FreedomCAR

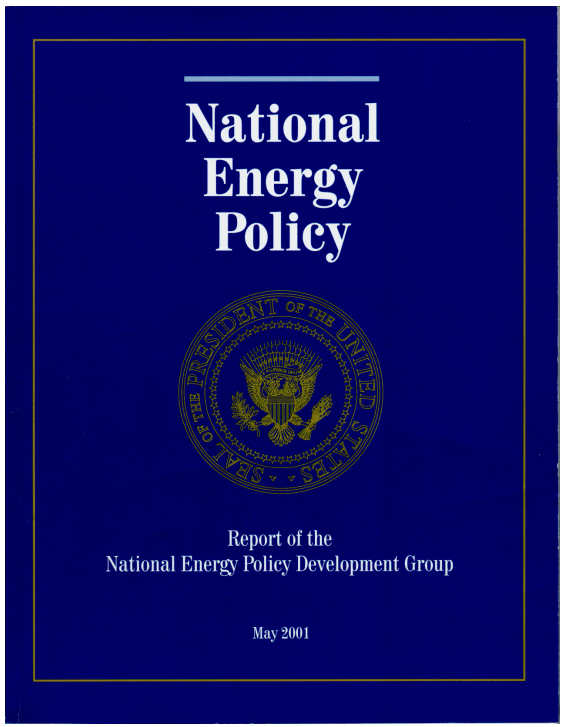
Energy Security for America's Transportation

Richard Moorer

U.S. Department of Energy

2002 CleanEnergy Seminar
Sacramento, March 20

National Energy Policy



- **"…that the President direct the Secretary of Energy to establish a national priority for improving energy efficiency. (Recommendation 4.14)**
- **"Increase funding for renewable energy and energy efficiency research and development programs that are performance-based and cost-shared." (page xii)**
- **"…Based on this review, the Secretary of Energy is then directed to propose appropriate funding of those research and development programs that are performance-based and modeled as public-private partnerships." (Recommendations 4.2 and 6.3)**

National Energy Policy

Directs the Secretary Of Energy "to develop next generation technology including hydrogen…

"Focus research and development efforts on integrating current programs regarding hydrogen, fuel cells, and distribution…

Develop legislation to provide for a temporary income tax credit available for the purchase of new hybrid or fuel cell vehicles."

"The President's Plan directs us to explore the possibility of a hydrogen economy…."
Spencer Abraham, Secretary of Energy

OTT Mission

Support the development and use of advanced transportation vehicles and fuels which will reduce energy demand, particularly for petroleum; reduce greenhouse gas emissions; and enable United States transportation to sustain a strong competitive position in domestic and world markets.

