

Friday, June 12, 2009

## Driving the Volt

The electric propulsion system for GM's new plug-in hybrid gives a silent yet powerful ride.

By Kevin Bullis

As part of a marketing [plan for its Volt](#) (<http://www.technologyreview.com/blog/energy/23597/>) plug-in hybrid, which is slated to go on sale by the end of 2010, [GM](#) (<http://www.gm.com/>) has been taking the unusual step of allowing journalists to drive test vehicles. The test cars, called "mules," have the same basic propulsion system that the Volt will have, but not the same body. Here's what it feels like to be behind the wheel.

The Volt will be electrically powered, its wheels driven exclusively by an electric motor. For the first 40 miles, that motor will be powered using energy stored in a large battery pack. After that, an onboard gasoline- or ethanol-fueled generator will provide the electricity (with the battery acting as a buffer to improve the generator's efficiency).

The test drive was meant to show off only the electric drive system, not the car's handling (since it does not have the Volt body and chassis), nor the performance of the car once the generator kicks in (since GM prefers to emphasize the electric-only portion of the driving experience). Unlike other plug-in hybrid designs, in which a gas engine is connected to the wheels and used to supplement the electric motor, the Volt gets all of its acceleration from the electric motor.

The key distinctive feature of electric drive is the instantaneous response of the motor. Electric motors deliver their maximum amount of torque right away, whereas conventional internal combustion engines have to work up to it. As a result, the car accelerates faster. Frank Weber, the GM executive in charge of the Volt program as well as vehicles that will use the Volt's underlying propulsion technology worldwide, says that this means the car feels as though it's powered by a 250-horsepower engine, even though the motor is only rated at about 150 horsepower. The car certainly felt more powerful than a typical compact car. Accelerating from 40 to 80 kilometers per hour seemed effortless. And because there is only one gear, the acceleration is smooth.

The engineers have designed the control system to mimic conventional cars in several ways. Taking your foot off the accelerator in a conventional car causes the vehicle to slow down quickly due to engine braking, a phenomenon that drivers are used to and count on to slow down when approaching a car on the freeway, for example. If you cut off power to an electric motor, it can still spin freely, so the car doesn't slow down much. So the engineers have programmed the control system to start using the motor to recharge the battery when the driver lifts up on the accelerator, which slows the car down. They've also included a setting that increases the amount of this recharging, which slows the car down faster. In the future, these settings might be user-configurable, although Weber says that the amount of control would probably be limited to a few presets.

The engineers also decided to program in a small amount of vehicle creep. When conventional cars are stopped, a driver can edge forward by releasing the brake without depressing the accelerator. The same thing is programmed to happen in the Volt propulsion system. This was done not just to make the car feel like a conventional car, but also to give drivers some feedback that the car is on. Because the motor is silent, it would be easy for a driver to get out of the car without realizing that it is on.

The test car didn't quite have the same performance as the final production version of the car, Weber says. For example, the initial power delivered by the motor has been scaled down a little because the jolt could be too much for the nonproduction parts in the test car. He says that the performance was at about 80 percent that of the production car.

The final car will contain a few additional features, including an extra horn designed to warn pedestrians that the almost-silent car is approaching without blasting them with the regular car horn. It may also include a system that uses GPS to help control when the car shifts from battery-only mode to using the generator. Normally, this happens when the charge level in the battery drops to 30 percent. If the car knows that you're almost to a charging spot, it could postpone the switch, allowing the level to drop lower, thereby conserving gasoline.

The test car is noticeably less powerful than the [Tesla Motors Roadster](http://www.technologyreview.com/TR35/Profile.aspx?trid=742) (<http://www.technologyreview.com/TR35/Profile.aspx?trid=742>), the only highway-capable electric car for sale in the United States now. But that comparison isn't fair: the Tesla is a tiny sports car designed for high performance, and it costs more than \$100,000. The Volt is meant to be an everyday sedan, and it's much cheaper: it's expected to cost about \$40,000.

The Volt has more power than a Toyota Prius and feels more responsive, perhaps because it gets all of its power from the electric motor, whereas the Prius gets most of its power from an internal combustion engine. (In the new Prius, the combined power of the electric motor and engine is 134 horsepower, of which only 36 horsepower comes from the battery. ) But the Prius only costs about \$22,000.

The performance of the Volt will be important. By the time the Volt comes out next year, it will face a very different market than the one today--one in which there will be serious fuel-efficient alternatives. In addition to there being a larger number of conventional hybrids, other plug-in hybrids will either already be for sale, such as one from Fisker Automotive, or will be soon. Toyota will have already been testing hundreds of [its own plug-in hybrids](#) (<http://www.technologyreview.com/energy/21951/>), which will include [a smaller battery pack](#) (<http://www.technologyreview.com/blog/energy/23062/>) and rely more on the gas engine. What's more, several electric vehicles will be for sale--at first to commercial and government customers, but more and more to general consumers--or they will be on the way, including cars from Mitsubishi, Subaru, and Tesla.

Copyright Technology Review 2009.

---

## Upcoming Events

### **[6th Annual MITX Technology Awards \(http://www.mitxawards.org/technology\)](http://www.mitxawards.org/technology)**

Boston, MA

Tuesday, June 16, 2009

<http://www.mitxawards.org/technology> (<http://www.mitxawards.org/technology>)

### **[Nanotech Europe 2009 \(http://www.nanotech.net\)](http://www.nanotech.net)**

Berlin, Germany

Monday, September 28, 2009 - Wednesday, September 30, 2009

<http://www.nanotech.net> (<http://www.nanotech.net>)

### **[2009 Medical Innovation Summit](http://www.ClevelandClinic.org/innovations/summit)**

**<http://www.ClevelandClinic.org/innovations/summit>**

Cleveland, OH

Monday, October 05, 2009 - Wednesday, October 07, 2009

<http://www.ClevelandClinic.org/innovations/summit>

<http://www.ClevelandClinic.org/innovations/summit>