 (displacement not released at press time)

TRANSMISSION
■ Two-mode hybrid system
■ Two 40-kW electric motors
■ Three planetary gear sets
■ All-wheel drive

CLAIMED FUEL EFFICIENCY
■ 10.5 L/100 km (estimated)

MORE
Two-mode hybrid system is planned for pickup trucks, too.

GMC's Yukon is a strapping 2500 kilograms unloaded. In other words, it ain't no Prius.

And yet, Yukons fitted with GM's new two-mode hybrid system use essentially the same principle to reduce energy consumption as Toyota's celebrity-friendly it-car. An electric drive can power the vehicle, by itself or together with the combustion engine. The battery that powers the motor is charged by the engine and also through regenerative braking.

Being as big as it is, though, the Yukon outdoes other hybrids by having two electric drive motors, each capable of 40 kilowatts sustained. A single motor with enough torque to move such a mass couldn't be accommodated inside the truck. So GM's engineers, who led a design effort that later included engineers from DaimlerChrysler and BMW as well, used a pair of electric motors—a system GM had previously put into production for its hybrid transit buses. As in the Prius, the Yukon's motors are actually motor/generators that can produce torque when fed with electricity—or vice versa.

The size of the system was constrained by the need to fit it into the same space as the company's 6-speed automatic transmission. Inside an aluminum casing are packed not only four fixed gears but (from front to rear) a "planetary" gear set and electric motor, a clutch, a second planetary gear set and motor, and then a final clutch and gear set. In each planetary gear set, a central gear (the "sun") is spun by the engine or electric motor. The sun is surrounded by planet gears that are in turn surrounded by a ring gear, which drives or is driven by another motor. By varying the speed at which the planet gears spin, you also change the power split between the torque on the sun and that on the ring gear. Being able to split the power arbitrarily like that lets you channel just the right amount of the engine's power to the wheels; the rest is devoted to charging the batteries.

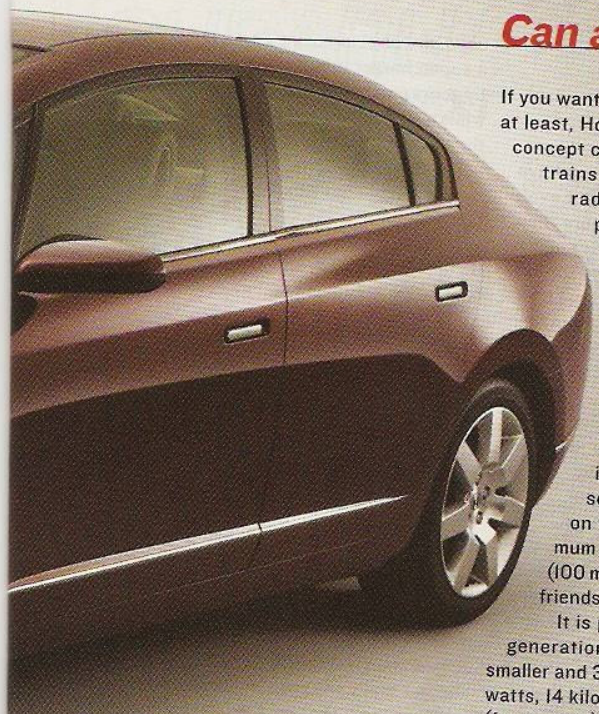
The "two modes" of GM's system refers to the different mixes of electric-motor and combustion-engine torque. The first, or input-split, mode is for low-speed and light-load applications from launch through second gear. As in existing single-mode hybrid systems, a planetary gear set splits engine power between the wheels and one of the

A hybrid heavy hauler

two electric motors. Acting as a generator, this motor charges the battery, which powers the other motor, which drives the wheels as well. In this mode, the engine-control system alternates among electric-only, engine/electric, and engine-only drive, choosing the option that provides the best performance with the lowest fuel consumption. From rest, energy from the 300-volt nickel-metal-hydride batteries powers the drive motor, which is quickly supplemented by torque from the engine.

