Partnership for a New Generation of Vehicles

Mobil Sources Technical Review Subcommittee

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Partnership for a New Generation of Vehicles
Background

Partnership for a New Generation of Vehicles
Status & Future Projections

Fuel Cells
Description & Future Outlook
How was PNGV started?

- During the 1992 Presidential Campaign, both Bill Clinton & Al Gore cited plans to address automobile fuel efficiency.
- The automaker CEOs met with the administration to develop a solution.
- An Industry/Government Partnership was agreed to be the best approach.
- Significant discussion resulted in an “up to three times” fuel efficiency goal.

The Partnership for a New Generation of Vehicles
PNGV Focuses Development on Greatest Energy Loss

100% Energy Input

(82%/74%) Engine, Standby, Accessories Losses

(18%/26%) Driveline

(6%/6%) Urban / Highway Driving Cycle

12%/20% Energy Output Remaining to Propel Typical Mid-Size Car

- Mass
- Aerodynamics
- Rolling Resistance
- Braking

Advanced Technology Vehicles

**Ford P-2000**
Driveable 2,000 lb. family-size car with a direct injection diesel engine: 63 mpg equivalent projected.

**Chrysler ESX2**
A “mild hybrid” with a 1.5 liter 3 cylinder CIDI. Six piece molded-in color plastic body.

**GM EV1 Parallel Hybrid**
EV1 based four passenger with 80 miles per gallon equivalent using an Isuzu three cylinder turbocharged diesel engine.
Program Timing

Candidates for Development:
- Low emission technologies
- New materials
- Advanced design simulations
- Ultracapacitors and flywheels
- Hybrid vehicles
- Fuel cells, fuel reformers
- Turbines, CIDI engines
- Efficient electronics and electrical devices
- Advanced batteries

PNGV Technology Selection

- Program will focus its efforts on:
  - hybrid-electric vehicle drive
    - smaller engine & regenerative braking
  - direct-injection engines
    - highly efficient (up to 45%)
  - fuel cells
    - highly efficient (up to 55%) & zero emission potential
  - lightweight materials
    - aluminum, steel, plastic, magnesium & composites
Technical Goals

- Energy conversion thermal efficiency: 45%
- Vehicle weight reduction: 40%
- Emissions targets (EPA Tier II levels, grams/mile):
  - 0.12 Hydrocarbons (HC)
  - 1.70 Carbon Monoxide (CO)
  - 0.20 Nitrogen Oxides (NOx)
  - 0.04 Particulates (PM)
- Accessories overall efficiency: 32%
- Aerodynamic drag co-efficient: 0.2

Single-Fuel Cell

- Combines hydrogen & oxygen to give off water & electricity.
- With a reformer, can run gasoline & methane.
Fuel Cells - Current Activity

- All major automobile manufacturers have fuel cell programs.
- Fuel cell companies include Ballard, Plug Power LLC, International Fuel Cells, Arthur D. Little Inc. and Ballard.
- Fuel cell powered cars and buses are currently being evaluated.
- Major challenges - cost, size & complexity.

Fuel Cells - Projection for the Future

- Several manufacturers have committed to vehicle production around 2004.
- Ballard projects worldwide production to be at 250,000 in 2008.