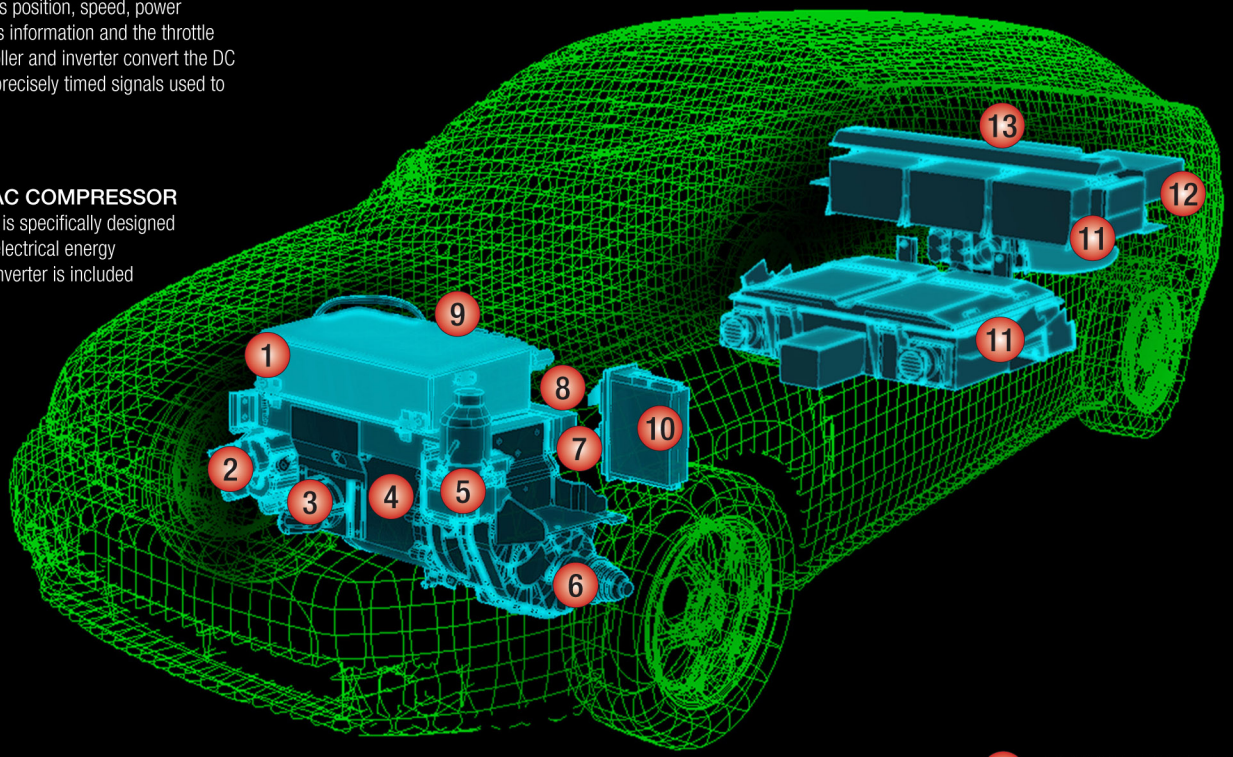
Ford Battery Electric Vehicle

Ford and strategic alliance partner Magna International will produce new battery electric vehicles (BEVs) that don't use a drop of fuel. Below is a detailed look at the components that will make up the new BEVs.



1 MOTOR CONTROLLER AND INVERTER
The motor controller monitors the motor's position, speed, power consumption and temperature. Using this information and the throttle command by the driver, the motor controller and inverter convert the DC voltage supplied by the battery to three precisely timed signals used to drive the motor.

2 HIGH VOLTAGE ELECTRIC HVAC COMPRESSOR
The high voltage air conditioning system is specifically designed for hybrid vehicle applications, drawing electrical energy directly from the main battery pack. An inverter is included in the compressor.

3 ELECTRIC WATER PUMP
The electric drive water pump circulates coolant for the traction motor, inverters, battery and heater.

4 TRACTION MOTOR
The traction motor performs the conversion between electrical and mechanical power. Electric motors also have efficiencies three times higher than that of a standard gasoline engine, minimizing energy loss and heat generation.

