



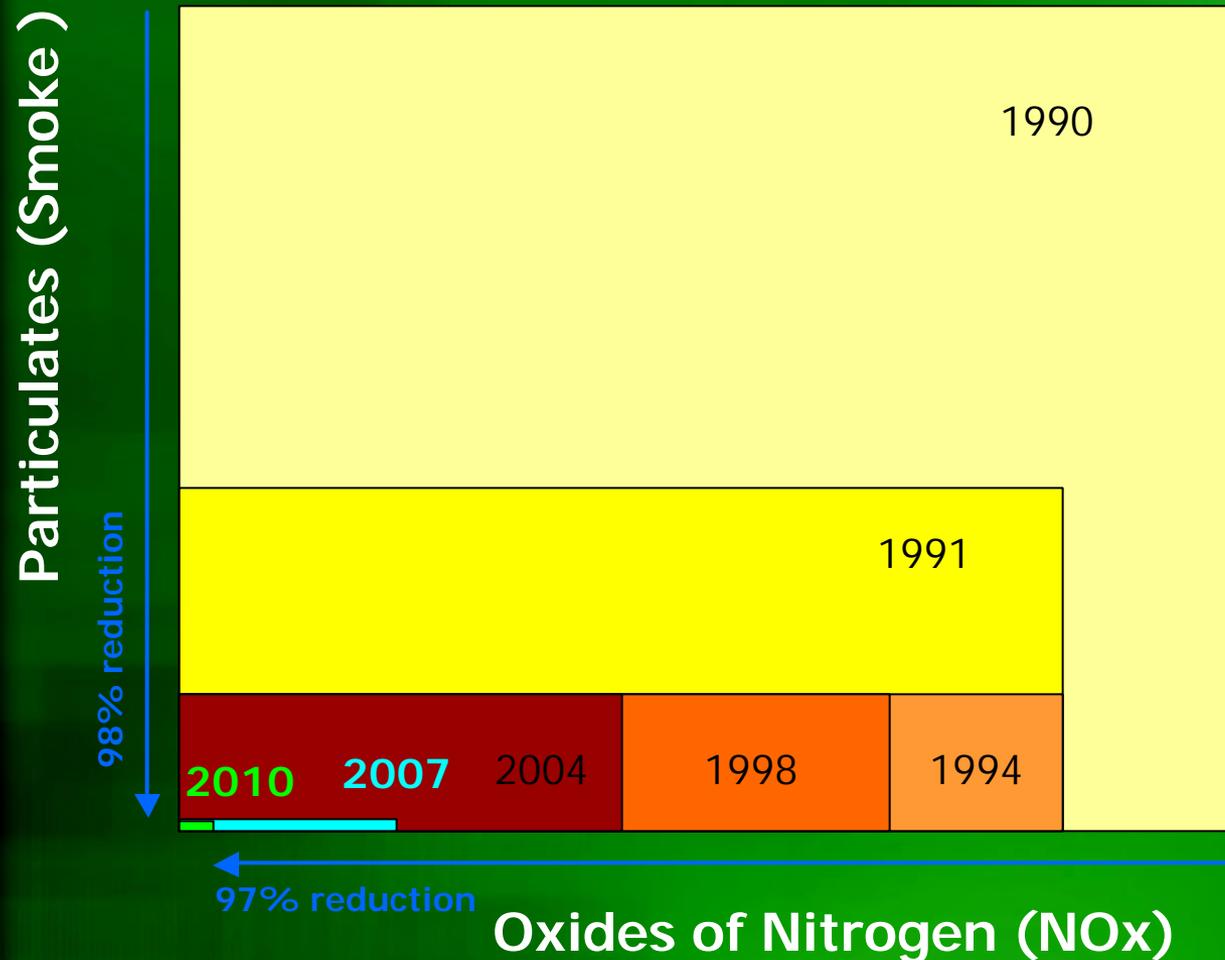
Heavy Truck Clean Diesel (HTCD) Program 2007 Demonstrator Truck

David Milam, Kevin Duffy
Andrew Kieser, Eric Fluga

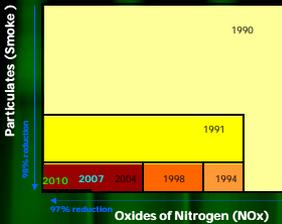
DOE Contract DE-FC05-00OR22806
Contract Monitor – Roland Gravel

