

# New concept cars demonstrate clean, efficient transportation technologies



## O A A T A C C O M P L I S H M E N T S

### High-Powered Partnership Achieves First Milestone

#### Challenge

In 1993, the Partnership for a New Generation of Vehicles (PNGV) established a goal of developing a vehicle which could achieve fuel efficiencies up to three times those of 1994 family sedans or 80 miles per gallon gasoline equivalent (mpgge). The vehicle was to keep the same level of cost, performance and comfort that consumers have come to expect. Production prototypes were to be developed by 2004, with concept vehicles that demonstrated technical feasibility developed by 2000.



General Motors Precept.

#### Technology Description

Researchers are looking at every vehicle component and system to determine how it can be improved to meet the PNGV goals. Areas of study include improved aerodynamics, lightweight materials, and advanced propulsion systems.

#### Accomplishments

This unprecedented partnership among government, industry, and academia has resulted in three concept cars that demonstrate the feasibility of a variety of new automotive technologies. Each of the Big Three auto manufacturers took a different approach in building their hybrid electric concepts and unveiling them in 2000.



Dodge ESX3.

#### Dodge ESX3

- The combination of an all-aluminum diesel engine, electric motor, and lithium-ion battery achieves 72 mpgge and a 400-mile driving range.
- At 2,250 pounds, body weight is 46% less than that of comparable five-passenger car.
- Lightweight injection-molded body costs 15% less than a conventional steel body.
- New transmission shifts gears as smoothly as an automatic but is as efficient as a manual.
- Advanced lithium-ion battery pack is integrated with cooling and control system to save space.



Ford Prodigy.

#### Ford Prodigy

- Hybrid powertrain based on the new DIATA (direct-injection aluminum through-bolt assembly) diesel engine delivers 72 mpgge and a 600-mile driving range.
- Advanced engine improves efficiency by 35% over conventional diesel engines.

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- Lightweight materials and computer optimization reduce vehicle weight by 30% (1,000 lbs) compared with current vehicles.
- Aerodynamic design reduces air resistance by 33%.
- High-power battery is recharged by energy recovered from braking.

### **General Motors Precept**

- Hybrid version uses two electric motors and a compression-ignition, direct-injection (CIDI) diesel engine to reach 80 mpgge. Fuel cell version will deliver up to 108 mpgge with no exhaust emissions.
- Extremely aerodynamic design results in the lowest coefficient of drag ever recorded for a five-passenger vehicle.
- A unique braking system incorporates regenerative braking from all four wheels.
- Engine is in the rear to improve airflow around the car.
- Aluminum and composite materials reduce vehicle weight by 45%.

### **Benefits**

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Combining the resources of many cooperating partners will bring more efficient, less polluting passenger vehicles to the marketplace sooner.

After six years of research, three working vehicles demonstrate the technical feasibility of the PNGV goal of 80 mpgge.

### **Future Activities**

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While these one-of-a-kind concept cars show the potential of advanced automotive technologies, much remains to be done before they will appear in local showrooms. Innovative process improvements must occur to make many of the technologies affordable and producible in large numbers. System reliability also must be demonstrated.

### **Partners in Success**

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- DOE National Laboratories
- DaimlerChrysler
- Ford Motor Company
- General Motors Corporation
- Government Agencies
- Automobile industry suppliers, universities, small businesses, and other organizations

