



Fuel Cell R&D

Hydrogen & Fuel Cell Program Review

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(EERE)

National Renewable Energy Laboratory
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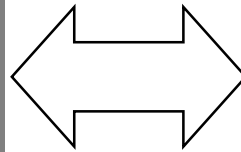
Presentation Outline

- ***FreedomCAR***
- ***EERE Fuel Cell R&D Activities***
- ***Merit Review***



DOE Fuel Cell Related Programs

**Office of
Energy Efficiency
and Renewable Energy
(EERE)**



**Office of
Fossil Energy
(FE)**

Emphasis on low temperature fuel cells

- Transportation Applications
- Distributed Generation (Building Applications)
- Hydrogen Technologies

Emphasis on high temperature fuel cells

- Large Stationary Applications
- Distributed Generation (Grid)



The FreedomCAR Partnership



January 9, 2002
Secretary Abraham announces
the FreedomCAR Partnership

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



FreedomCAR 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.**



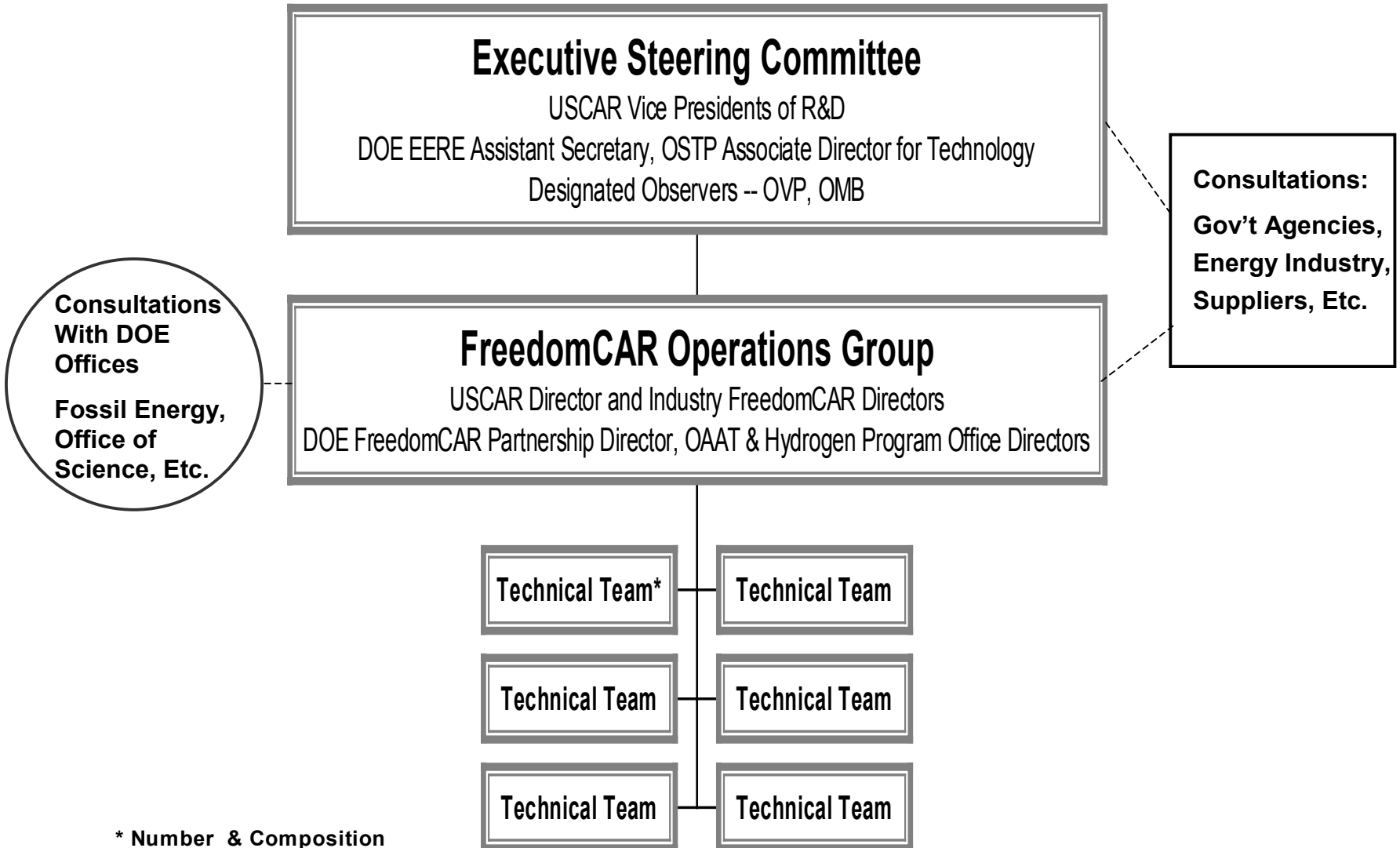
2010 FreedomCAR Technology Specific Goals