DEER Conference
Newport, RI
August 25, 2003

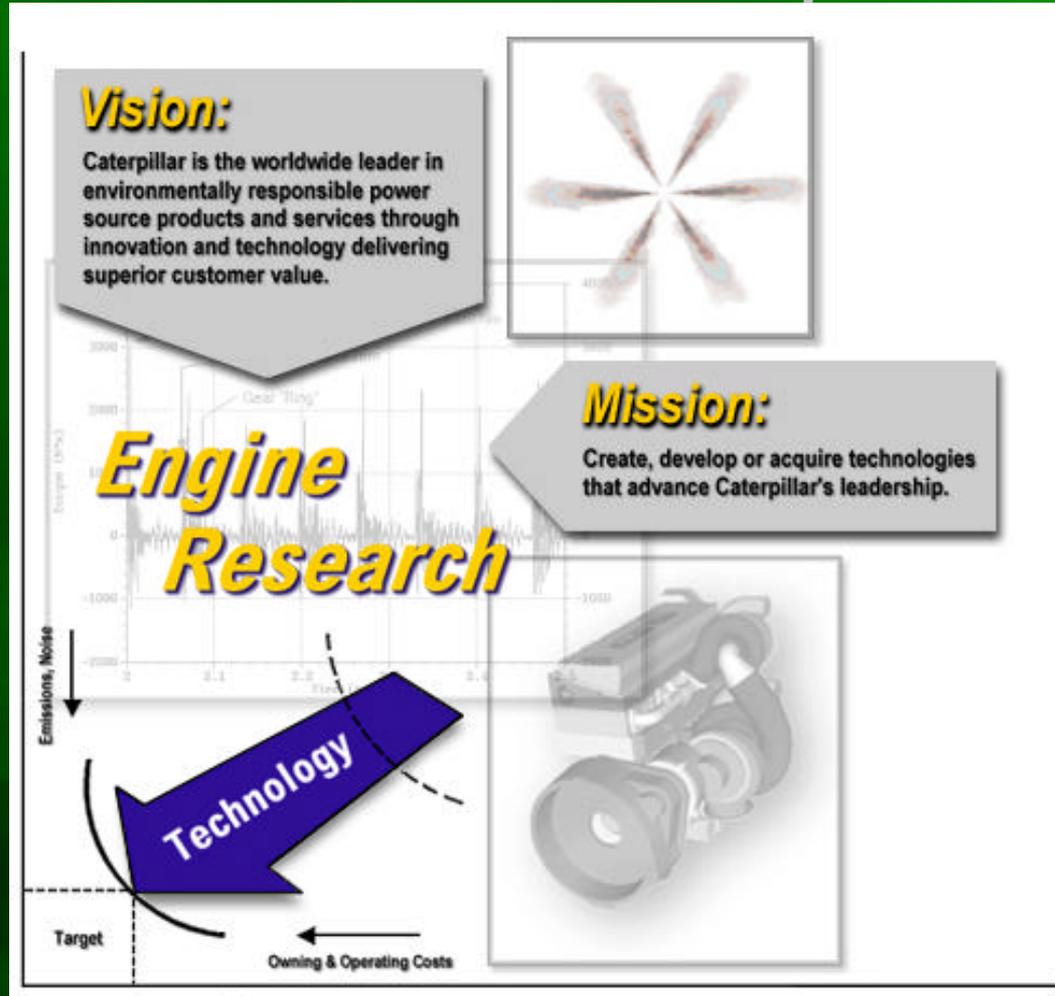
HTCD Program 2007 /2010 Development



HTCD Program 2007 /2010 Development

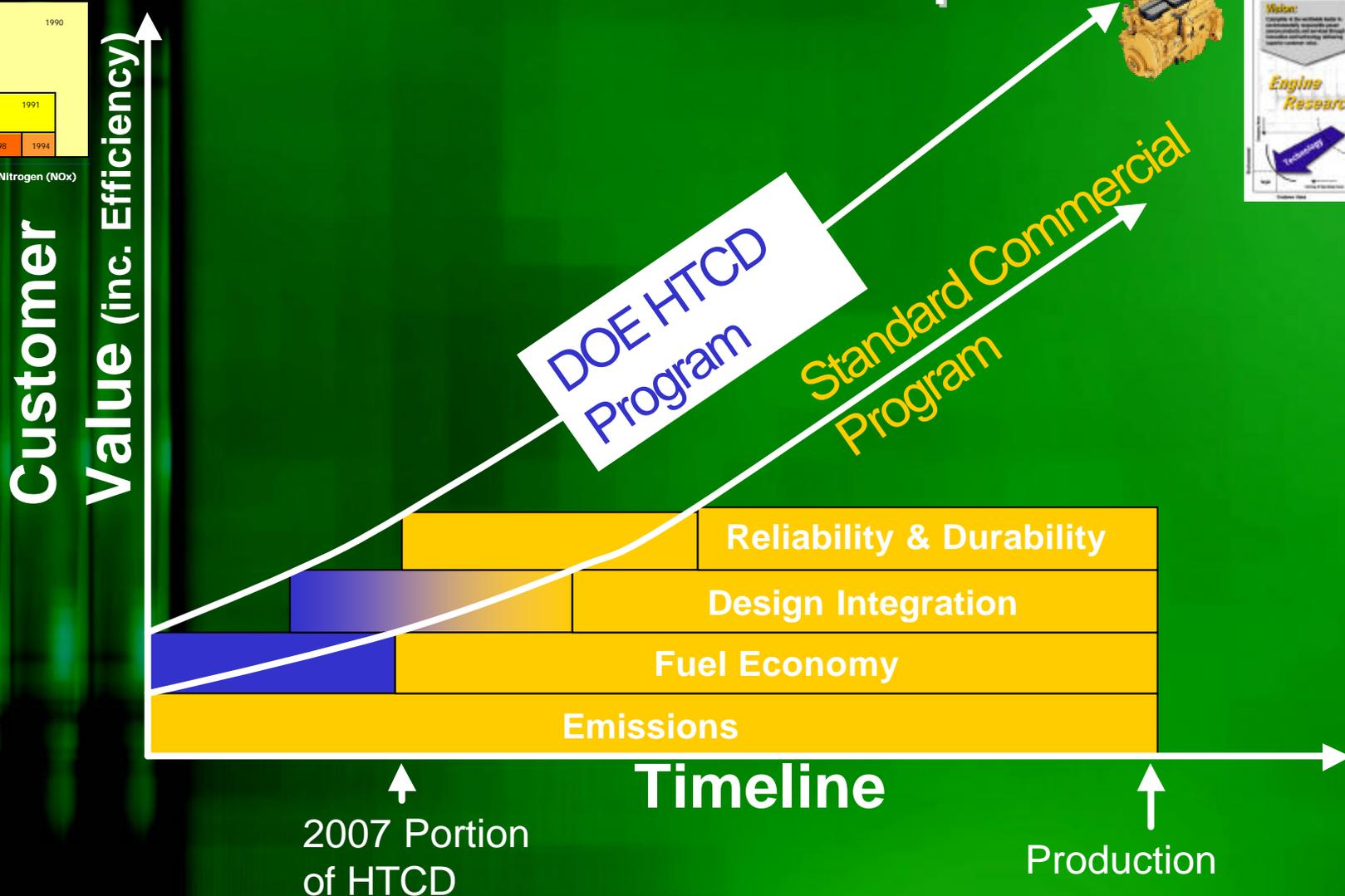
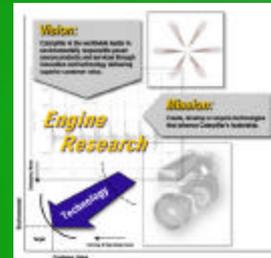
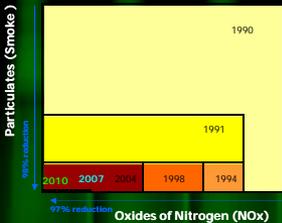


