

---

U.S. Department of Energy  
Heavy Vehicle Systems Optimization Review

Argonne National Laboratory

April 18-20, 2006

# HV Systems Optimization

## Parasitic Energy Losses

- Aerodynamic Drag – 53% @ 65mph
- Rolling Resistance – 32%
- Drivetrain – 6%
- Auxiliary losses – 9%

***1% increase in FE = 245x10<sup>6</sup> gallons  
diesel fuel/year saved***

# Heavy Vehicle Systems Optimization

➤ *Increase fuel efficiency at least 25% by reduction of parasitic energy losses (4% decrease in fuel for ALL transportation!)*

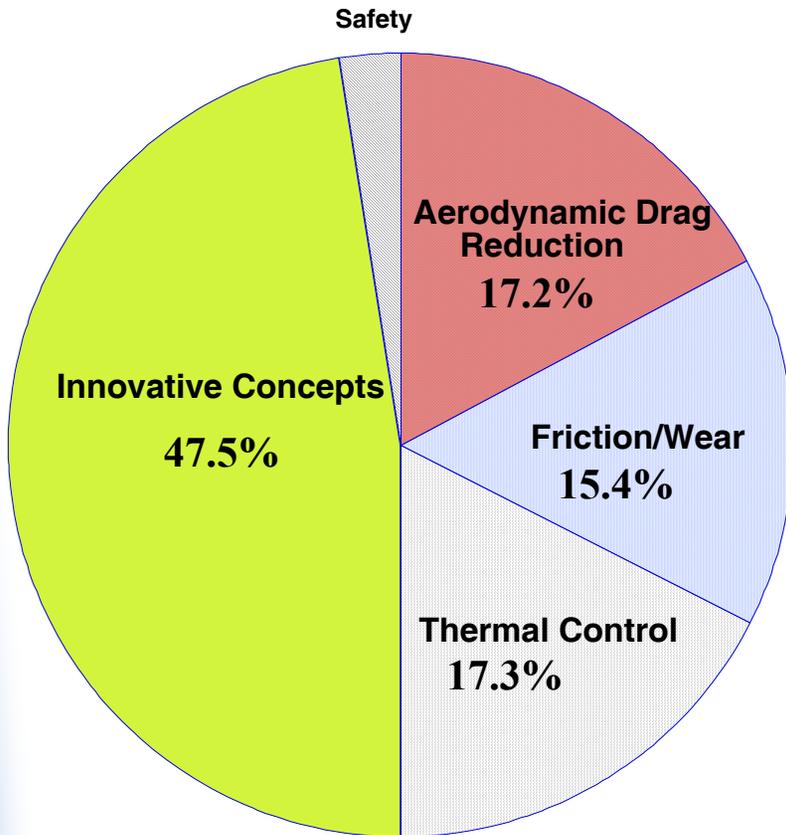
- **Aerodynamic Drag Reduction–Goal: reduce  $C_d$  by 25% (12.5% increase in FE @65mph)**
  - ◆ CFD
  - ◆ Wind-tunnel testing
  - ◆ On-road testing
- **Friction/Wear Reduction–Goal: 3-4% increase in FE**
  - ◆ Theory, modeling, laboratory scale tests, engine tests
- **Thermal Control–Goal: reduce size of radiator by 10% (5% increase in FE)**
  - ◆ Theory, testing, underhood CFD for thermal/drag reduction
- **Innovative Technologies–Goal: 10% increase in FE)**
  - ◆ Includes truck electrification, hybrid locomotive, ultra light weight bus regenerative shocks/tires. Idle reduction
- **Safety (brakes)**

# Achievements

- Aerodynamic drag–CFD and wind tunnel tests indicate goal can be achieved, tests in progress
- Friction/Wear–Simulations indicate goal can be achieved, engine tests planned
- Thermal Control–Calculations, CFD, thermal conductivity of coolants will guide the path
- Innovative Technologies–MET, APUs, ultra lightweight bus, radial designed fan, replacement of belt-driven equipment by electrically operated ones have demonstrated  $2\% \leq FE \leq 12\%$