OTT Portfolio

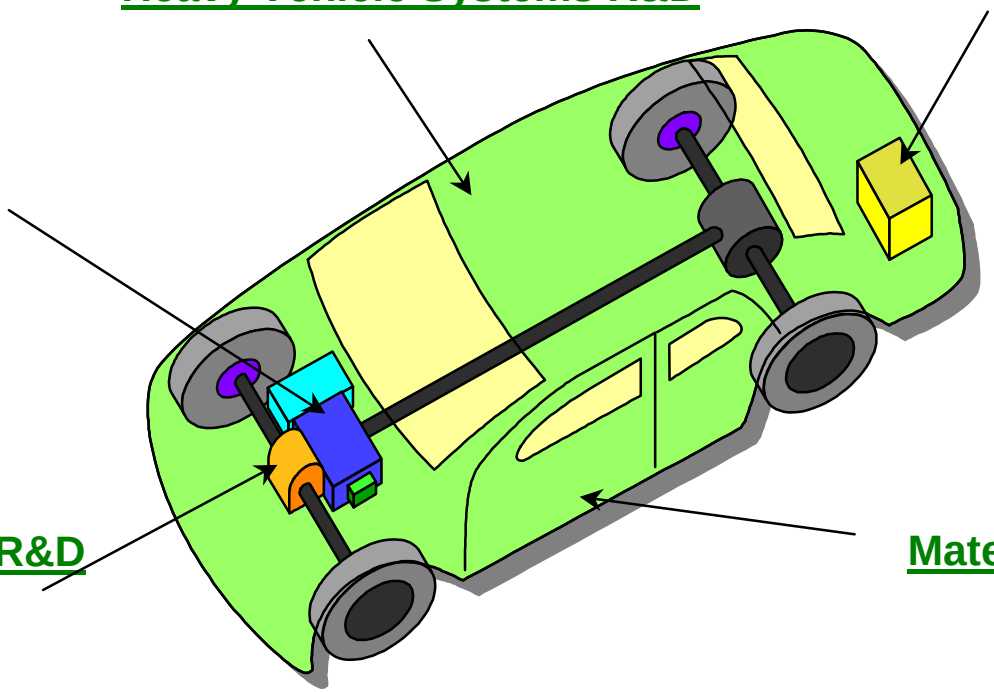
Hybrid Systems R&D

Fuels Utilization R&D

Heavy Vehicle Systems R&D

Advanced Combustion Engine R&D

Biofuels



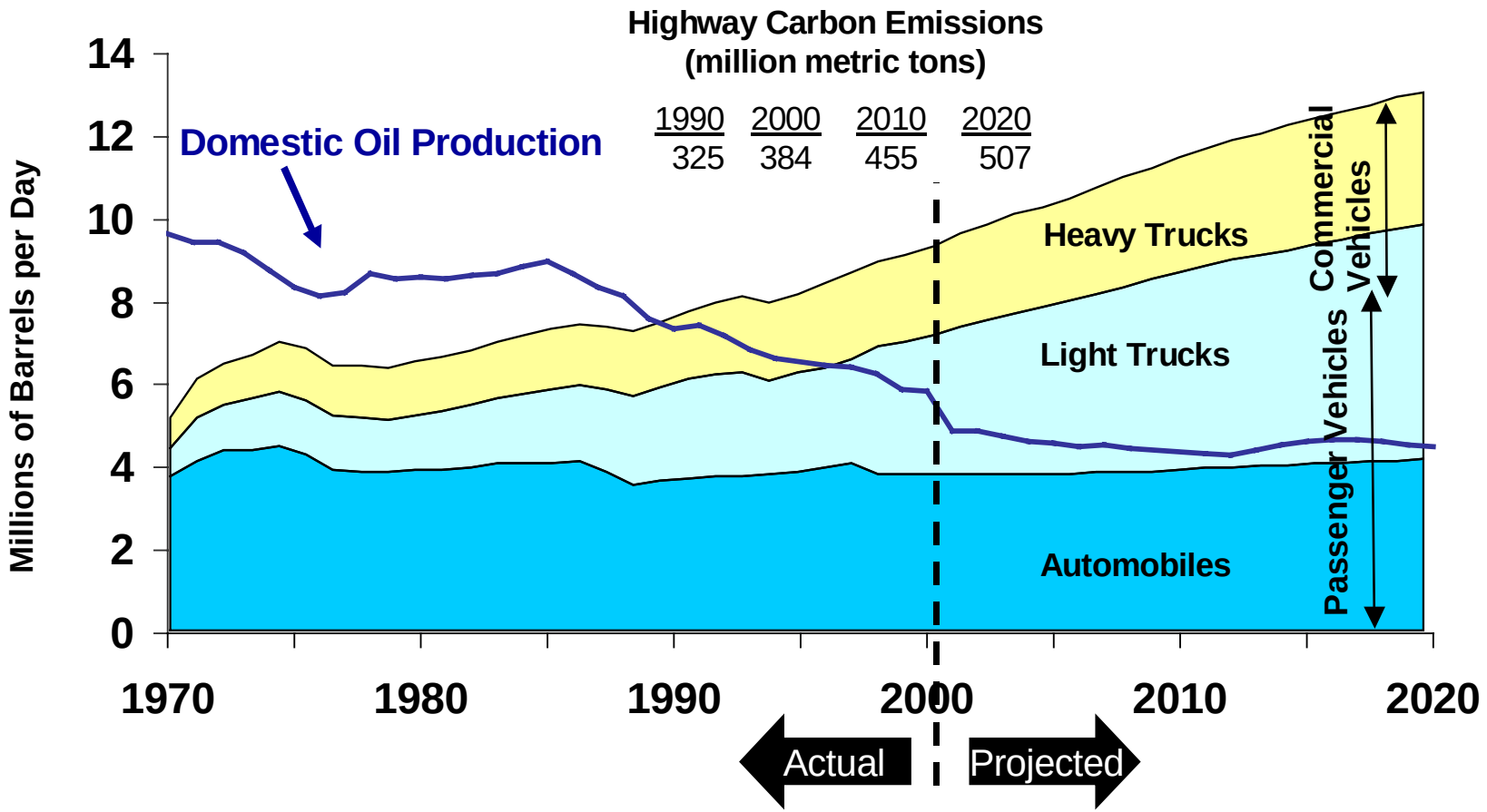
Fuel Cell R&D

Electric Vehicle R&D

