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# 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

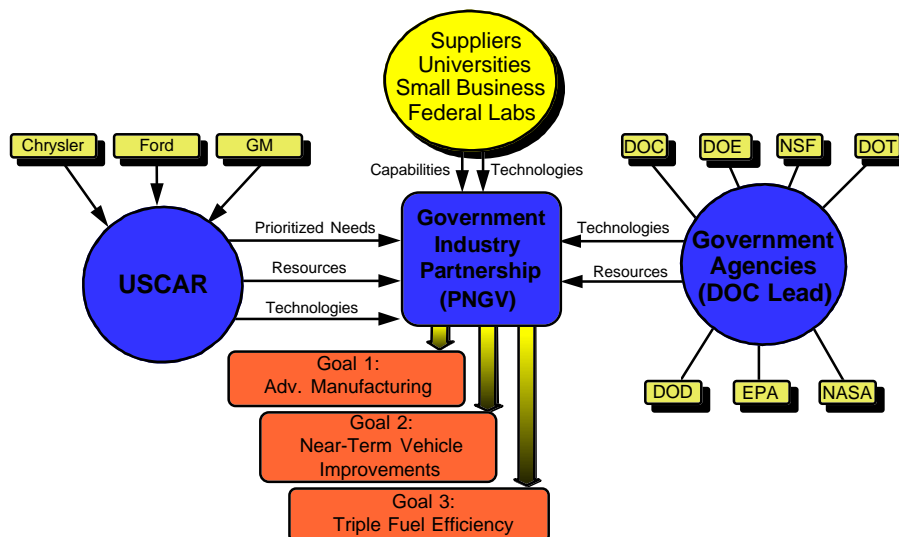


## How was PNGV started?

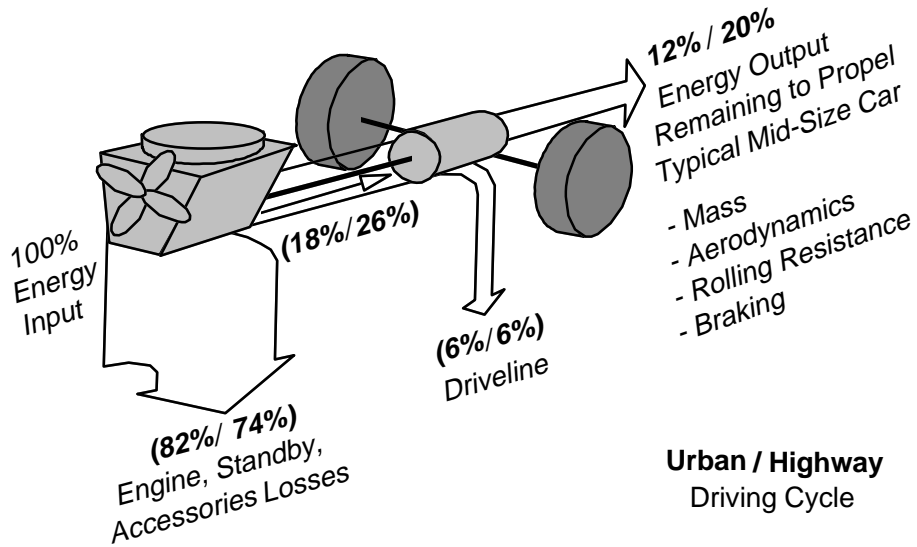


- During the 1992 Presidential Campaign, both Bill Clinton & Al Gore Cited plans to address automobile fuel efficiency.
- The automaker CEOs met with the administration to develop a solution.
- An Industry/Government Partnership was agreed to be the best approach.
- Significant discussion resulted in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



# PNGV Focuses Development on Greatest Energy Loss



# 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

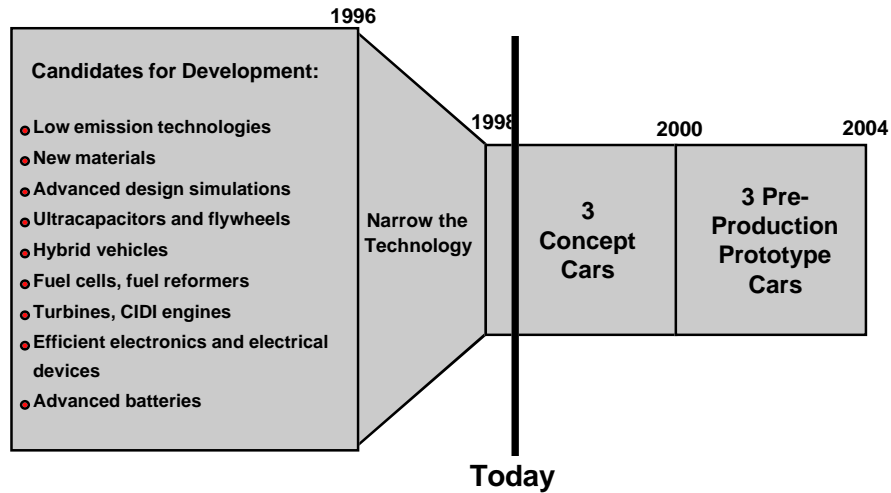
A "mild hybrid" with a 1.5 liter 3 cylinder CIDI. Six piece molded-in color plastic body.



### GM EV1 Parallel Hybrid

EV1 based four passenger with 80 miles per gallon equivalent using an Isuzu three cylinder turbocharged diesel engine.

## Program Timing



## 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

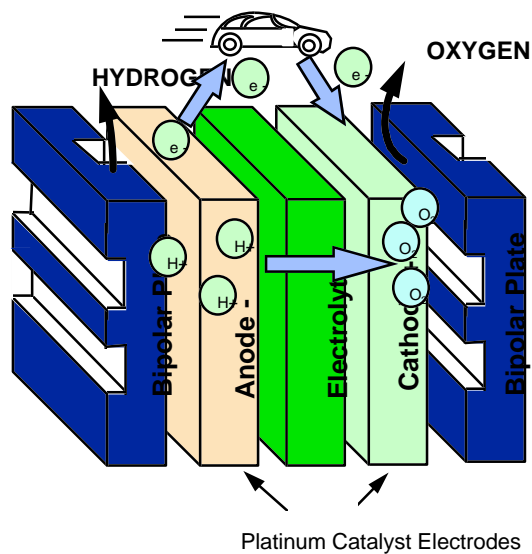


- Energy conversion thermal efficiency: 45%
- Vehicle weight reduction: 40%
- Emissions targets (EPA Tier II levels, grams/mile):
  - 0.12 Hydrocarbons (HC)
  - 1.70 Carbon Monoxide (CO)
  - 0.20 Nitrogen Oxides (NOx)
  - 0.04 Particulates (PM)
- Accessories overall efficiency: 32%
- Aerodynamic drag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