5 ELECTRIC POWER STEERING
Electro-hydraulic steering pump was installed to assist a retuned steering rack. A production vehicle would be designed with electric power steering.

6 GEARBOX
The transmission has the identical role as in a conventional vehicle; however, it has different design considerations due to the higher RPM range available from the electric motor and increased emphasis on efficient and silent operation. The transmission is a single-speed unit with a 5.4:1 reduction.

7 MODULAR POWERTRAIN CRADLE
A structure for monitoring all engine compartment EV components and providing isolation from the vehicle body through traditional engine mounts.

8 ELECTRIC VACUUM PUMP
The vacuum pump supplies vacuum to the brake system for power assist.

9 HIGH VOLTAGE PTC ELECTRIC COOLANT HEATER AND CONTROLLER
Heating systems are specifically designed for hybrid vehicle applications. Energy efficient PTC technology is used to heat the coolant that circulates to the passenger car heater. Heat also may be circulated to the battery.

10 VEHICLE CONTROL UNIT
The VCU communicates with the driver as well as each individual vehicle system to monitor and control the vehicle according to the algorithms developed by the vehicle integration team. The VCU manages the different energy sources available and the mechanical power being delivered to the wheels to maximize range.

11 BATTERY PACK AND BATTERY CELLS
The battery pack is made up of 7 battery modules of 14 cells, 98 cells total for 23 kWh of power. The batteries are air cooled using existing vehicle cabin air. The pack includes an electronic monitoring system known as the BMS that manages temperature and state of charge of each of the cells.

12 AC CHARGER
Power electronics are used to convert the off-vehicle AC source from the electrical grid to the DC voltage required by the battery, thus charging the battery to its full state of charge in approximately 8 hours based on a 110v source. The current charger is air cooled. The production design should be water cooled and be able to accommodate both 110 and 220 voltage sources.

13 DC-DC CONVERTER
A DC-DC converter allows the vehicle's main battery pack to charge the on-board 12V battery, which powers the vehicle's various accessories, headlights, etc.

Collaboration key to electrification vision

Ford Motor Company's electrification strategy is designed for collaboration with major stakeholders who can make a big difference. Ford is already working to forge partnerships that will help make the electrified vehicles of the future affordable, attainable and attractive to millions.

Utilities

The new generation of electrified vehicles – Battery Electric Vehicles (BEVs) and Plug-in Hybrid Electric Vehicles (PHEVs) – require access to the electrical supply grid to charge their batteries. That makes electrical utilities key partners, providing an important customer interface to optimize the electrified vehicle ownership experience. Ford is already forging relationships with key electrical utilities, starting with SoCal Edison and broadening its efforts through its new collaboration with the Electrical Power Research Institute.

Suppliers

Automotive suppliers will play a critical role in developing the new technology required for vehicle electrification, and Ford already has formed alliances with Magna International for a future BEV passenger car and Johnson Controls-Saft for its current test fleet of PHEVs. The investment levels for the development of new battery technology, power electronics, electric motors, generators, high-voltage systems and componentry are massive, but so is the potential return on investment. Through Ford's Blueprint for Sustainability, suppliers will see economic benefits as well as environmental and social rewards.

Policymakers

Governments on the federal, state and local level as well as internationally also have a crucial role in the drive toward success of vehicle electrification. Through policy changes and incentives, government has the power to encourage motorists to go electric. Ford is already involved in a four-way 'eco-partnership' with China's Changan Auto Group Corporation and the cities of Chongqing, China and Denver, Colo., on projects expected to include the development of electrified vehicle technology, green city planning, efficient urban transportation and grid integration.

Universities

The electrified vehicle world brings a need for new skill sets and engineering specialties that give universities a key role to play. Ford believes universities must be part of the collaboration to foster the new talents for innovation. There is great potential for young people to make a difference in these new technical frontiers, which represent huge opportunities for ideas.

Hybrid Battery Technology Comparison

Ford's electrification strategy will take advantage of rapid developments in lithium-ion (Li-ion) battery technology, which offers more power and energy for hybrid electric vehicles (HEVs) and Plug-in Hybrid Electric Vehicles (PHEVs) than the nickel metal hydride (Ni-MH) battery technology used today.