Material Technologies

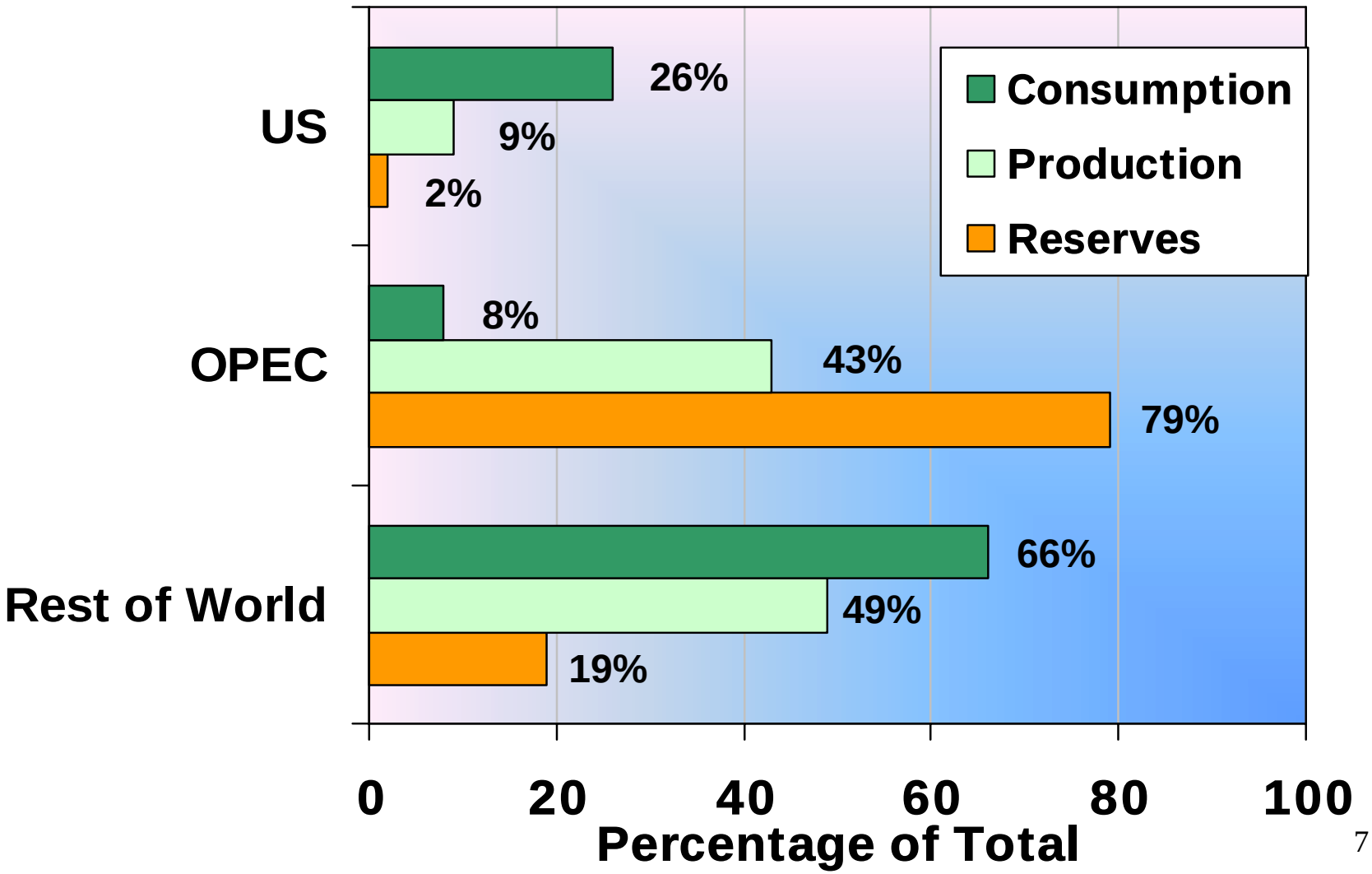
Transportation Technology Assistance

The "Oil Gap" is Growing



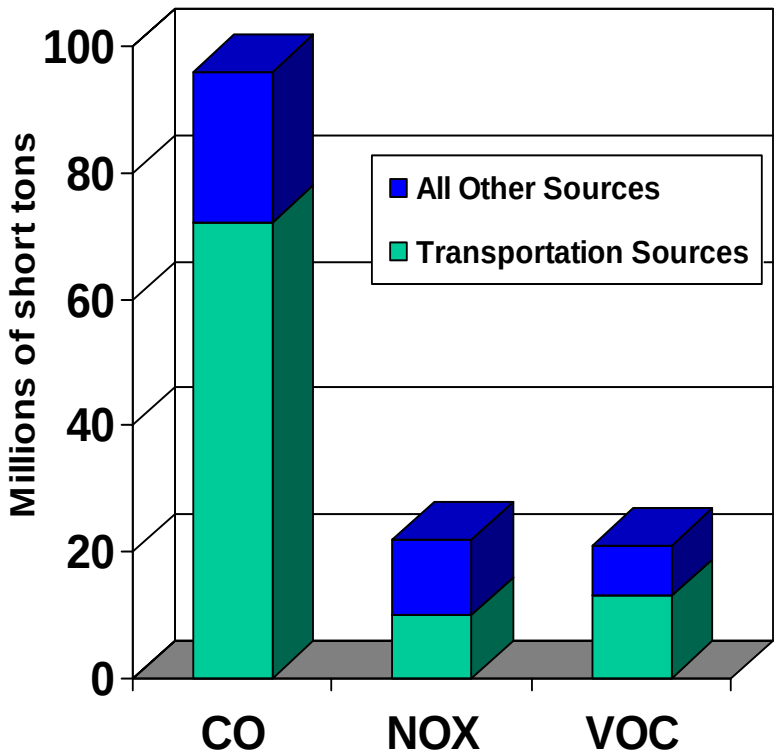
Source: Transportation Energy Data Book: Edition 21, DOE/ORNL-6966, September 