Environmental (inc. emissions)



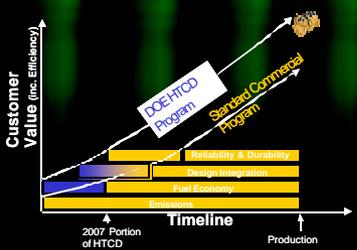
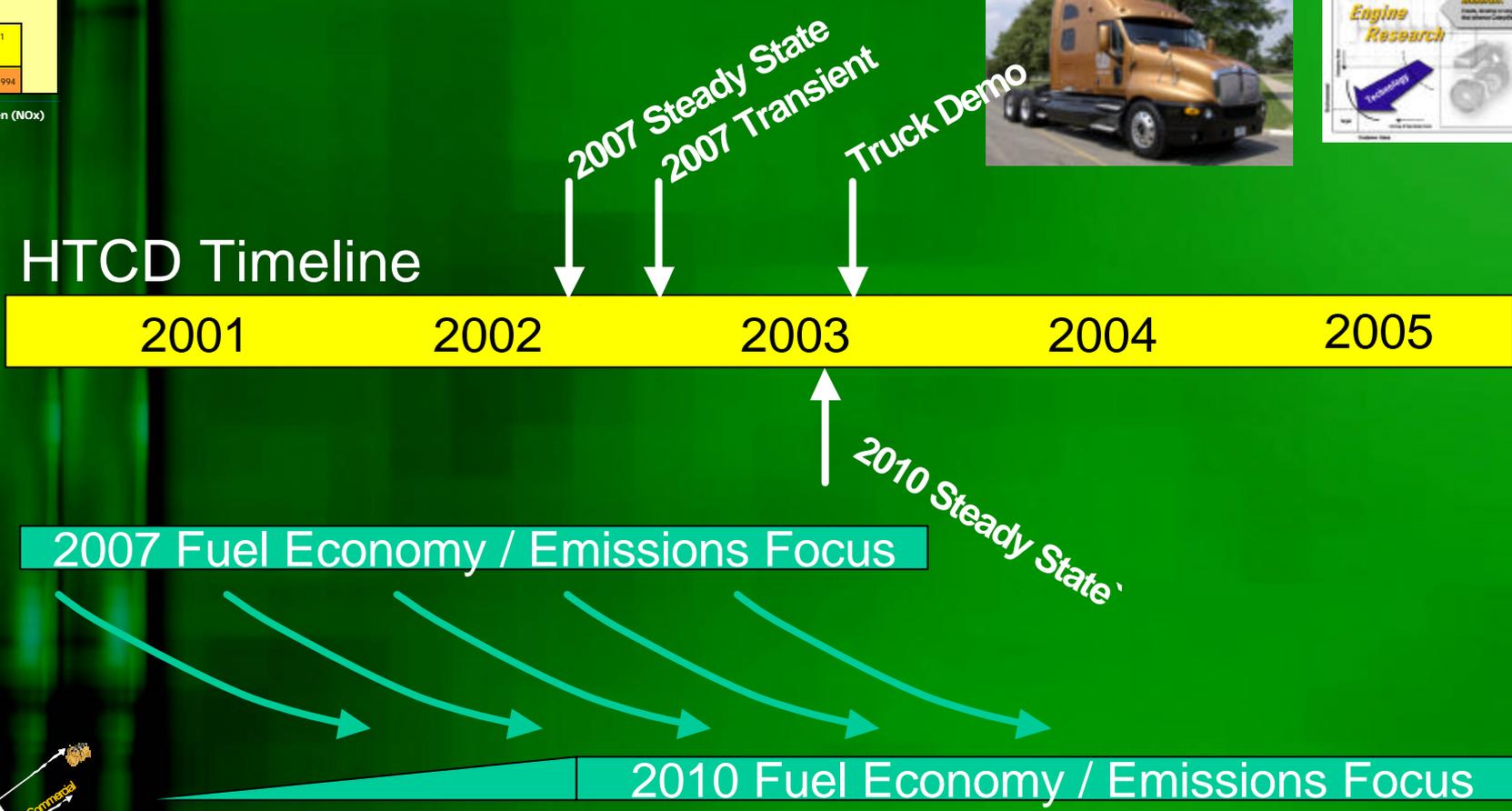
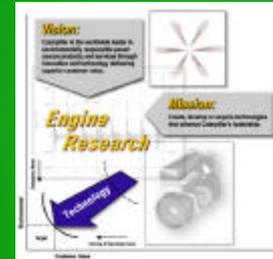
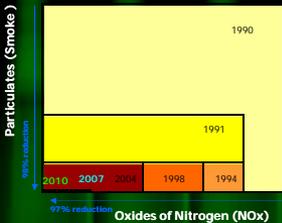
Customer Value (inc. efficiency)

HTCD Program 2007 /2010 Development



HTCD Program

2007 /2010 Development



ACERT™ Building Blocks Foundation for 2007 and 2010

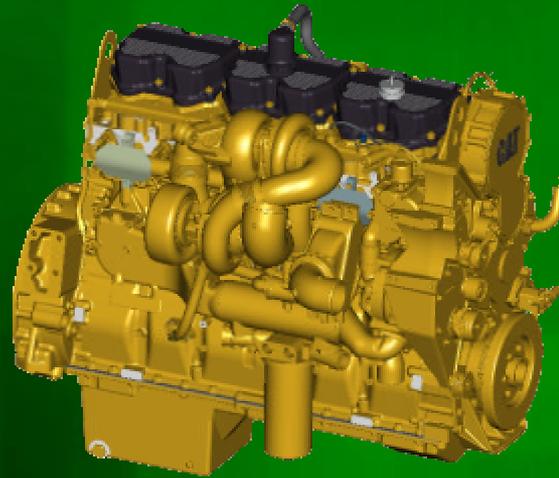
Combustion



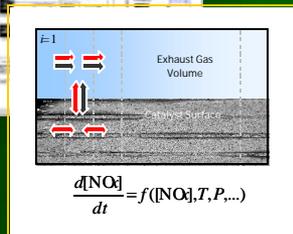
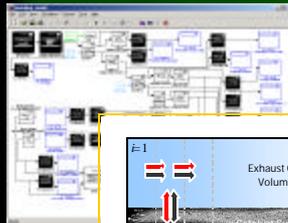
Aftertreatment