The second, or compound-split, mode is for high speeds and heavy loads. It provides electric assist in the third and fourth gears. Here, both electric motors can receive torque from the engine

Can a fuel-cell car be sexy?



If you want one, you'll have to wait until 2018 at least, Honda says. But still, its latest FCX concept car takes hydrogen fuel-cell power trains into a new, sleeker realm. It's a radical, stylish departure from the previous FCX's upright, slab-sided hatchback design.

Honda revealed its new FCX this past summer, around the same time GM previewed its Chevrolet Sequel fuel-cell vehicle. But the two cars couldn't be more different. The Sequel is a conventionally attractive sport-utility vehicle, but the FCX is a low, four-door, five-passenger sedan. It would look right at home on the Autobahn, although its maximum speed of 160 kilometers per hour (100 miles per hour) wouldn't win it many friends in the left lane.

It is powered by the company's third-generation fuel cell, which is 20 percent smaller and 30 percent lighter, and at 100 kilowatts, 14 kilowatts more powerful. The new V (for vertical) Flow stack stands upright, and can be packaged in what used to be called a "transmission tunnel" between the seats, lowering the center of gravity and doing away with the characteristic tall, upright design of most previous fuel-cell vehicles.

More important, the design helps eliminate one of the biggest obstacles to mainstream use of fuel-cell cars: the cost and complexity of the systems needed to let the cells withstand sub-freezing temperatures when they're not running. Water is a by-product of the reaction that liberates electrical energy in a fuel cell. But any water remaining in the cells' stack, where the reaction occurs, would cause damage if it froze there. In Honda's vertical-flow design, gravity helps drain that water—improving performance and reducing the power needed to pump the stack dry every time the car is turned off. According to Honda, the system works so well that the car can start at temperatures as low as –20 °C.

With a smaller and lighter 95-kW drive motor, the new FCX's complete power system is 180 kilograms lighter and almost 40 percent smaller than its predecessor's. Hydrogen is stored in a 171-liter tank at a pressure of 350 atmospheres, giving the car a range of 435 km (270 miles), Honda says.

Honda plans to put the car into very limited production in Japan next year. Still, it's a step forward: virtually all fuel-cell cars built so far have gone into carefully maintained and sheltered fleets at utility companies, for example. But Honda says it is considering leasing the cars for US $600 or $700 a month to interested private citizens, to get real-world feedback on how the new FCX drives, rides, and performs. ■

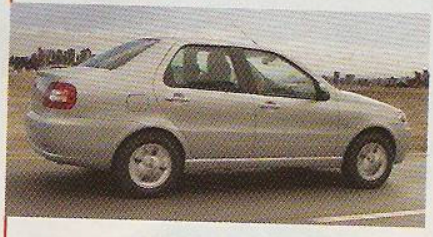
and power from the battery. The second and third planetary gear sets not only split the engine power among the drive wheels and the electric motors, they can multiply all torque to deliver maximum power to the wheels.

Controlling it all are microprocessors. In fact, according to chief engineer Tim Crewe, 70 percent of the total effort involved in designing and testing the system went toward control logic. That logic analyzes hundreds of inputs every 10 milliseconds, including vehicle load, engine operations, battery parameters, and the temperatures in the high-voltage electric components. Depending on vehicle speed and power requirements, one motor-generator may assist the engine, or provide regenerative braking, with the other shut down for greater efficiency. Or both motors can provide boost or braking simultaneously. And the combination of planetary gear sets and electric motors smooths the shifting among modes, so that engine speed can stay constant even as it varies the electric power delivered to the battery or drive wheels.

