

Vehicles Technology Program Annual Merit Review – Propulsion Materials

U.S. DEPARTMENT OF
ENERGY

Energy Efficiency &
Renewable Energy



**ULTRA-LOW SULFUR
HIGHWAY DIESEL FUEL**
(15 ppm Sulfur Maximum)

Required for use in all model year
2007 and later highway diesel
vehicles and engines.

Recommended for use in all diesel
vehicles and engines.

**AMERICA'S FIRST
BIOFUELS CORRIDOR**



Jerry Gibbs
Technology Development Manager
Propulsion Materials
Vehicle Technologies Program

- Improve efficiency of advanced vehicles through innovative material solutions
- Critical enabler supporting Advanced Combustion, Thermoelectric, and Hybrid-Drive Systems
 - Material compatibility for Alternative Fuels
 - Materials for high efficiency AF/SI Engines
 - Materials for high efficiency CIDI engines
 - Materials for HCCI / HECC engines
 - Thermoelectric materials
 - Materials for reliable high performance hybrid and EV drive systems

Propulsion Materials Activities

Materials for Combustion Systems /

High Efficiency Engines

Turbocharger, Valve train, Fuel Injection, Structural Components Head/Block, Sensors, Materials/Fuel Compatibility

Materials for Exhaust and Energy Recovery

DPFs, Catalysts, Thermoelectric Materials, Materials for high temperature structures

Materials for Electric and Hybrid Drive Systems

High Temperature Power Electronics Materials, Solder Joints, Materials/Coolant Compatibility, And Materials for Electric Drive Motors

Materials By Design

Materials Synthesis, Characterization, Multi-Scale Computer models, Testing Standards, and Coatings

VTP Team Collaborations

Advanced Combustion Engine

LD 45%e @ \$30/kW
HD 55%e
Biofuels

Hybrid Electric Systems

55kW @ \$12/kW
300Whr @ \$20/Whr

Fuels Technologies

Petroleum Displacement

Lightweighting improves efficiency of all vehicles:

Reduce the weight of the vehicle by 50% in a cost effective way

Propulsion materials support the goal of achieving combustion efficiency:

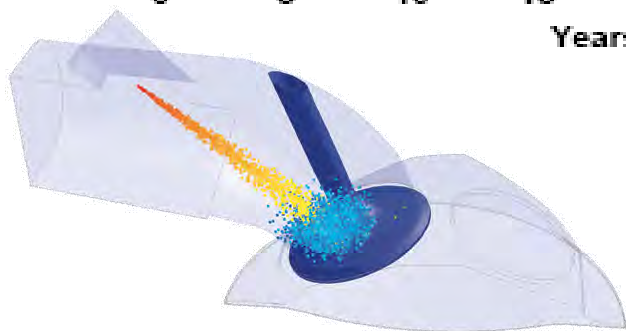
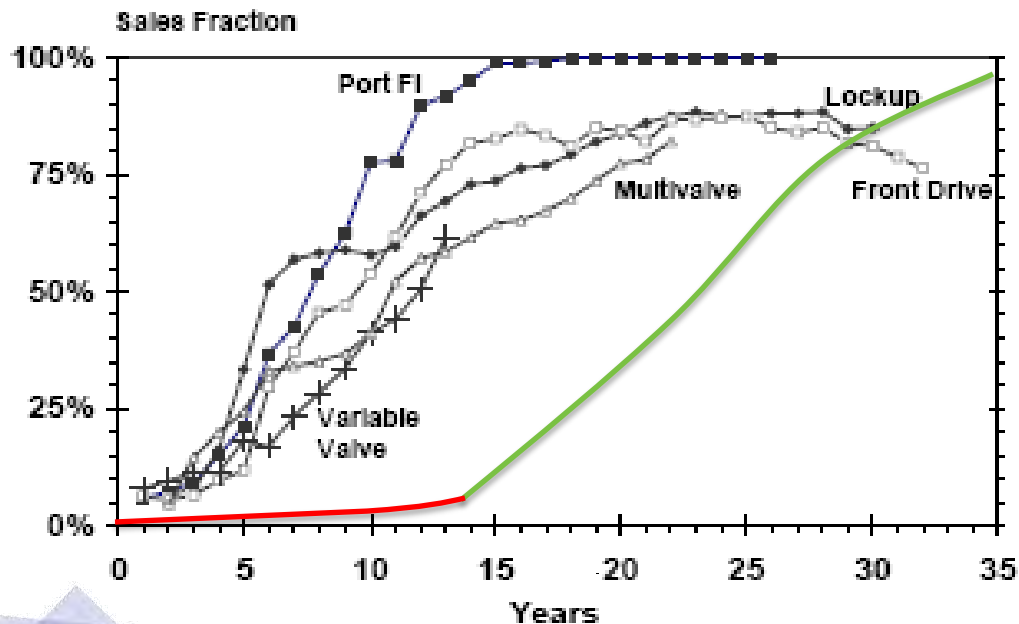
Passenger vehicles up to 45% and commercial vehicles 55% at today's cost :