Integrated
Engine System



Electronics
and Controls

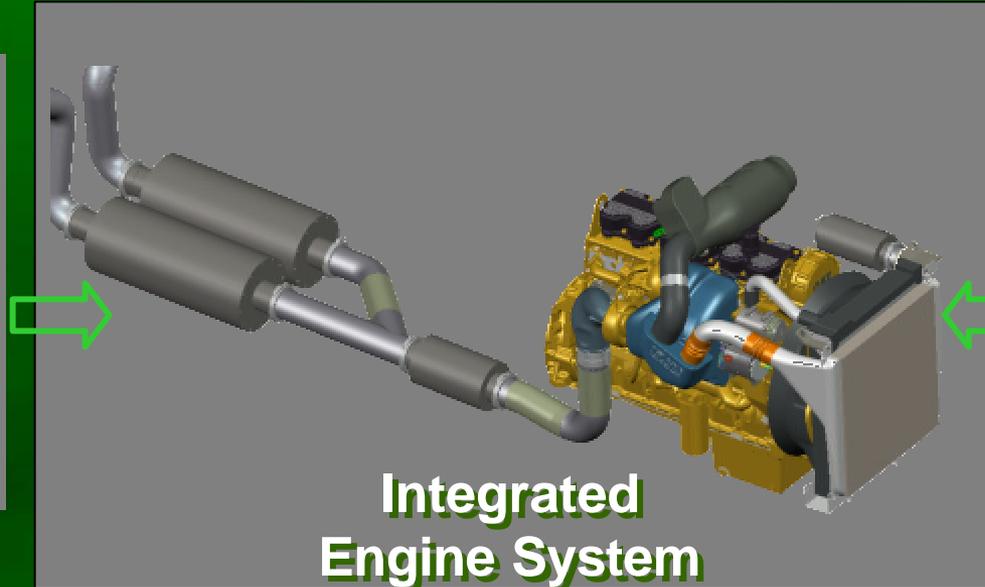
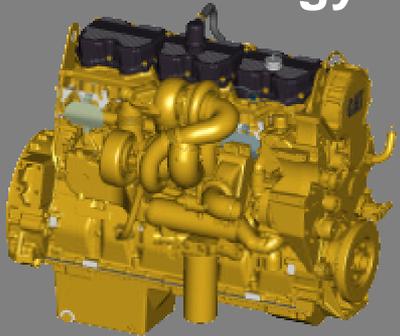


Air Systems



HTCD 2007 / 2010 Technology Options

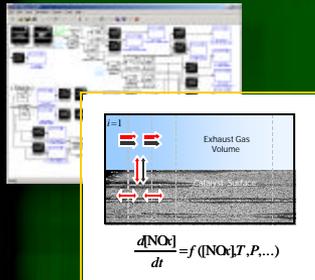
Combustion Technology



Aftertreatment



Electronics and Controls

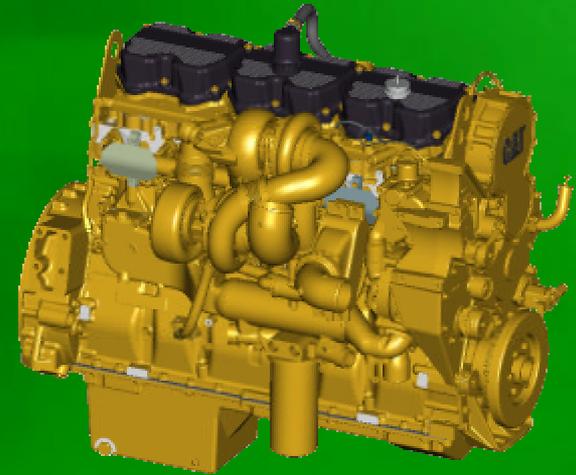
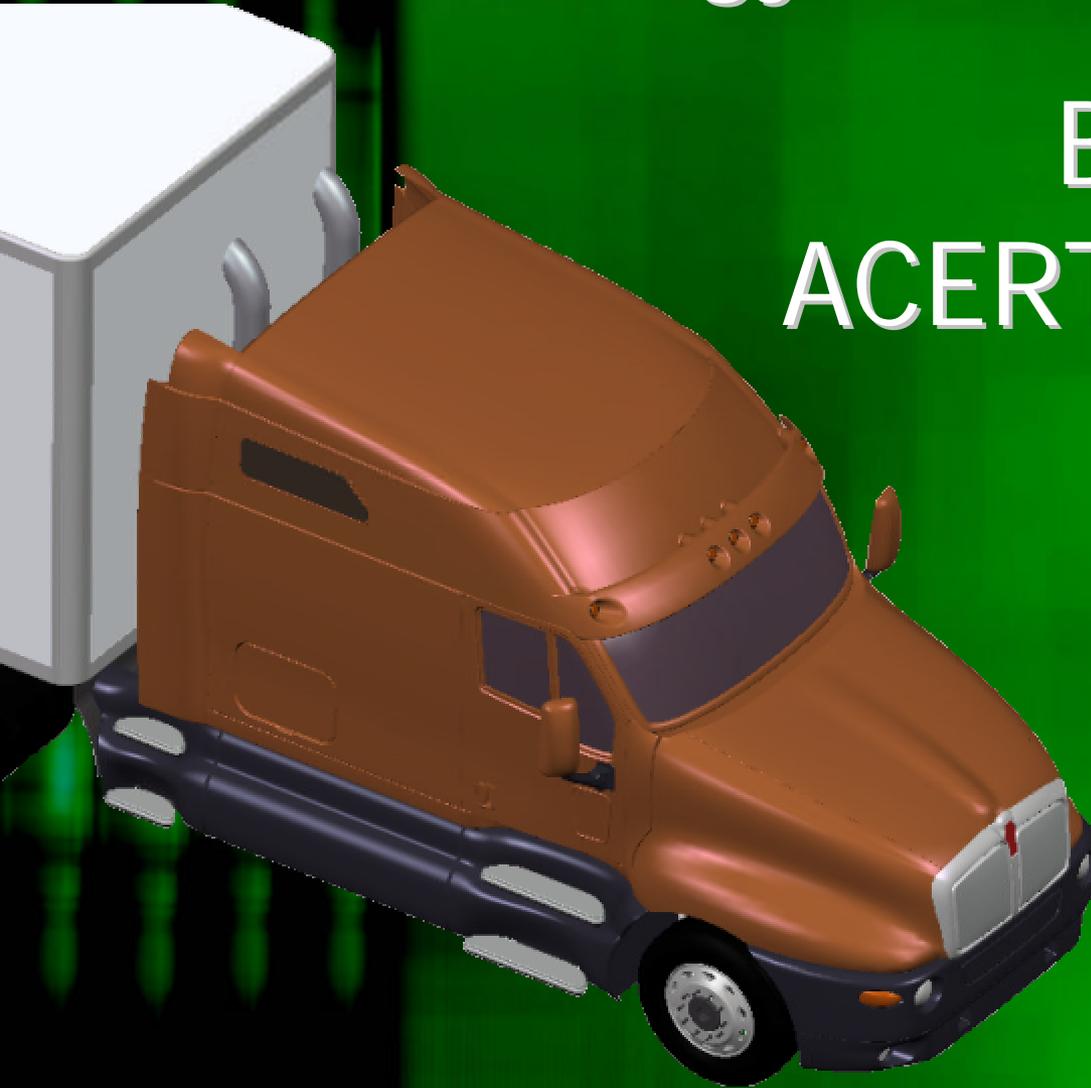