When coupled with cylinder deactivation, the two-mode hybrid system is expected to improve overall fuel economy by 25 percent, to 10 or 11 liters per 100 kilometers (about 22 miles per gallon). For comparison, the standard GMC Yukon gets 15 to 16 L/100 km (roughly 15 mpg) in the city and 11 to 12 L/100 km (20 mpg) on the highway, according to the U.S. Environmental Protection Agency. ■

FIAT

2007 Siena Tetrafuel



POWER PLANT
- 1.4-L 4-cylinder
- 59 kW (gasoline, ethanol)
- 50 kW (natural gas)

TRANSMISSION
- 5-speed manual

CLAIMED FUEL EFFICIENCY
- 5.6 to 7.7 L/100 km (gasoline)
- 8.3 to 11.5 L/100 km (ethanol)
- 15 to 20 km/m³ (natural gas)

MORE

At 6270 liters per hectare (670 gallons per acre), Brazil's production of ethanol from sugarcane is nearly twice as efficient as U.S. production from corn, according to the Earth Policy Institute.

Research and translation for this segment was provided by Erico Guizzo.

Auto omnivore

Stand on a street corner in any middle-class suburb in Brazil and well over half the cars whizzing by will be flex-fuel vehicles capable of burning various mixtures of gasoline and ethanol.

Among Brazil's many flex-fuel cars, a version of the Fiat Siena stands out because it runs on any blend of ethanol and gasoline, and also on pure natural gas as well. It burns the natural gas first because it's Brazil's cheapest car fuel.

The Siena stores the liquid fuel in a 48-liter tank and the natural gas in two 6.5-cubic-meter cylinders in the trunk. The 1.4-L engine has two sets of injectors, one for liquid fuel and a second for natural gas. But those are the engine's only major hardware modifications. The engine-control unit (ECU) is the same as the one on ordinary Sienas. It just runs more sophisticated software.

The car's existing sensors measure the airflow into cylinders, the engine speed and load, and the specific fuel being sent to the engine. The data are fed to the ECU, which uses them to optimize fuel injection and spark timing. Most important, the ECU uses data from the sensor that monitors oxygen in the exhaust to vary the air-fuel mix continuously until that sensor detects no oxygen remaining in the exhaust, indicating complete combustion. ■

TOP: AMERICAN HONDA MOTOR CO.; LEFT: GENERAL MOTORS CORP.; RIGHT: FIAT

VOLKSWAGEN

2007 Golf GT TSI

POWER PLANT
- 125-kW 1.4-L turbocharged and supercharged 4-cylinder

TRANSMISSION
- 6-speed manual
- Front-wheel drive

CLAIMED FUEL EFFICIENCY
- 7.2 L/100 km

MORE
After his test run, notoriously irritable reviewer Jeremy Clarkson called it one of the five worst cars he has ever driven.

Powerful small-displacement engines have always been a European specialty. But even in Europe, an engine that puts out more than 75 kilowatts (100 horsepower) per liter of displacement is notable. So one that gets 125 kW (168 hp) and 240 newton meters of torque from 1.4 liters is quite an achievement. Throw in fuel consumption of 7.2 liters per 100 kilometers (33 miles per gallon), and you've really got something to cheer about.

So let's hear it for Volkswagen's Golf GT with the TSI Twincharger engine. VW's goal was to reduce carbon dioxide emissions while maintaining power, torque, and driving characteristics in an engine that could be produced in high volumes for a variety of vehicles. The resulting engine delivers the highest specific power of any mass-produced 4-cylinder, and the same torque as a 2.3-L engine while using 20 percent less fuel.

VW's engineers opted for the conventional approach to maximizing kilowatts per liter: start with small displacement, and coax out every possible kilowatt. To do this, their unusual trick was to use both a supercharger and a turbocharger. Each is essentially a pump that pushes more air into the cylinder, allowing more fuel to be used, thereby increasing an engine's power. But a supercharger is basically an air pump driven by gears or a belt from the engine's crankshaft, while a turbocharger is a small turbine spun by the force of escaping exhaust gases.

Because it's driven off the crankshaft, a supercharger can supply additional air to the combustion process even at low engine speed. On the other hand, a turbo has to "spool up" to its operating speed, which happens only when the engine is running fast enough to generate significant exhaust pressure to spin it. The delay between a driver accelerating and the turbo boost coming on is called "turbo lag."