2001, and EIA Annual Energy Outlook 2002, DOE/EIA-0383(2002), December 2001

World Oil Reserves are Consolidating in OPEC Nations



Transportation Emissions Remain an International Concern

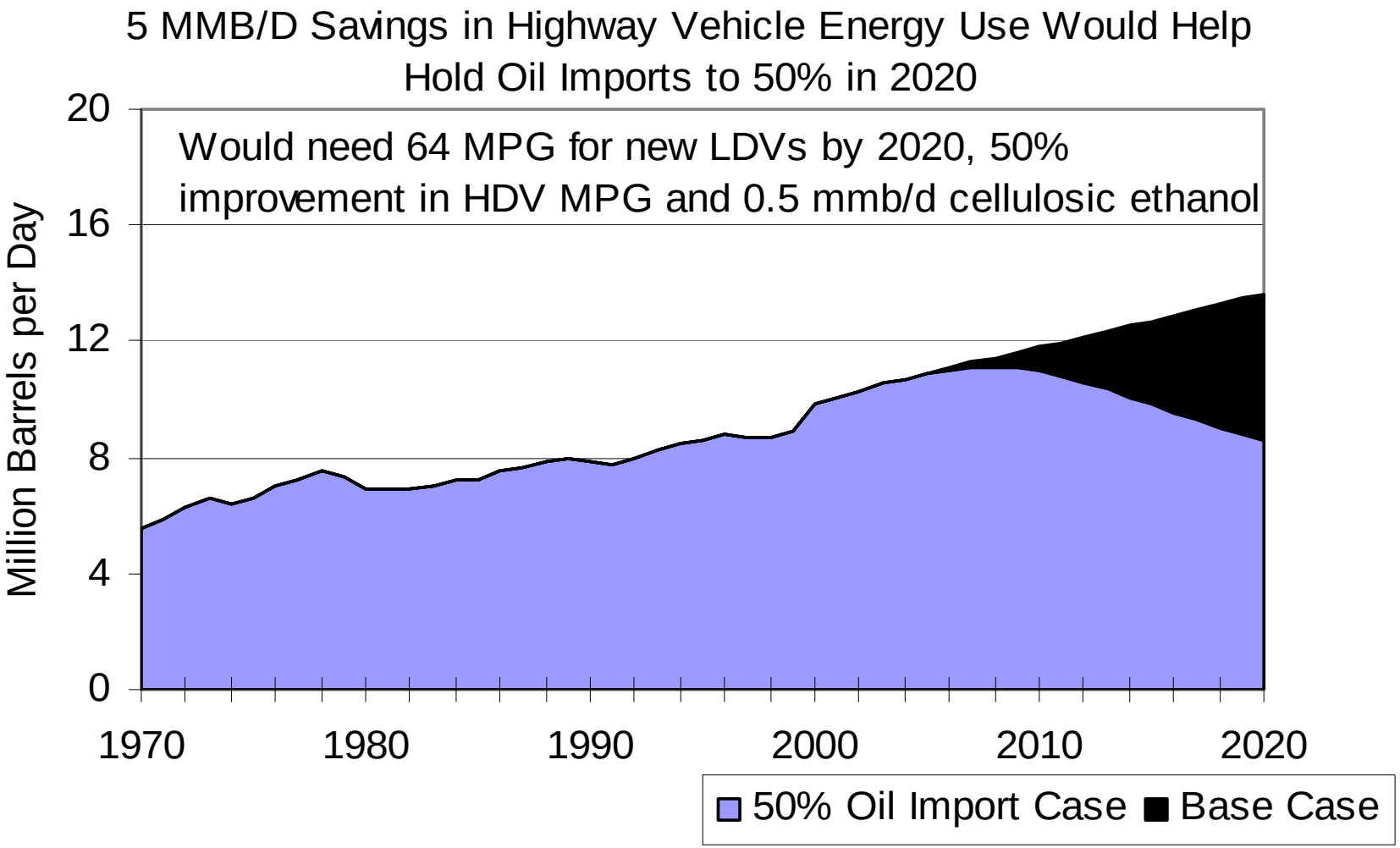
- Transportation produces:
  - 79% of carbon monoxide,
  - 50% of nitrogen oxides,
  - 36% of volatile organics, and
  - 42% of carbon dioxide emissions
- Over 100 million people live in areas not meeting National Ambient Air Quality Standard (EPA, Oct. 1995)