Air Systems



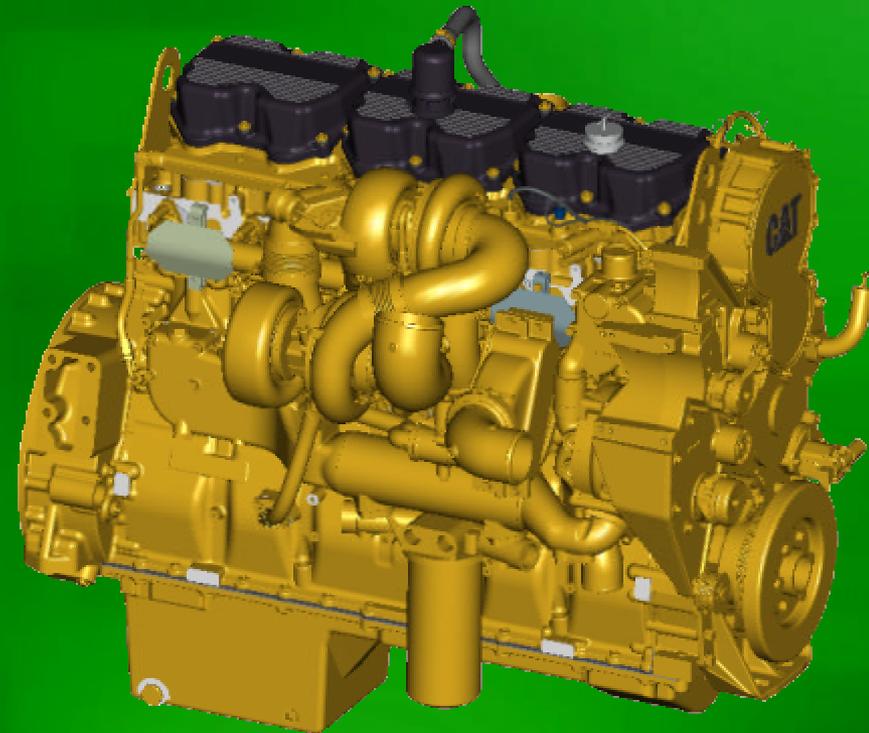
2007 System Integration for Technology Demonstrator Truck

Building on
ACERT™ Technology



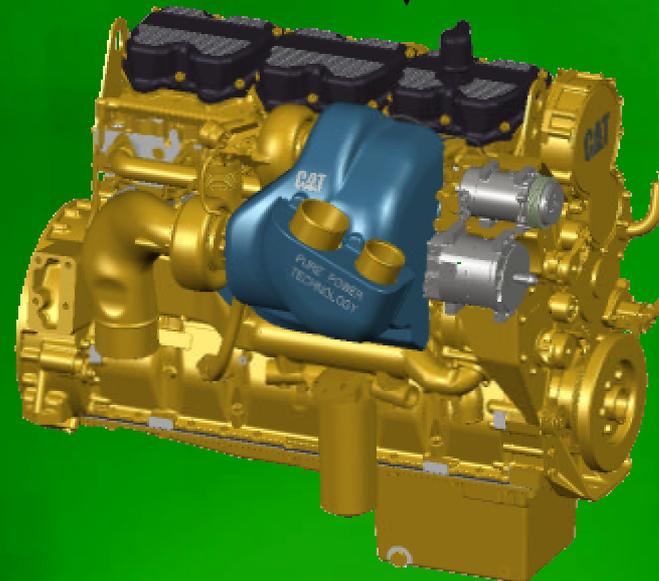
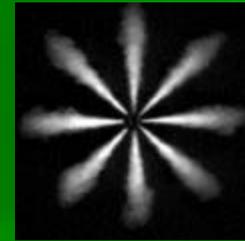
2003 Production C15 ACERT™ Engine