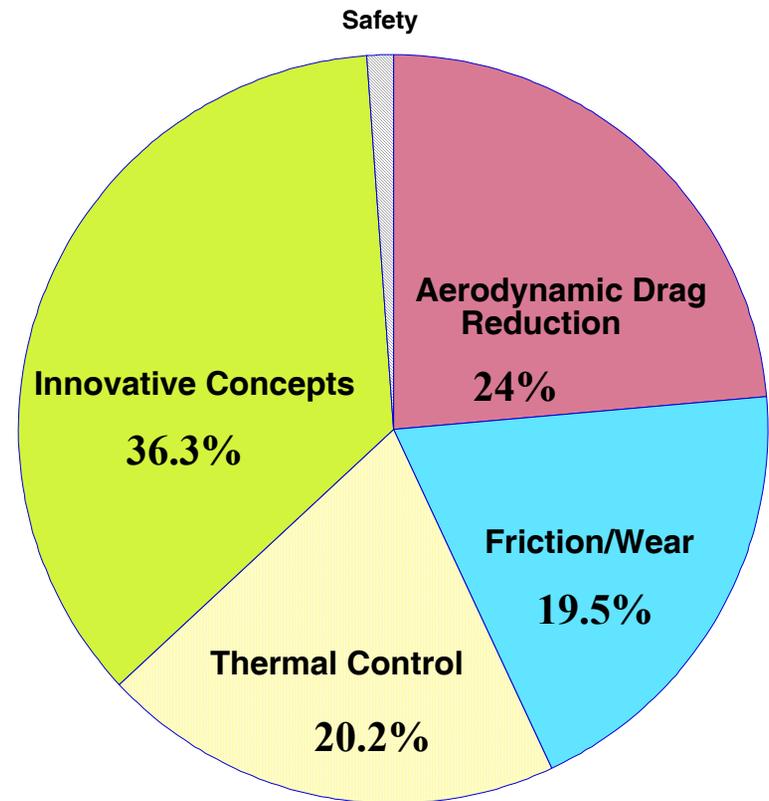
# Distribution of Funding(by Area)