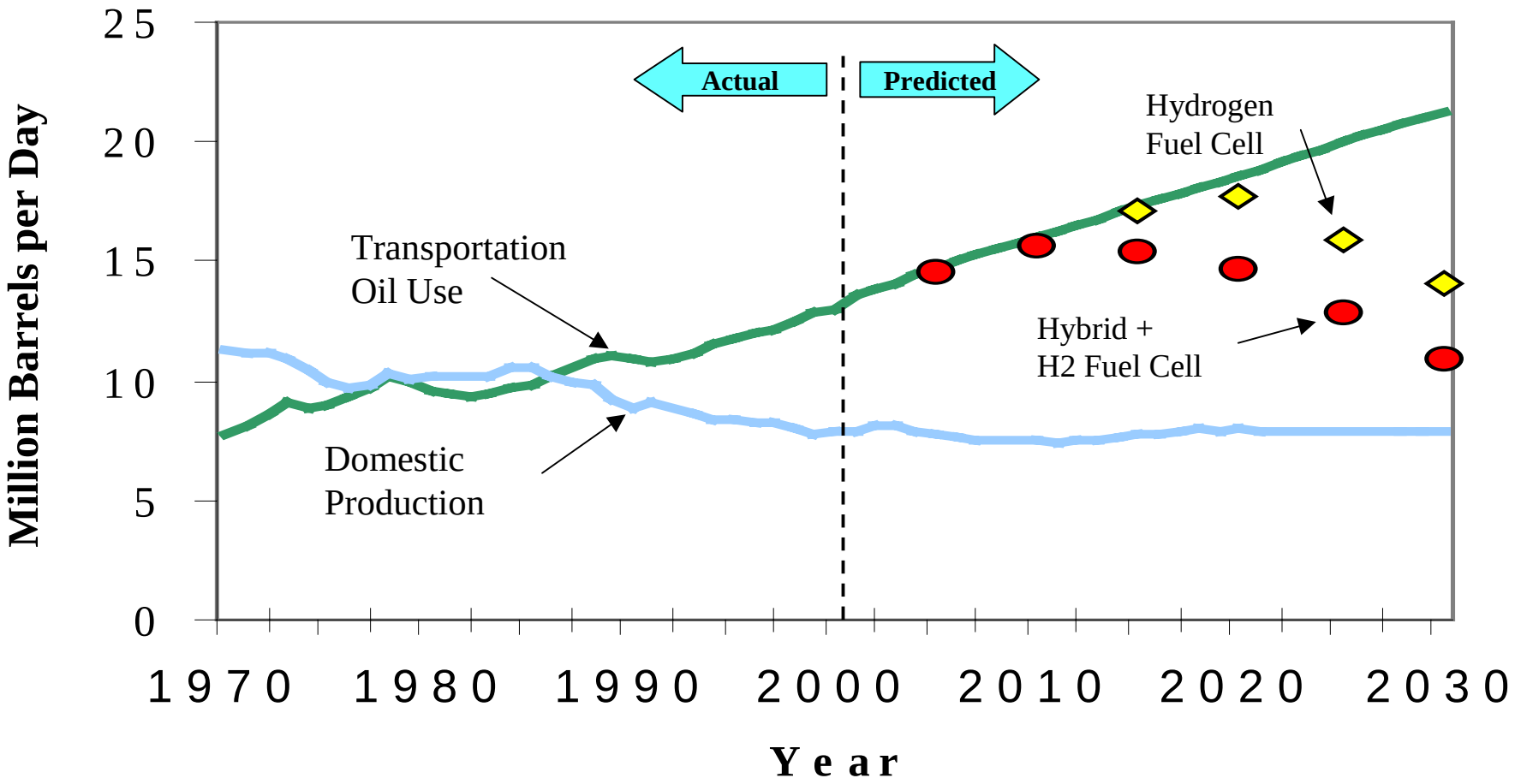
Closing the Oil Gap

- ✓ **Increase the Supply of Oil**
- ✓ **Reduce the Demand for Oil**
  - -- **Improve the Fuel Economy of Vehicles & other Oil Using Equipment**
  - -- **Replace Oil with Alternative Fuels (& Feedstocks)**

Energy Security – Reducing Petroleum Imports to 50%



Closing the "Oil Gap"



FreedomCAR is a Partnership

January 9, 2002
Secretary Abraham announces the FreedomCAR Partnership

- **The CAR in FreedomCAR is for Cooperative Automotive Research**
- **The Partners are:**
  - **U.S. Department of Energy**
  - **U.S. Council for Automotive Research**

(USCAR is a cooperative endeavor of DaimlerChrysler, Ford and General Motors to conduct pre-competitive research)

Energy Security Through FreedomCAR Technology

America's Transportation Freedoms

- Freedom from dependence on foreign petroleum
- Freedom from pollutant emissions
- Freedom to choose the vehicle you want
- Freedom to drive where you want, when you want
- Freedom to obtain fuel affordably and conveniently

Strategic Approach

- Develop technologies to enable mass production of affordable hydrogen-powered fuel cell vehicles and assure the hydrogen infrastructure to support them.
- Continue support for hybrid technologies and advanced materials that can dramatically reduce oil consumption and environmental impacts in the nearer term.
- Develop technologies applicable across a wide range of passenger vehicles.

Goals

- **Develop reliable systems for future fuel cell powertrains with costs and performance comparable to conventional internal combustion engine/automatic transmission systems.**

- **Enable clean, energy-efficient vehicles operating on clean, hydrocarbon-based fuels powered by either internal combustion powertrains or fuel cells.**

- **Enable reliable hybrid electric vehicles that are durable and affordable.**

Goals

- **Enable the transition to a hydrogen economy, ensure widespread availability of hydrogen fuels while retaining the functional characteristics of current vehicles.**

- **Develop material manufacturing technologies for light weight, high volume production vehicles.**