- ❑ ICE Requirements are demanding
 - High pressure fuel injection materials up to 45,000 psi for diesel engines
 - Peak cylinder pressure > 3,500 psi
- ❑ Increased need for Energy Recovery
 - Accelerate use of Thermoelectric devices
 - Increased use of boosting technologies
- ❑ Anticipate impacts of new fuel formulations



Vehicle Technology Penetration

Years After Initial Significant Use

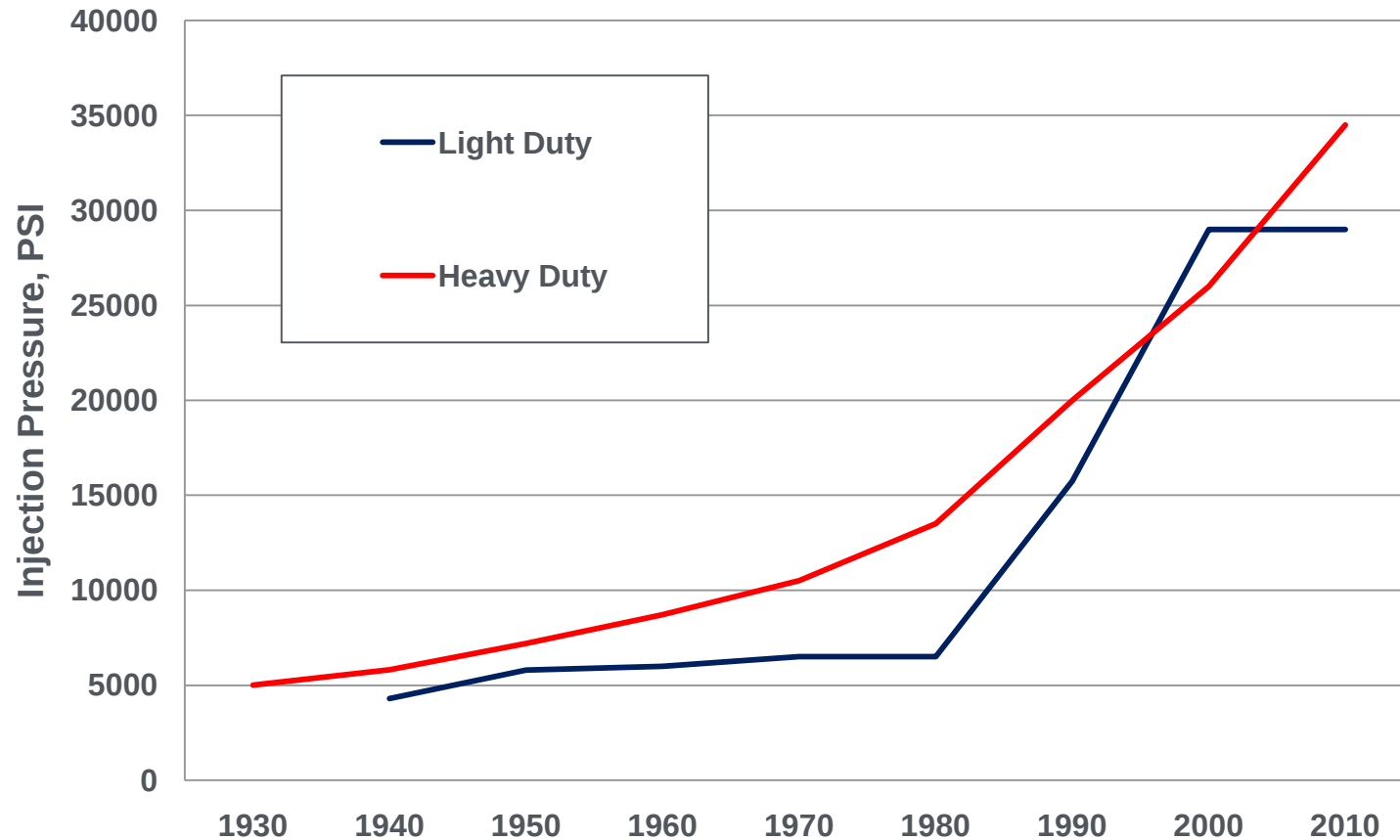


Food for Thought

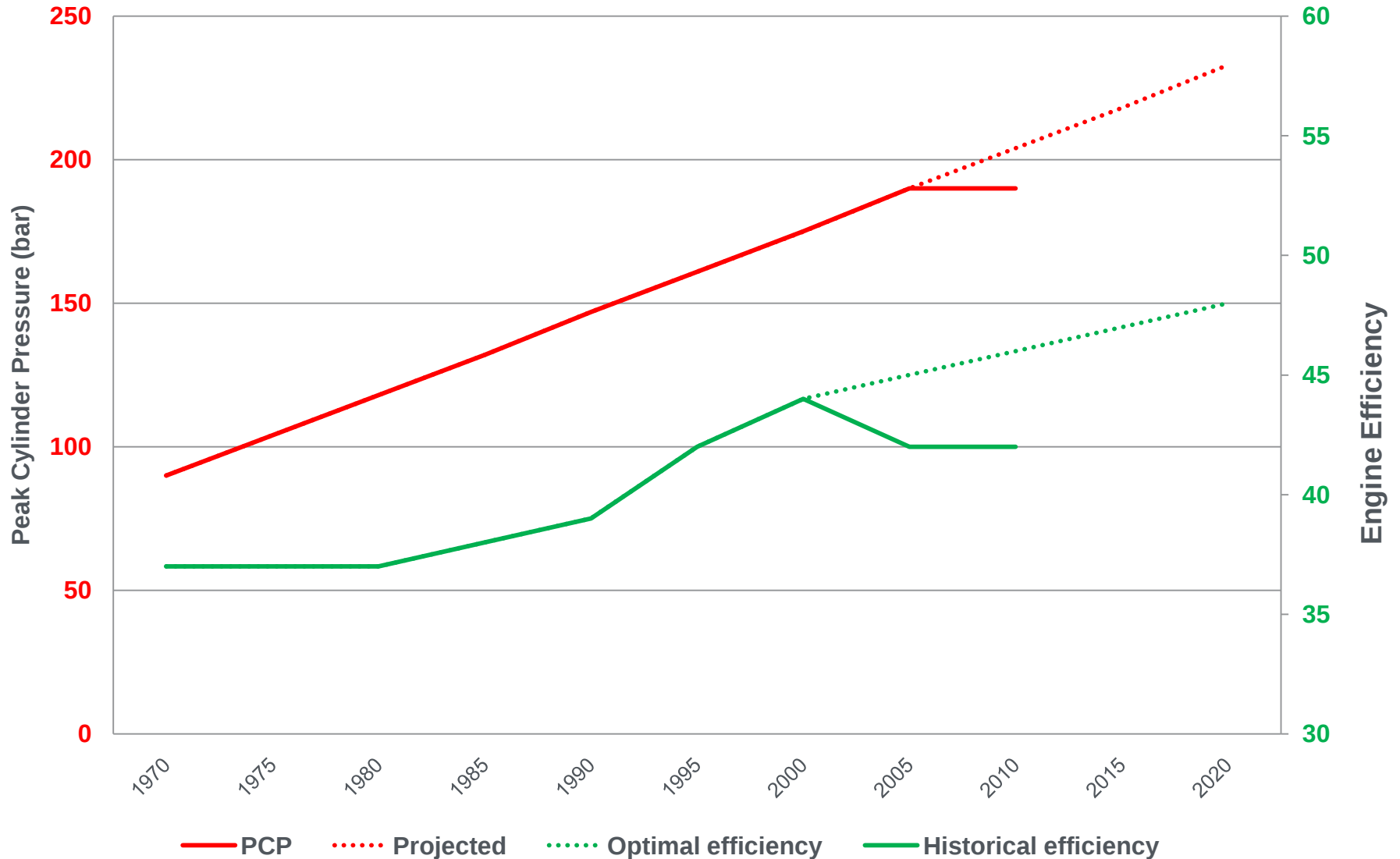
- Design Process is about 4 years,
- For inclusion, new materials must be qualified before designs begin
- New materials typically take 10+ years to develop