- Combustion
- Air Systems
- Aftertreatment
- Electronics and Controls



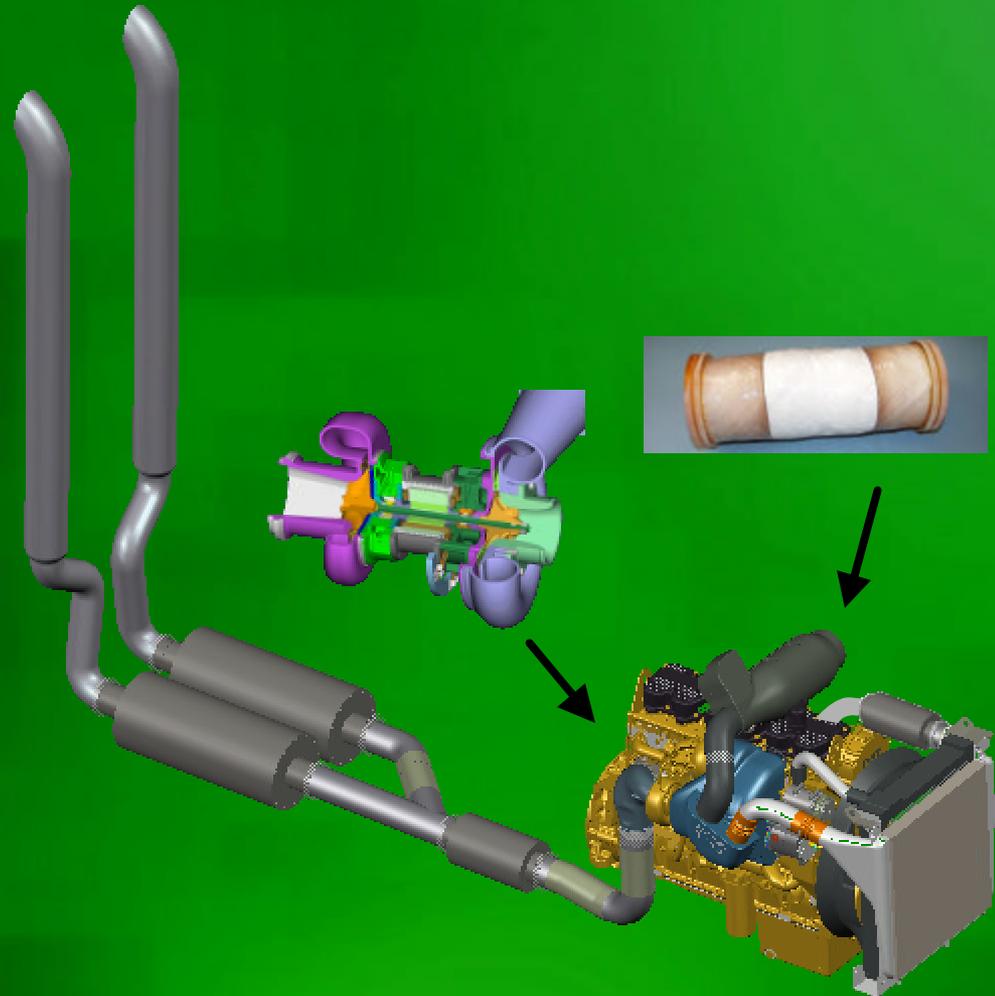
Combustion Development

- Fuel System - Key to low engine-out emissions with excellent fuel economy
- High pressure injection to minimize trap regeneration thus minimizing BSFC penalties