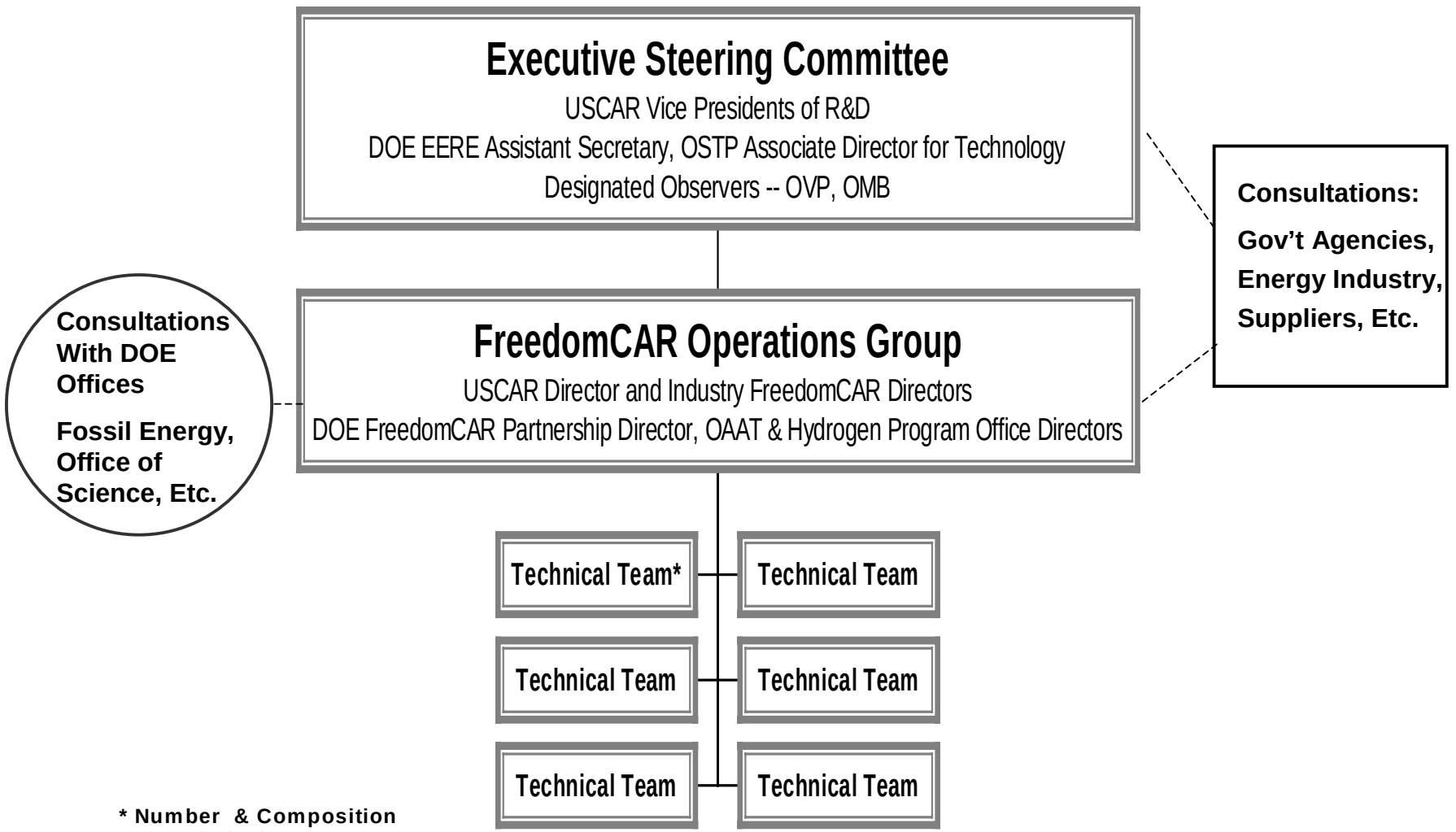
2010 FreedomCAR Technology Specific Goals

	Efficiency	Power	Energy	Cost**	Life	Weight
Fuel Cell System	60% (hydrogen) 45% (w/ reformer)	325 W/kg 220 W/L		$45/kW (2010) $30kW (2015)		
Hydrogen Fuel/ Storage/ Infrastructure	70% well to pump		2 kW-h/kg 1.1 kW-h/L	$5/kW-h $1.25/gal (gas equiv.)		
Electric Propulsion		≥55 kW 18 s 30 kW cont.		$12/kW peak	15 years	
Electric Energy Storage		25 kW 18 s	300 W-h	$20/kW	15 years	
Materials						50% less
Engine Powertrain System*	45% peak			$30/kW	15 years	

* Meets or exceeds emissions standards.

