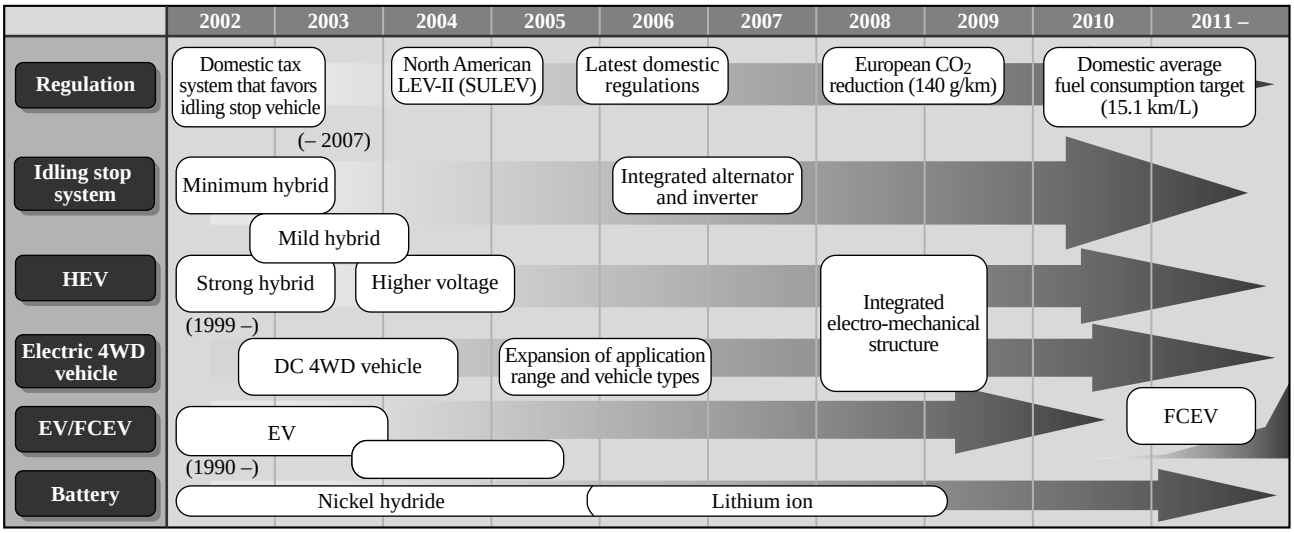
Trends in Electric Powertrain Systems and Hitachi Group's Initiatives



HEV: hybrid electric vehicle
4WD: 4-wheel drive
EV: electric vehicle
FCEV: fuel cell electric vehicle
LEV: low-emission vehicle
SULEV: super ultra low-emission vehicle
DC: direct current

THE period from 2006 to 2008, when legal regulation will be tightened worldwide, will be a turning point for automotive technology related to the environment, and new technology is being developed and introduced to meet the challenge.

Emphasis is shifting from current environmental measures that focus on the engine, to electric powertrain technology using electric motors and inverters, and progress towards the various types of HEV, EV, and FCEV is expected to accelerate.

In the 1990s, practical EVs were expensive and infrastructure such as charging facilities was not generally available, so those vehicles were limited in number. In 1999, strong hybrid vehicles were announced, raising the curtains on the true electric powertrain era. The Hitachi Group, too, began mass production of related products in 2000.

Later, mild hybrids aimed at economy and minimum hybrids whose functions are restricted to idling stop system were made practical, and are holding many variations today.

For the drive system, on the other hand, 4WD vehicles in which the rear wheels are driven by an electric motor were put into mass production in 2002, and the switchover from a mechanical system to an electrical system has been in progress. There is also rapid progress in the development of high energy density lithium-ion batteries for storing electrical power.

The Hitachi Group has long years of experience with electric motors and technology for their control, and we have also been developing the technology required for the electric powertrain.

The electric 4WD announced in 2002, demonstrated major improvements in driveability and safety as well as fuel economy through harmonized control of the electric motor driving force and the engine driving force and was highly evaluated by the public.

AS for HEVs, we believe the integrated electro-mechanical structure, in which the electric motor, the inverter and the mechanical system are integrated, will be the mainstream in the future. In particular, the electrical system will be proportionately larger, and in concert with increased power achieved by using higher-voltage power sources, it is expected to contribute greatly to improved mileage. Furthermore, widespread use of the minimal hybrid is indispensable for raising the average mileage, and we plan to offer a product that incorporates an inverter into the conventional alternator.

The final form of the electric powertrain is said to be the FCEV, but the HEV and the electric 4WD are more than simply steps toward the FCEV. Solutions that match the uses of the automobile will require development of specific technologies.