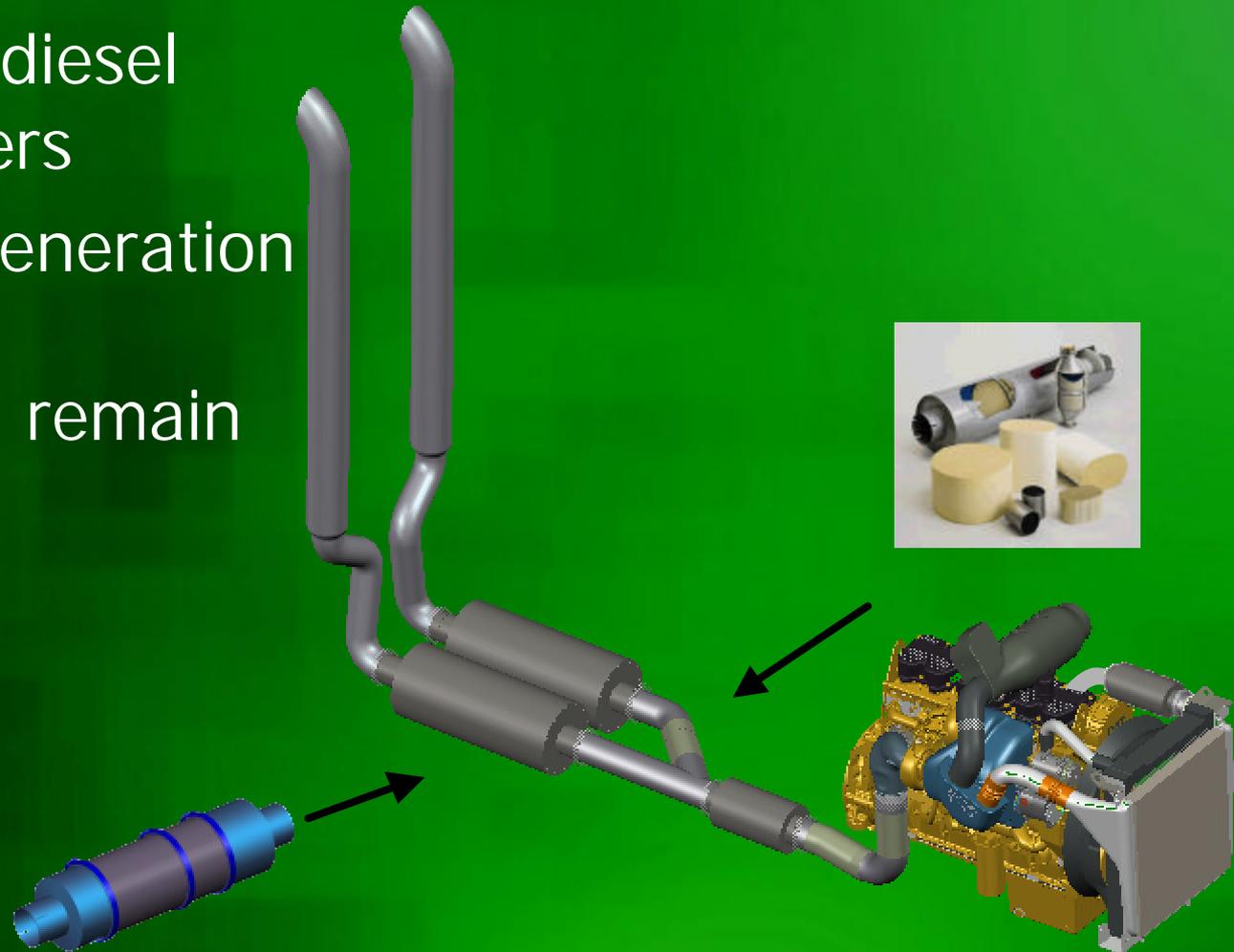
Air-System Development

- Oxygen depletion membrane technology
- Leveraging Caterpillar proprietary heat exchanger technology
- MEI and Electric turbocompounding



Aftertreatment Development

- 90+% PM reduction required from diesel particulate filters
- Significant regeneration and durability challenges still remain



Electronics and Controls Development

- Next Generation Engine Control Module
 - Building block for
 - Advanced control logic
 - Complex OBD II models
 - Additional sensors and actuators.
- Advanced Sensor Technologies
- Smart Actuator Technologies