	Efficiency	Power	Energy	Cost	Life	Weight	Volume
Fuel Cell System	60%	325 W/kg		\$45/kW			220 W/L
Hydrogen - Storage - Infrastructure	70% well to pump		2 kW-h/kg 1.1 kW-h/L	\$5/kW-h \$1.50/gal (gas equiv.)			
Electric Propulsion	95%	55 kW 18 s 30 kW cont.		\$12/kW peak			
Electric Energy Storage	90%	25 kW 18 s	300 W-h	\$20/kW	15 years	40 kg	32 L
Materials				1X		50% less	
Engine Powertrain System**	45% peak			\$30/kW	15 years*		

* Tier 2 emissions standards by 2010 (PM=0.01 gm/mile, NOx=0.03 gm/mile)



FreedomCAR Organization

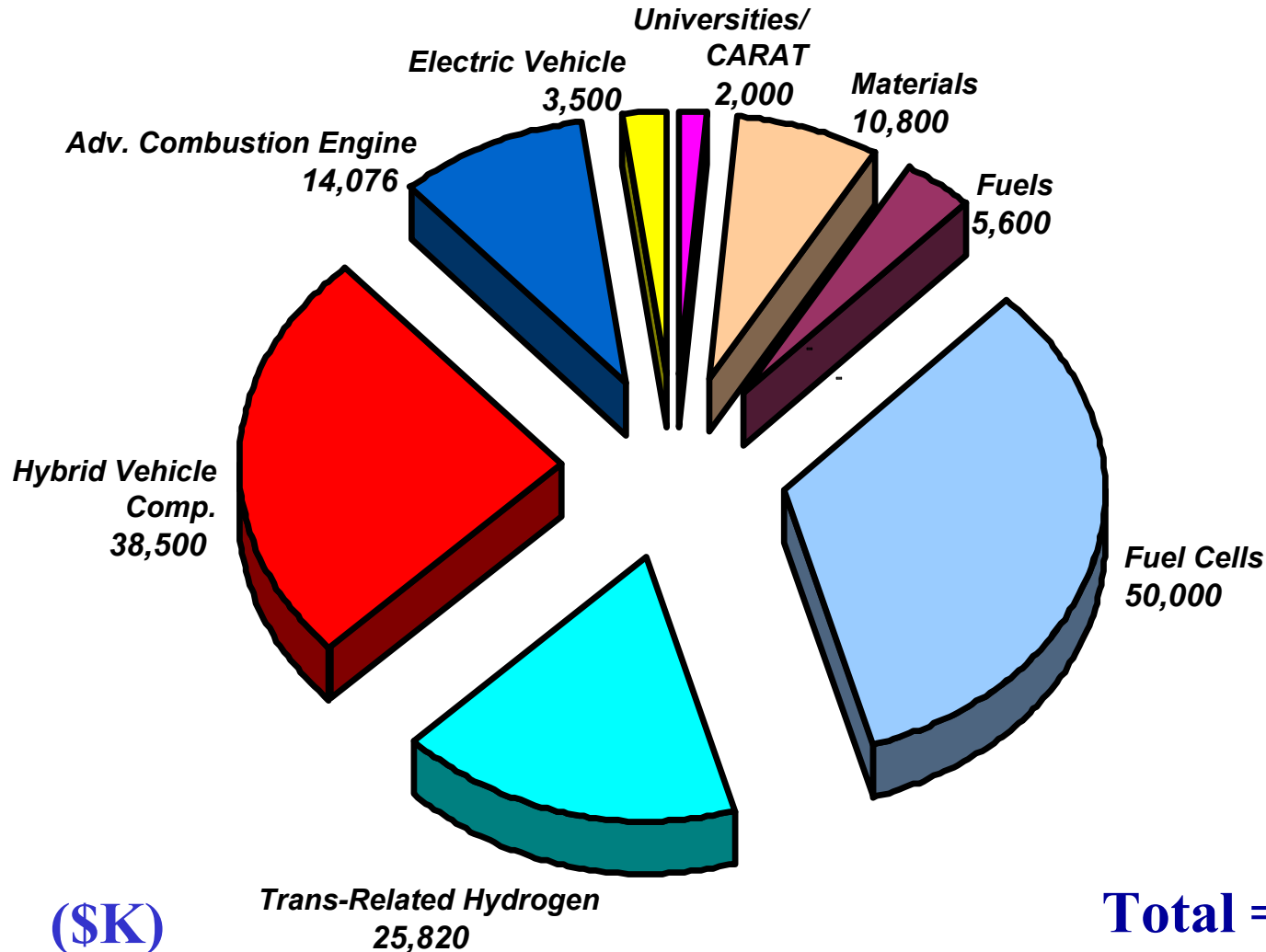


* Number & Composition of Technical Teams TBD



FreedomCAR FY03 Budget

Request Reflects Fuel Cell and Hydrogen Priorities



(\$K)

Total = \$150,296



Fuel Cells and Hydrogen – The Critical Challenges

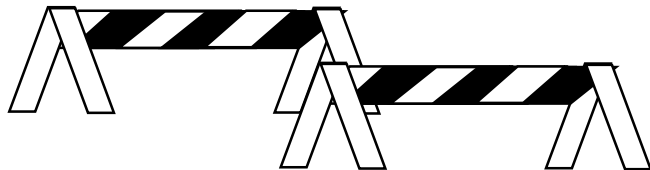
Fuel Cells:

- Cost (platinum)
- Durability
- Fuel Processing
- Air/Thermal/Water Management
- Codes & Standards



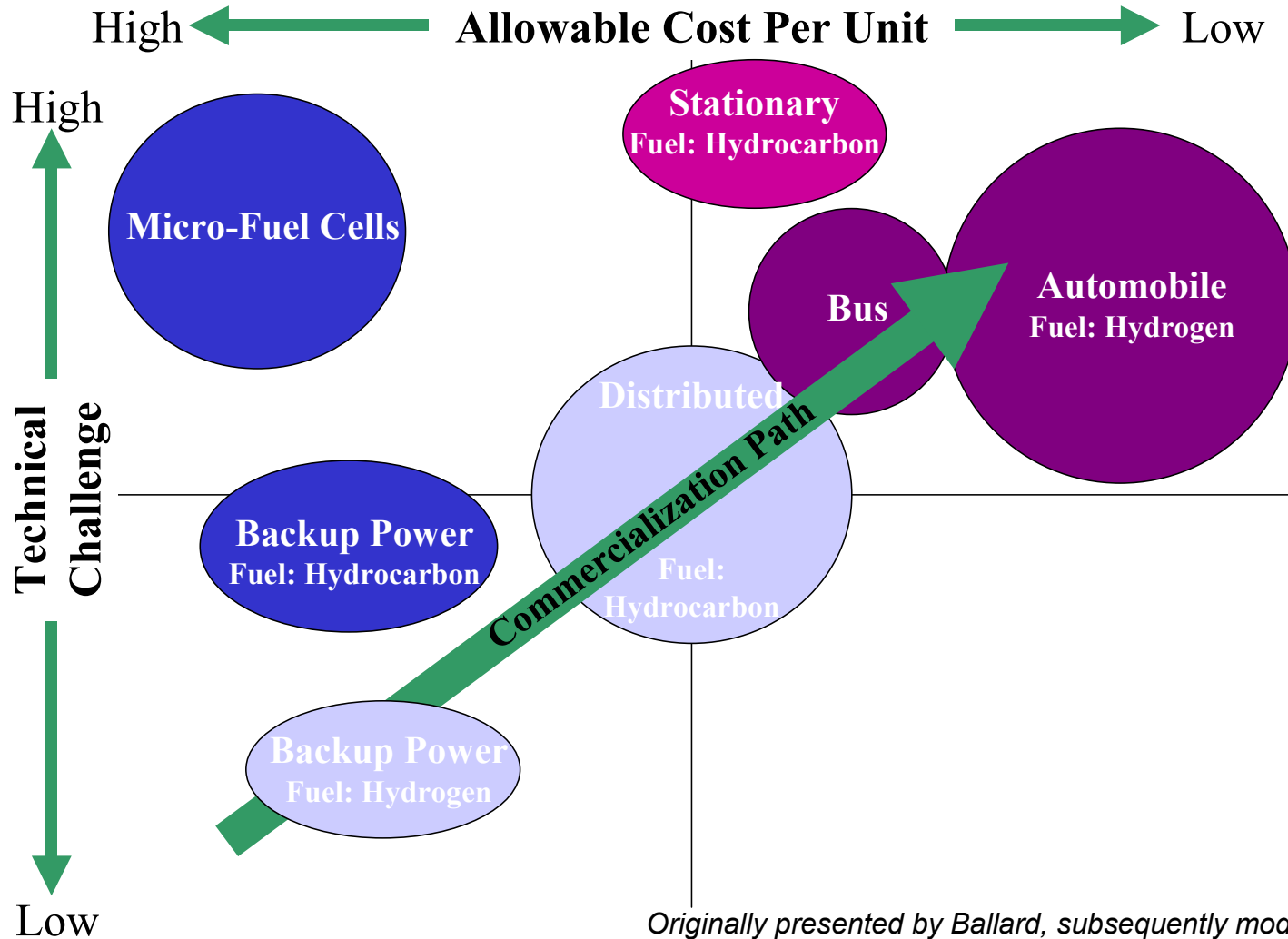
Hydrogen:

- Storage
- Fuel Infrastructure
- Hydrogen Fuel Cost
- Codes & Standards





Fuel Cell Applications



Originally presented by Ballard, subsequently modified by DOE.



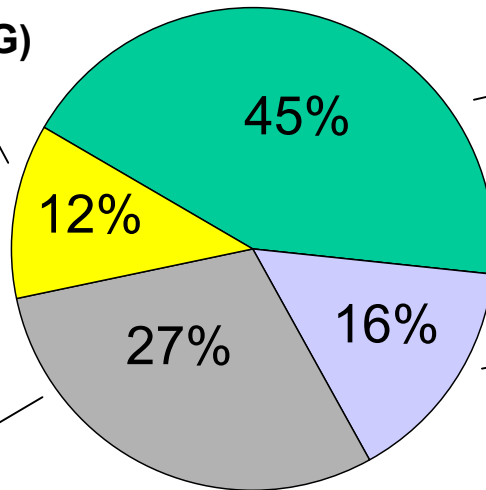
FY02 EERE Fuel Cell Activities (Interior)

Activities Focus on Removing High Risk Technical Barriers

FY 2002 Budget = \$47.425M

Distributed Generation (DG)

- Reforming Technology (NG)
- Critical Components
- Codes and Standards



Transportation Fuel Processing Subsystem

- On-Board Fuel Processor R&D
- gasoline, diesel, methanol

Transportation System

- Modeling/Validation
- Cost Analyses
- Ancillary Components
(Compressors, Sensors)

Transportation Fuel Cell Stack Subsystem

- Catalyst Loading Reduction
- MEA/Bipolar Plate Manufacturing
- Durability Studies



R&D is carried out by industry suppliers, national labs and universities.

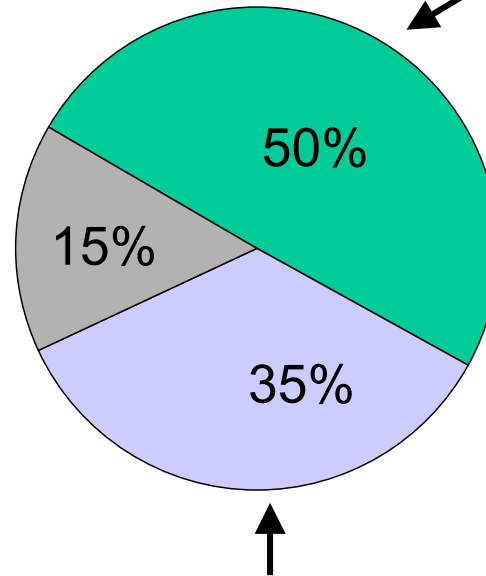


FY02 EERE Hydrogen Activities (Energy and Water)

FY 2002 Budget = \$29.183M

Analysis and Outreach

- Codes and Standards
- Educational Training
- Tank Standards



Core R&D

- Storage technology
- Hydrogen generation



Technology Validation

- Hydrogen refueling station demonstration
- Development of Power Parks concept



FY03 Fuel Cell R&D Activities

Transportation:

- Continuation of critical R&D through 30 new cost-shared industry contracts and national laboratories to address key barriers
- Field Evaluations - Emphasize the introduction and evaluation of fuel cell vehicles in fleets

Distributed Generation:

- Test laboratory natural gas fuel processor for PEM fuel cell systems
- Develop 50kW high temperature PEM system



Merit Review and Peer Evaluation National Laboratory Fuel Cell R&D

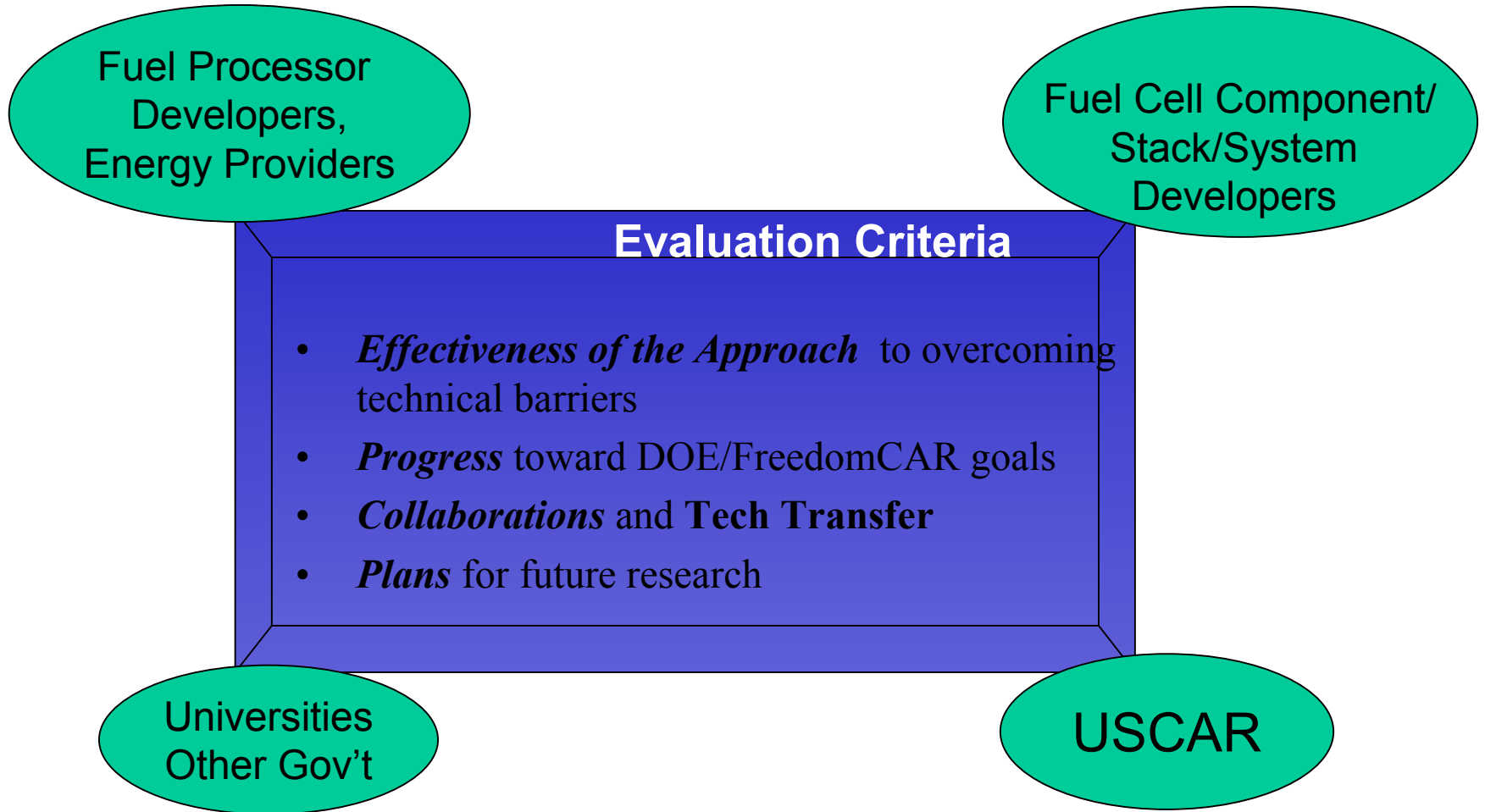
Meeting Objectives

- **Review progress/plans**
- **Foster industry/laboratory interactions, technology transfer**
- **Enhance National laboratory interactions**
- **Guide R&D priorities**





Advisory Panel/Evaluation Criteria





2001 Annual Progress Reports

Available at
www.carttech.doe.gov