Recipe for fun: take a turbo and add a blower

VW's supercharger compensates for that lag.

Below 2400 revolutions per minute, the supercharger can increase the pressure of the air provided to the combustion process by up to 150 kilopascals (about 1.5 atmospheres). Under acceleration from 2400 to 3500 rpm, the supercharger stays engaged while the turbo spools up. Once the turbo nears its maximum boost of 250 kilopascals (2.5 atmospheres), a bypass flap switches the air supply from the supercharger to the turbo. The integration of the two provides high torque from 1750 rpm to 4500 rpm.

LEFT: VOLKSWAGEN; BELOW: GENERAL MOTORS CORP.

CHEVROLET

Volt / Concept

POWER PLANT
- 120-kW electric motor
- Turbocharged 1-L 3-cylinder engine
- 53-kW generator: recharges 16-kWh battery pack

TRANSMISSION
- None; electric motor drives front wheels

MORE
One of two cars this year named for an electricity pioneer, the other being the Tesla.

SUBARU

2007 Outback 2.5XT

SUBARU OF AMERICA

POWER PLANT
- 2.5-L 181-kW turbocharged flat-4 (or horizontally opposed 4-cylinder)

TRANSMISSION
- 5-speed automatic
- All-wheel drive

CLAIMED FUEL EFFICIENCY
- 9 to 11.8 L/100 km

MORE
Testing the three different modes of Subaru's SI-Drive may pose a challenge for government agencies.

Subaru has always been a Jekyll-and-Hyde company. Its sensible all-wheel-drive station wagons sit in the same showrooms as their unruly alter egos, such as the fast, road-hugging Impreza WRX sedans, developed over many years of punishing off-road rallies.

Now Subaru has introduced technology to let drivers choose—sensible or wicked?—by twisting a dial on the console. The Subaru Intelligent Drive (SI-Drive) system lets drivers select one of three modes: Intelligent, Sport, or Sport Sharp. It comes standard on three 2007 models—one of them the Outback 2.5XT with automatic transmission—and more are due next year.

The turbocharged 2.5-liter double-overhead-cam engine in the 2.5XT—in which the cylinders are horizontally opposed, like a Porsche's, to lower the center of gravity—produces 181 kilowatts (243 horsepower) and a rousing 327 newton meters (241 foot-pounds) of torque.

As you change SI-Drive modes, the system's control software revises settings for the engine control, automatic-transmission shift points, and throttle response. In Intelligent mode, the system limits engine torque to 309 Nm, thereby cutting maximum power by roughly 20 percent. It also makes throttle response smoother and more gradual, improving the fuel mileage by up to 10 percent, Subaru says.

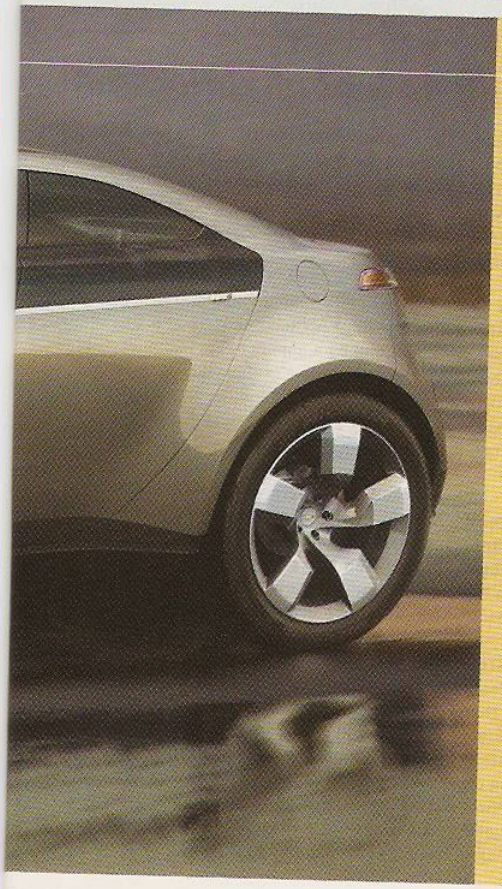
The Sport mode sharpens throttle response to favor acceleration and power over fuel efficiency. This mode is best for freeway and suburban driving and in hilly terrain, Subaru says.