** Cost references based on CY2001 dollar values.

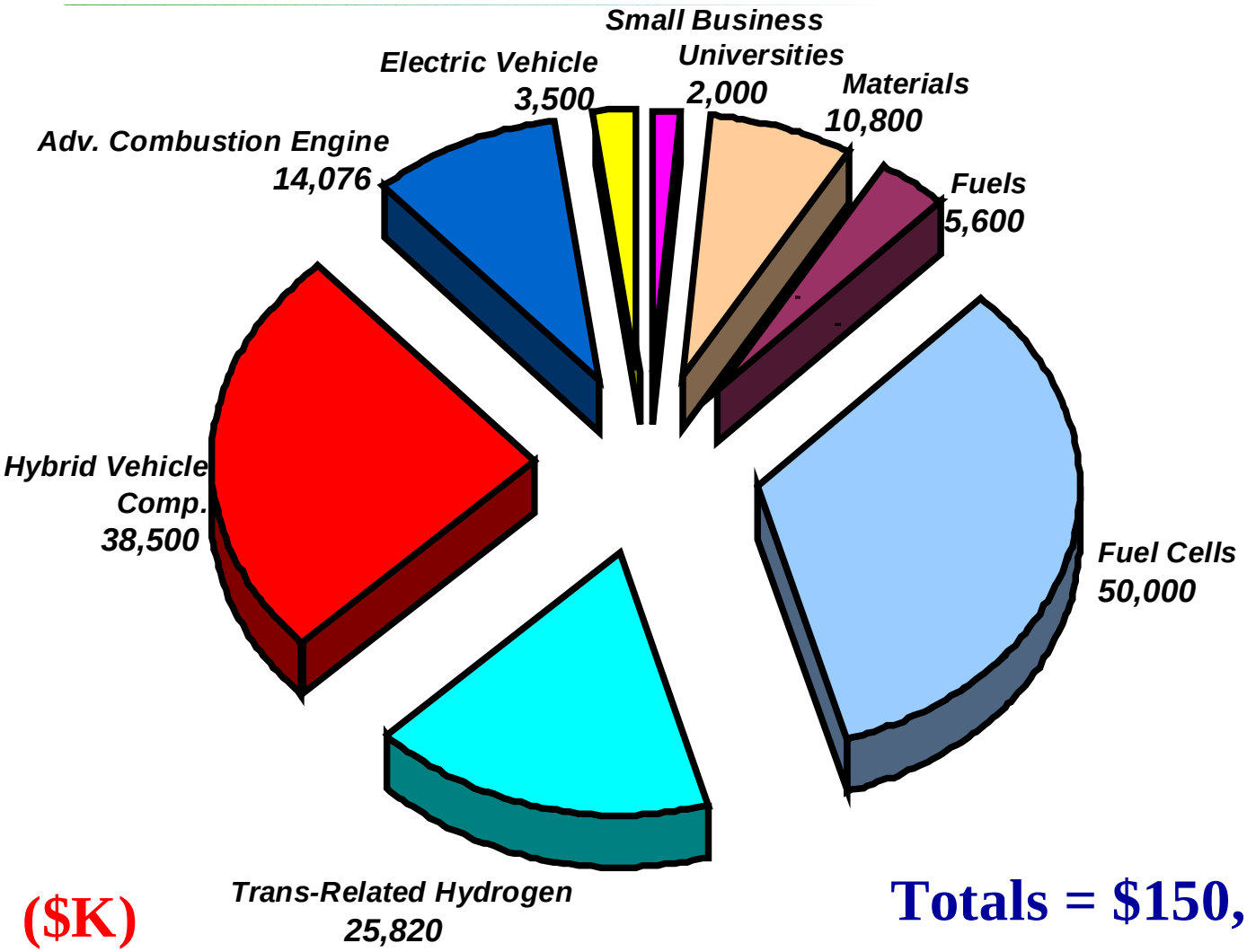
Organization



* Number & Composition of Technical Teams TBD

February 5, 2002

FreedomCAR FY03 Budget Request Reflects Fuel Cell and Hydrogen Priorities



($K)

Totals = $150,296

Fuel Cell Vehicles and Advanced Hybrids Share Much Technology

FreedomCAR encompasses support for technologies with the potential to dramatically reduce oil consumption and environmental impacts in the period prior to the introduction of affordable fuel-cell vehicles.

- ✓ Hybrid Electric Drivetrains
- ✓ Advanced Internal Combustion Engines
- ✓ On-Board Fuel Processors for Fuel Cells
- ✓ Lightweight Materials, Energy Storage, Electronic Components

Fuel Cell Report to Congress

FY02 Interior Appropriations Bill

"The Department should report to the House and Senate Committees on Appropriations, within twelve months of the date of enactment of this Act, on the technical and economic barriers to the use of fuel cells in transportation, portable power, stationary, and distributed generation applications. The report should include recommendations on program adjustments based on an assessment of the technical, economic, and infrastructure requirements needed for the commercial use of fuel cells for stationary and transportation applications by 2012."

FreedomCAR Partnership

A Long-Term Effort to Achieve

Clean Energy-Efficient Automotive Transportation

Based on Hydrogen-Powered Fuel-Cell Vehicles

With

✓ Intermediate Goals and Metrics

to Ensure Measurable Progress

While

✓ Ensuring America's Transportation Freedoms