**FY2005**



**Cost share - 38%**

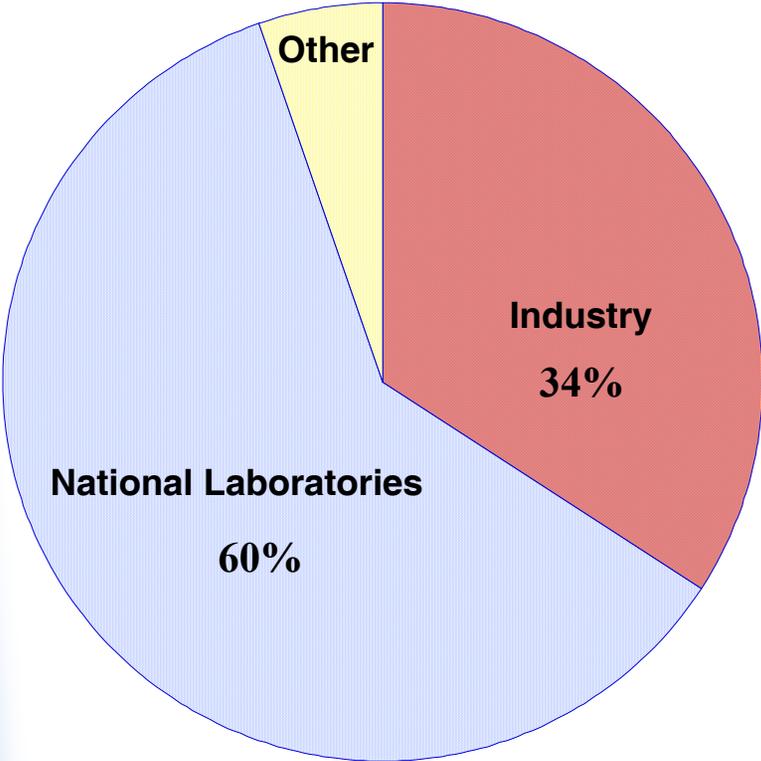
**FY2006**



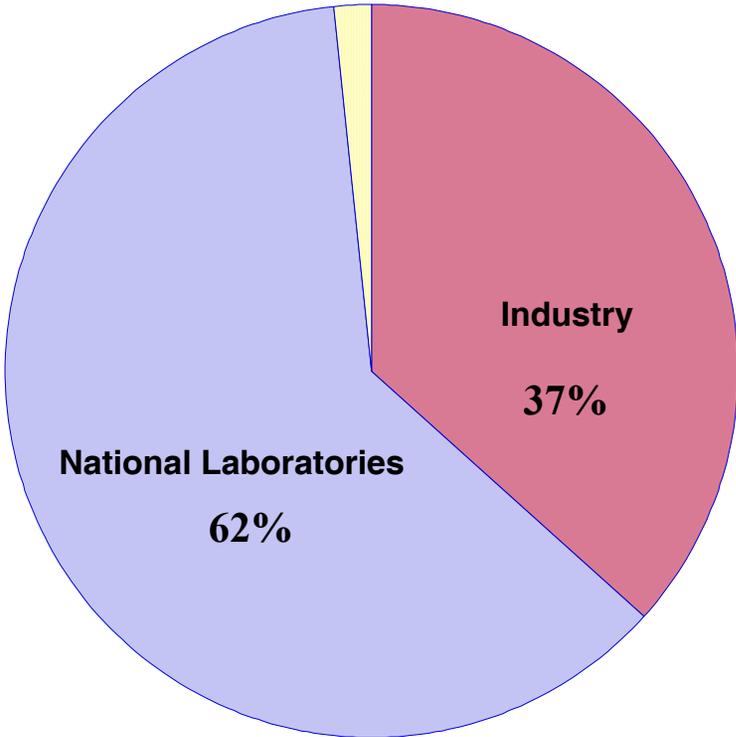
**Cost share - 47%**

# Distribution of Funding (by Recipient)

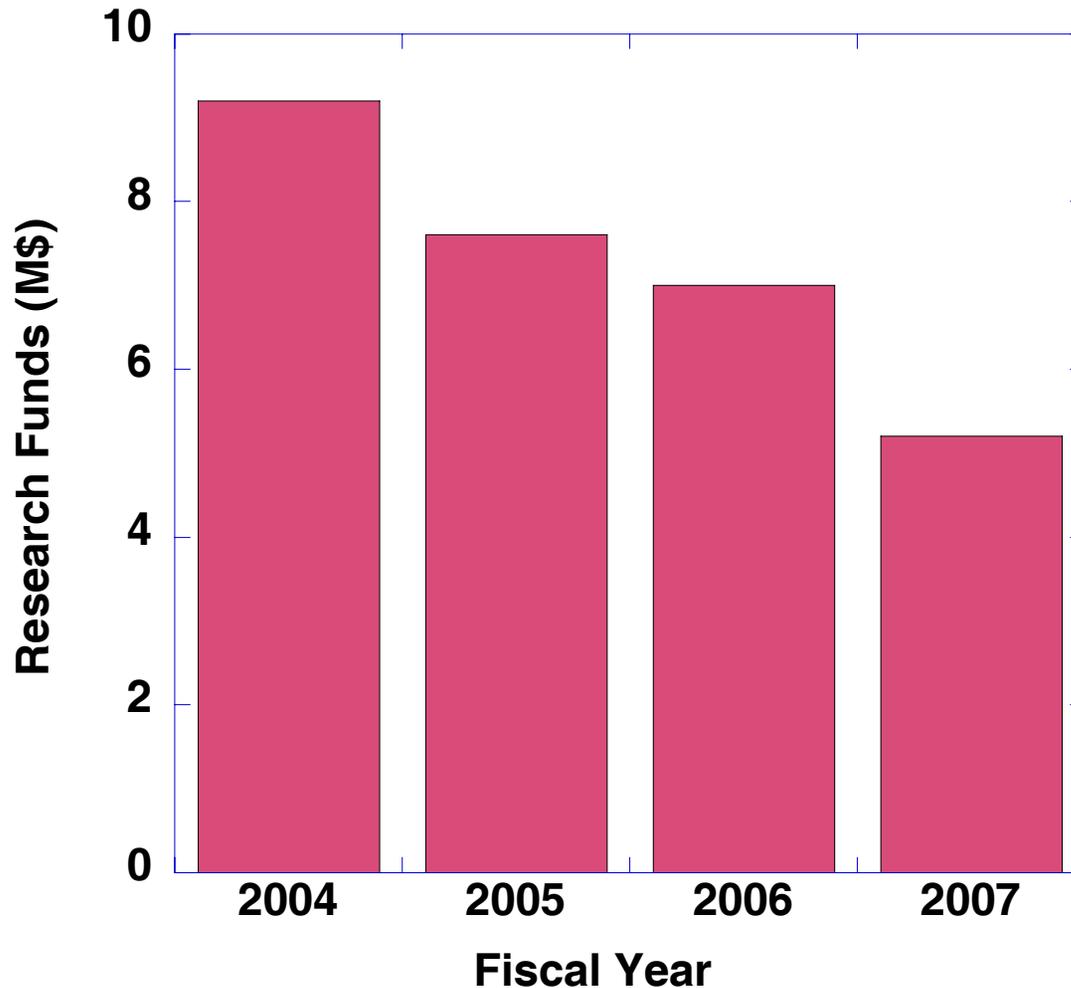
**FY2005**



**FY2006**



# HV Systems Research Funds



*Doesn't include SBIR, cross-cutting, administration, taxes, etc.*