The Sport Sharp mode emphasizes instantaneous power delivery. It's useful for passing. Remapped shift points hold the car in its lower gears longer, improving acceleration by more than 50 percent compared with Intelligent mode, Subaru says, and mimicking the wild-child behavior of the WRX.

A sensible car acquires multiple personalities

The idea of a single engine with multiple personalities had long been the dream of Toshio Masuda, Subaru's project general manager for the Legacy Outback line. Despite skepticism that such a system was possible, one of his engineers built a prototype of what would become the SI-Drive and installed it in a test "mule." That car gradually won management over to the idea.

The team's challenge lay in the fact that offering three performance profiles required three times as much software development and testing. ■



GM's vision of an electric-drive future

Hybrid-electric vehicles have been available for a decade now. And within a few years, so-called plug-in hybrids will offer beefier batteries that can be recharged from a wall socket, as well as by the vehicle's internal-combustion engine. But both variants are still adapted from the same design handed down during a century of mechanically driven cars, in which the engine's torque is transferred mechanically to the wheels.

A more radical design is the series hybrid electric car—driven by one or more electric motors powered by batteries that can be recharged by the combustion engine. In the series configuration, the combustion engine cannot drive the wheels directly; it switches on, only as needed, to run a backup generator that recharges the batteries on trips that exceed the car's all-electric range.

The Chevrolet Volt, which stole the show at Detroit's North American International Auto Show in January, is the first-ever series hybrid concept vehicle shown by a major carmaker. Its 1-liter, 3-cylinder turbocharged engine runs an onboard 53-kilowatt generator that recharges a 16-kilowatt-hour lithium-ion battery made up of 80 4-volt cells.

That battery powers the car through a 120-kW electric motor delivering 320 newton meters of peak torque, giving an all-electric range estimated at 65 kilometers (about 40 miles). The plug-in recharge time likely will be 6.5 hours or less. And the 45-L gasoline tank gives almost 1000 km between refuelings.

On paper, anyway. "We don't have a battery pack yet" for the concept, acknowledges Tony Posawatz, the vehicle line director, who confirmed that the car shown in Detroit doesn't yet run—so its range has been estimated from lab tests. Among other qualifications for automotive use, lithium-ion battery packs must last 10 years or longer through more than 4000 full charge-discharge cycles.

The Volt is the first of several concepts that are expected to use what GM calls its E-flex platform for electrically driven vehicles. Starting around 2010, GM plans to build a variety of subcompact vehicles the size of an Opel Astra on a basic architecture that accommodates E-flex components. Some will have combustion engines, some are likely to be parallel hybrids with plug-in capability, and others may be serial hybrids like the Volt.

GM's announcement that it would produce cars using E-flex changed the Volt from just another shiny concept to a possible precursor of a truly radical shift in drive technology. During the Volt's unveiling, Robert A. Lutz, GM's vice chairman for product development, was clear: GM intends to sell cars powered by electricity. But, understandably, the company won't commit to a date for doing so until it can get sufficiently powerful and durable lithium-ion batteries for automotive use. ■

AUDI
2008 R8

POWER PLANT
- 4.2-L 309-kW V8

TRANSMISSION
- 6-speed manual
- All-wheel drive

CLAIMED FUEL EFFICIENCY
- 12 to 17 L/100 km (14 to 20 mpg), according to *Car and Driver*

MORE
Holding down both the accelerator and brake activates the optional automatic's Launch Control mode, which revs the engine for the best traction and quickest acceleration.