Materials Research Must be Focused on the Horizon

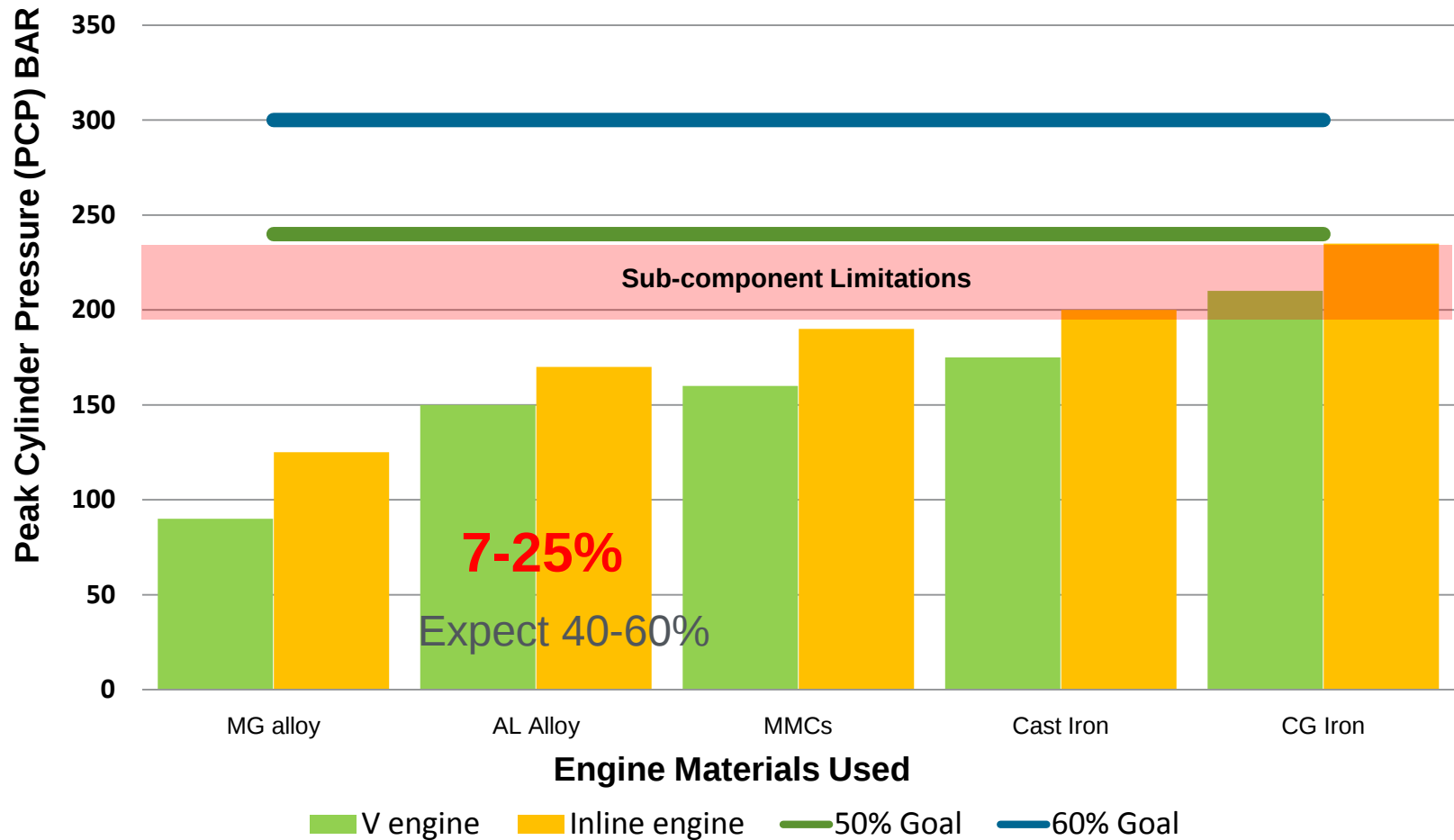
Direct Fuel Injection Pressure Trends



Heavy Duty Diesel Engine Trends

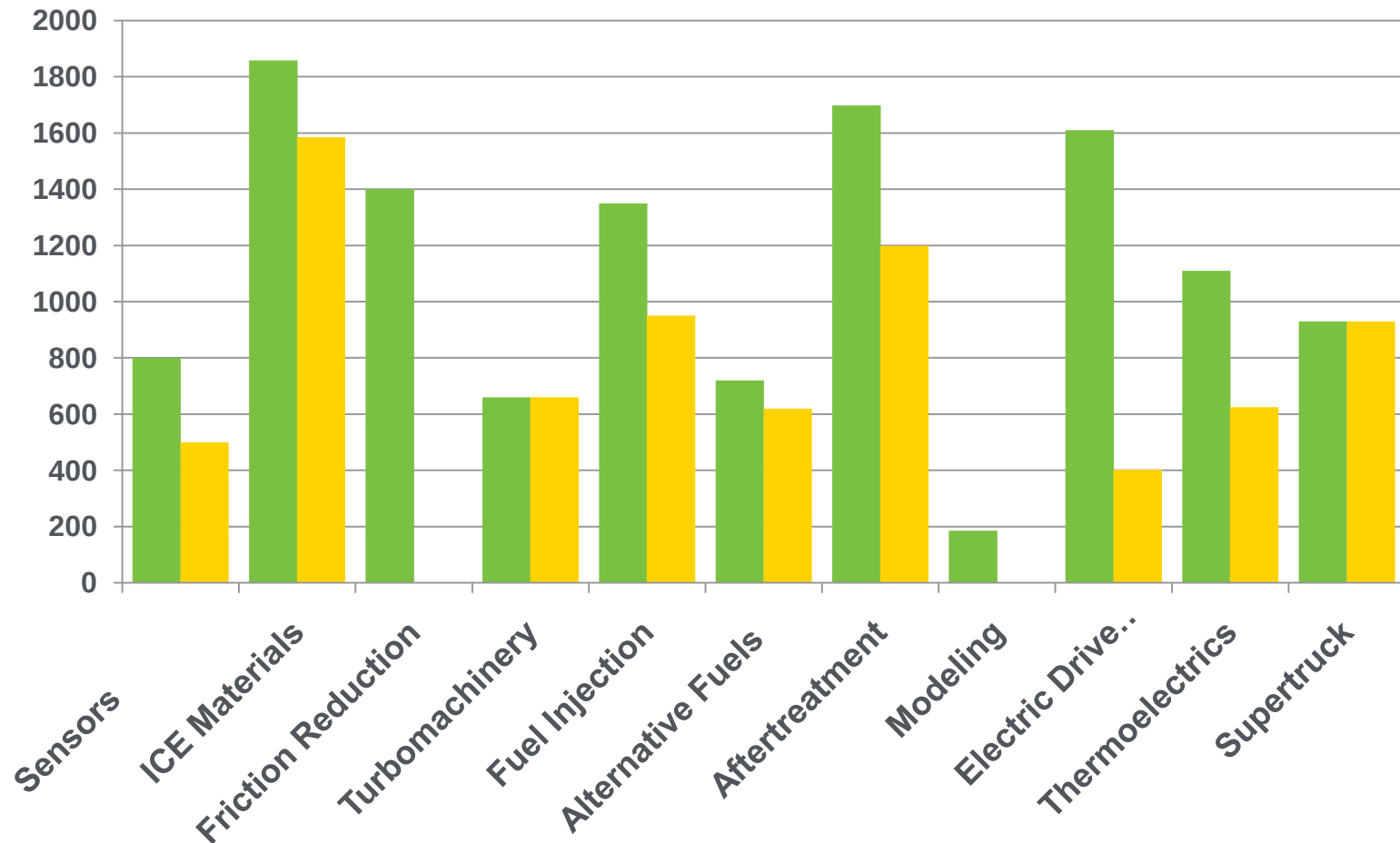


Current Material Limits



Based on 1999 study

Propulsion Materials funding and cost share by technology



Prospective New Agreements in Each Technology Area are Evaluated On:

- Relevance to Vehicle Technologies Program Objectives
- Supported Team's Priorities
- Potential for Co-funding from other VTP Teams
- Industry Support for Activity
- Perceived risk/benefit to program
- Mechanism for Technology Transfer
- Existing activities are evaluated annually
 - Identify activities that should be transitioned to other VTP Teams or Industry
 - Identify activities requiring changes in effort
- Approximately 15% of activities are retired each year
- Goal to migrate over 50% of portfolio to competitively awarded Solicitations by 2014

Thank You

www.vehicles.energy.gov



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