As automakers hunt for ways to boost fuel economy, many systems in gasoline-powered vehicles shift to electricity.

**How eAssist recaptures energy to boost mpg on the 2012 Buick LaCrosse**

1. **Regenerative braking**
2. Electricity from the brakes charges a lithium ion battery.
3. The battery powers a motor generator.
4. The motor generator assists the 2.4-liter gasoline engine.

In addition, a stop-start system cuts the engine at stoplights, and the motor generator restarts the engine.

**Driver’s gauges for LaCrosse with eAssist**

The 2013 Malibu with eAssist gets an estimated 38 mpg on the highway, vs. 33 for the standard 2011 base Malibu.

These electrical devices have created demand for improved engine control units and sophisticated software to manage the electrical system.

**Electric power**

Here’s a quick tour of key components in the electrification of the vehicle:

- **Stop-start systems.** When the motorist stops the vehicle, the engine control unit automatically stops the engine, then restarts it when the driver lifts his foot off the brake. Stop-start can improve fuel economy from 4 to 10 percent. These systems typically require an upgraded starter motor and a more durable battery. Robert

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**GM’s approach**

Mass-market automakers are taking a similar approach. General Motors, for instance, has improved its mild hybrid technology and reintroduced it as eAssist. Features of eAssist, which will be available on the 2012 Buick LaCrosse and Regal and 2013 Chevrolet Malibu, include stop-start systems, regenerative brakes that recharge a small lithium ion battery.

The lithium ion battery, in turn, provides power to the stop-start system, reducing the starter battery’s workload. The separate starter battery on the three cars is a traditional 12-volt lead-acid unit.

When the vehicle accelerates, the lithium ion battery provides extra power to the wheels via a motor that doubles as the car’s alternator and starter. A drive belt connects the alternator-starter to the crankshaft. The battery and alternator-starter alone cannot power the wheels; they only provide an assist.

To GM, eAssist is attractive because it is much cheaper to produce than a hybrid powertrain.

“Consumers want fuel economy,” says Buick spokesman Nick Richards. “But the cost [of a full hybrid] holds them back. So we didn’t redesign the entire vehicle around the powertrain.”

**BMW turns its engineers loose to slash energy use**

BMW wants to coax as much power as possible from a gallon of gasoline — and protect its performance image in an era of rising fuel-economy standards. So its engineers are searching for high-tech ways to conserve energy.

For instance, BMW is developing an intelligent engine control unit that uses the vehicle’s navigation system to more efficiently regulate functions such as battery recharging and engine cooling.

The concept is called “predictive engine management,” said Tom Baloga, vice president of engineering for BMW of North America Inc.

The concept works best for motorists on regular daily commutes. After the driver enters a destination into the navigation system, the computer calculates the locations of hills, high-speed highways and low-speed city streets.

The computer might plan to recharge the battery during an extended downhill stretch when less of

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