BMW
2008 5-Series

POWER PLANT
- Nine different engines available, from 120 to 270 kW, including...
- 4- and 6-cylinder in-line diesels
- Gasoline in-line 6 or V8

TRANSMISSIONS
- 6-speed manual or automatic
- Rear- or all-wheel drive

CLAIMED FUEL EFFICIENCY
- 6.1 to 10.9 L/100 km

MORE
To reduce engine loads, BMW plans to introduce more electric accessory drives.

Regenerative braking in a nonhybrid

For 40 years, engineers from the Bavarian Motor Works have ingeniously applied technology to the pursuit of a single goal: superb handling and performance. But nowadays, not even BMW can ignore calls for cars that consume less, emit less, and tread more gently on the planet.

The company has not announced a hybrid, though it has partnered with GM and Daimler Chrysler in their two-mode hybrid project [see "2008 GMC Yukon Two-Mode Hybrid"]. And now, on its revised 5-Series sports sedans, BMW has introduced regenerative braking—the first time such a system has been used on a nonhybrid car.

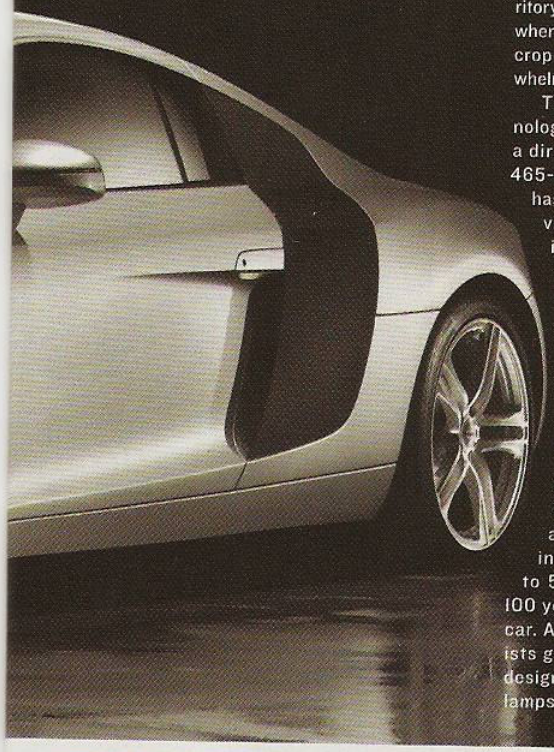
The company's Brake Energy Regeneration system grew out of an intelligent alternator control project shown at last year's Paris Auto Show. The core idea is to change the times at which the alternator charges the battery.

In a conventional car, the alternator generates power continuously, regardless of other loads on the engine. But in the new 5-Series cars, it is engaged to generate power only when the car decelerates. At other times, when the car is cruising or accelerating, it merely freewheels. With the alternator no longer sapping power—a phenomenon known as alternator drag—the engine needs to work slightly less hard to move the car, cutting fuel consumption. The alternator itself has not changed; BMW has simply inserted an electronically controlled clutch that engages to let it charge only when the car decelerates.

The power to drive all the car's electric components—as much as 3.5 kilowatts in the average midsize car these days—is supplied by a somewhat more powerful battery. BMW won't release exact figures, but it does say that it uses glass-mat technology, which separates the battery's plates with saturated absorbent glass—boron silicate—rather than the usual gel or liquid electrolyte. The acid electrolyte is held in the microfibers between layers of lead, improving its energy storage during frequent charge/discharge cycles, compared with standard lead-acid batteries. Those ordinary batteries convert up to 20 percent of electrical energy to heat during charging, against as little as 4 percent for glass-mat designs.

Alternator drag is found in almost every vehicle sold today, so its impact may seem insignificant. But in the European Union driving cycle, which is used to measure fuel consumption for cars sold within that market, BMW's revised alternator system reduced energy consumption by roughly 3 percent.

LED lights hit the road



The R8, Audi's first excursion into supercar territory, is projected to cost roughly US $130 000 when it hits showrooms this year. If the current crop of starter supercars leaves you underwhelmed, your ship may be about to come in.

