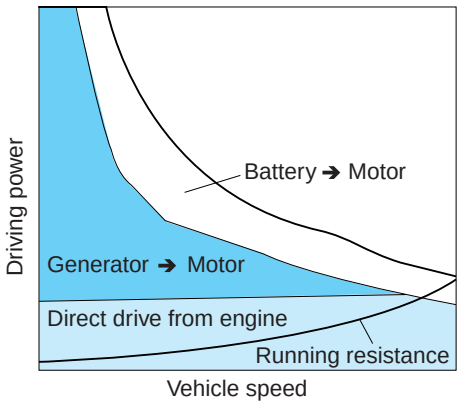
Driving Control

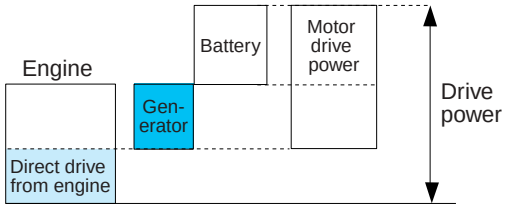
The driving power of a vehicle with THS II is expressed as the combination of the direct engine driving power and the motor's driving power. The slower the vehicle's speed, the more the maximum driving power is derived from the motor's driving power. By increasing the generator rpm, THS II has made it possible to use the engine's maximum power starting at slower speeds than was possible with the current THS. It has also made it possible to significantly increase the maximum drive power by using a high-voltage, high-output motor that successfully improves power performance. Because the engine has no transmission and uses a combination of the direct driving power from the engine and the motor's driving power derived from electrical conversion, it can control the driving power by seamlessly responding to the driver's requirements, all the way from low to high speeds and from cruising with a low power requirement to full-throttle acceleration. (This is known as torque-on-demand.)

Additionally, the time required to start the engine during acceleration from motor-only drive has been reduced by 40%, greatly improving the acceleration response. In order to eliminate shock during engine start-up, the generator also precisely controls the stopping position of the engine's crank. To ensure that the vehicle's driving power is not affected even when a large load is applied, e.g., when the air-conditioner is turned on, precise driving power correction control is carried out, achieving smooth and seamless driving performance.

Driving power performance



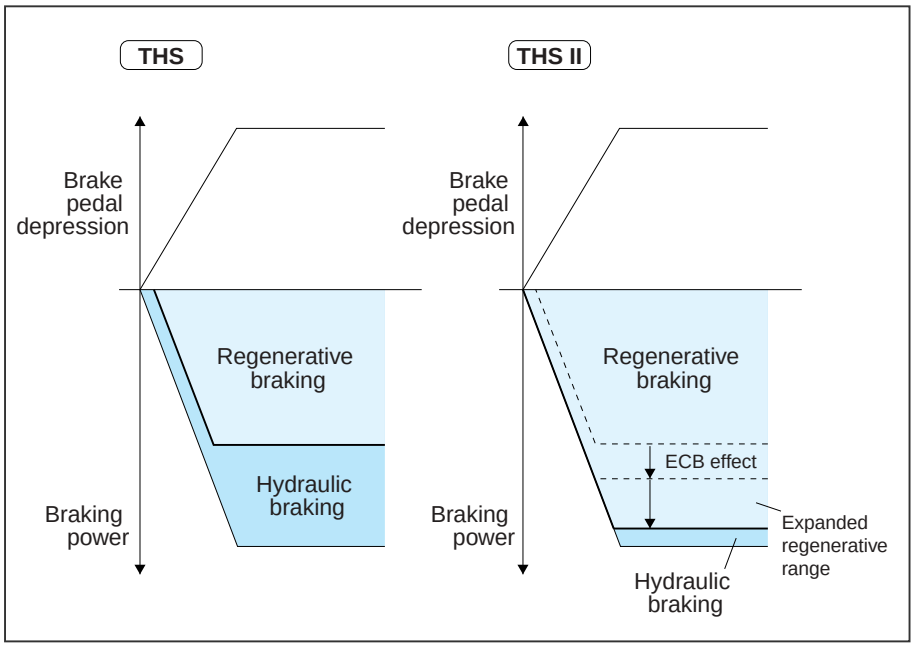
THS II drive power (conceptual diagram)



Regenerative-brake Control

In THS II, the newly developed Electronically Controlled Braking System (ECB) controls the coordination between the hydraulic brake of the ECB and the regenerative brake and preferentially uses the regenerative brake; it also uses a high-output battery and increases the amount of energy that can be recovered and the range in which it can be recovered. The system increases overall efficiency and, thus, fuel economy.

Improved regenerative braking



Improved Environmental Performance

OVERALL EFFICIENCY

THS II has achieved higher efficiency by improving hybrid energy management control and making improvements to the regenerative coordinated brake control, both of which are designed to improve the energy efficiency of the entire vehicle.

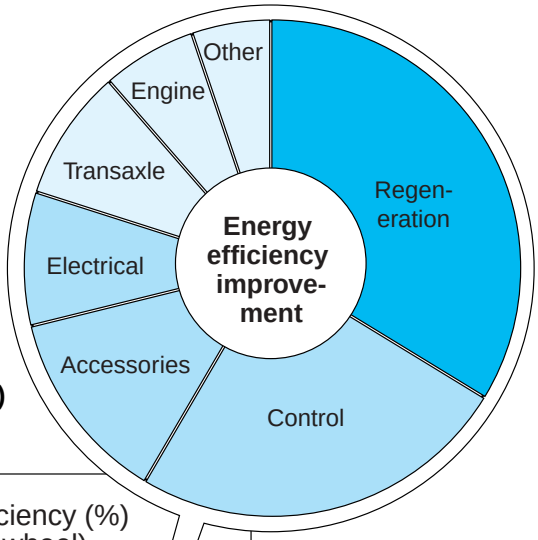
When compared in terms of overall efficiency (well-to-wheel efficiency), which indicates the efficiency of the entire process starting from the fuel manufacturing process, to the driving of a vehicle using that fuel, THS II's efficiency is striking. Its overall efficiency value has reached a level that exceeds even that of an FCHV (fuel cell hybrid vehicle), which is highly efficient, representing one step closer to creation of the ultimate eco-car.

Through technology such as that found in THS II, Toyota is working on development to the next step, including how such technology may apply to FCHVs, with an aim toward achieving even better efficiency.

EMISSIONS

According to Toyota's in-house measurements, the emission level from a vehicle with THS II meets the Ultra-Low Emissions Level in Japan, as well as the planned zero-emission (ATPZEV) regulations in California, which are considered to be strictest in the world, and Europe's next-generation regulations (EURO IV).

Contribution to energy efficiency



Fuel efficiency(%) x Vehicle efficiency(%) = Overall efficiency(%)

Overall efficiency

	Fuel efficiency (well-to-tank) (%)	Vehicle efficiency (tank-to-wheel) (%)	Overall efficiency (%) (well-to-wheel)
Recent gasoline car	88	16	14%
Prius (before improvement)	88	28	25%
Prius (after improvement)		32	28%
Prius with THS II		37	32%
Toyota FCHV	58 Natural gas-H2	50	29%
FCHV (target)	70	60	42%

Note: The Japanese-market Prius was upgraded in August 2002.