The R8 is stuffed with advanced technology, including an aluminum space frame, a direct-injection midmounted V8, and a 465-watt 12-speaker sound system. It also has shock absorbers filled with fluid whose viscosity is varied electromagnetically, as in the Cadillac XLR and SRX.

All those technologies have appeared in other cars, but not all together in one car. And the stylish, two-seat R8 has something that sets it apart in its category: light-emitting diodes for its daytime running lights.

LEDs offer many advantages as automotive lamps, including low power and long life. The automotive-lighting company Hella quotes just 10 W for a pair of LED running lights, against as much as 150 W for standard, incandescent ones. LEDs also last up to 50 000 hours—which translates to 100 years of headlight use for an average car. And they're small enough to give stylists great freedom over front-end design: designers can cluster or scatter single LED lamps as their sketches require.

The only problem is cost: up to $1000 per pair if you have to replace them. That's roughly 10 times as much as the high-intensity discharge lamps, which cast a bluish light, used on upscale cars today. So for the moment, LED running lights are limited to just a few high-end Audis: the R8 and the A8, S6, and S8. The racy R8, however, goes its siblings one better by also using LEDs to illuminate its 4.2-liter, 309-kilowatt, high-revving V8, which is visible through a window behind the seats.

The R8's lights are produced by Osram Opto Semiconductors, in San Jose. Each running lamp has 12 separate LED spotlights arranged in a sinuous curve under the pod containing the high beam and turn signal. Each of the LEDs provides 18 lumens at 140 milliamperes.

Meanwhile, Audi and Lexus are competing to be the first to use LEDs as headlights in a production car. Lexus probably will win the race, as its LS600h—the ultraluxurious hybrid-electric flagship of the LS line—is expected to hit showrooms any day now. The Lexus designers stayed with a conventional headlight shape—which holds high-intensity discharge lamps in other LS models (it was shaped to evoke Baccarat crystal). But Audi promises to offer full LED headlamps as an option for the R8 by the end of this year. ■

CHRYSLER

2007 Sebring

POWER PLANT
- 2.4-L, 2.7-L, or 3.5-L

TRANSMISSION
- 4- or 6-speed automatic
- Front-wheel drive

CLAIMED FUEL EFFICIENCY
- 8.7 L/100 km (combined, 2.4-L engine)

MORE
My Gig lets you rip CDs onto its hard drive, but it won't let you transfer the MP3 files to any external device.

If you've bought a new car recently, chances are that it can accommodate most of the entertainment media, formats, and compression algorithms you probably now enjoy: AM, FM, and satellite radio; CD; DVD; MP3. But the challenge of accessing all those options may have left you resignedly listening to the drone of news radio.

Chrysler feels your pain. A new, US $1700 option on this year's Sebring sedan bundles players for all those media, plus a cellphone and navigation system, into a single dash-mounted entertainment setup called My Gig. The system, developed with stereo maker Harman/Kardon, features a single, consistent user interface to operate them all.

Nav system + DVD player + iPod + phone + hard drive = integration

In the My Gig–equipped Sebring, the disc player can play music or show movies to backseat passengers from a 7-inch display at the rear of the console between the front seats or—if the car is parked—on a 6.5-inch in-dash display. The music, video, and navigation functions can all be controlled by voice commands (in English, Spanish, or French) or through a touch screen. The system integrates Bluetooth hands-free mobile calling, and it can record voice memos.

The heart of the My Gig system is its ruggedized hard drive that holds navigation data and up to 1600 MP3 or Windows Media Audio files, as well as eight photos and up to 32 address-book names. It is one of the first car-based systems that lets you rip CD tracks into MP3 format and store them on the hard drive. MP3-savvy readers may wonder how the system, without an Internet connection, can fetch the artist, title, and other track information for a CD. Glad you asked. Included within the system's 1 GB of software is the Gracenote lookup engine to locate information for roughly a million CDs that Gracenote believes North American users may play. Chrysler hadn't decided at press time whether to charge users for quarterly updates at the dealer. ■

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