The Packaged Solution



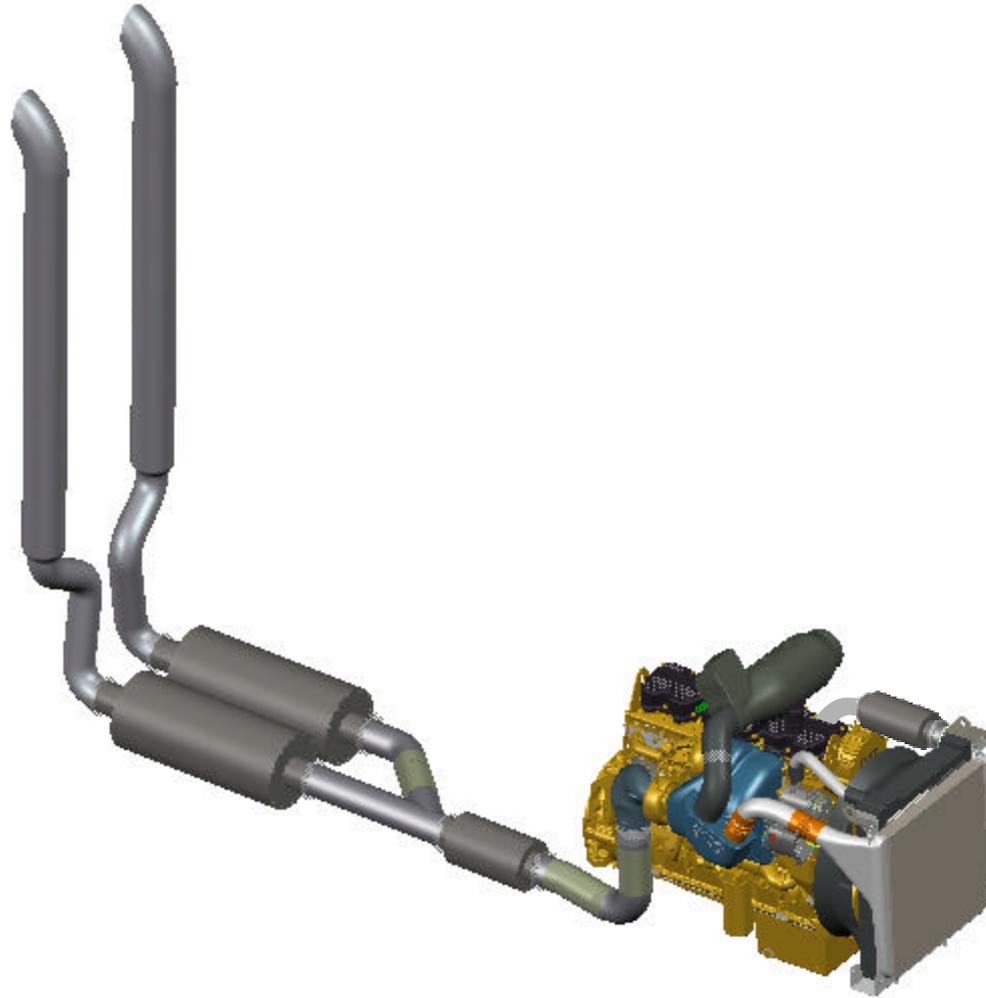
The Packaged Solution



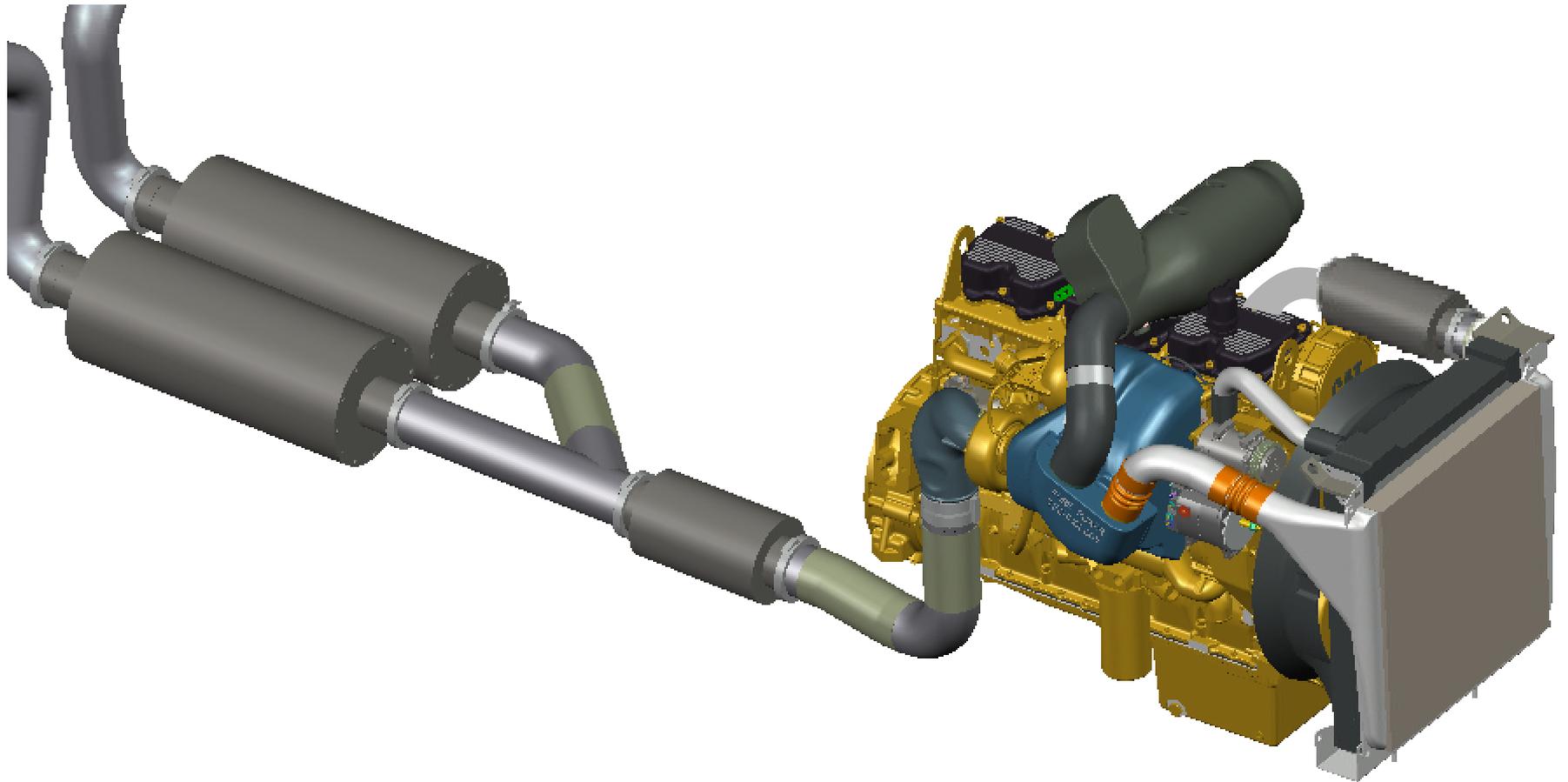
The Packaged Solution



The Packaged Solution

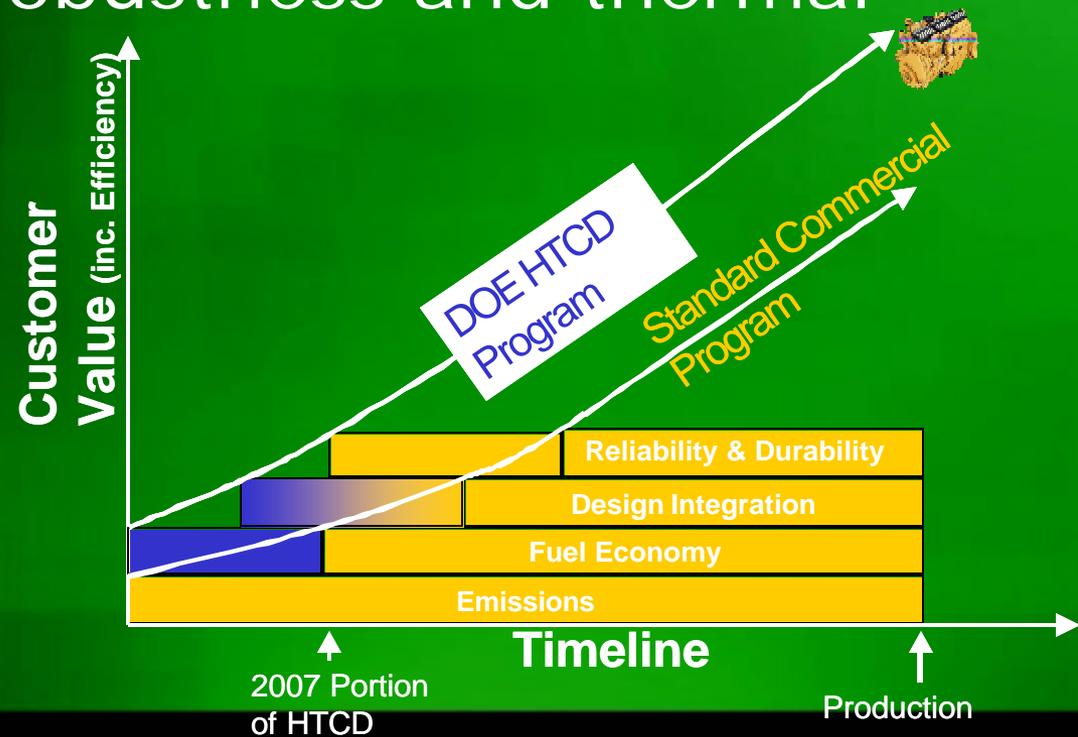


The Packaged Solution



2007 Challenges

- Further Fuel Economy Improvements
- Further Design Integration
- Reliability & Durability of new systems
- Aftertreatment robustness and thermal management



HTCD Program Next Steps

- 2010 Program Focus
 - Fuel Economy / Emissions
 - Integration
 - Technology Downselect
- Develop further fuel economy building blocks
 - Ultimate flow head
 - Reduced friction

2007 Emissions Demonstration Truck

- Caterpillar purchased - 2000 Kenworth T2000
- 475 HP Rating with 1850 ft lbs peak torque
- 2007 Emissions Compliant
 - On-board NOx sensor
 - Observably clean exhaust stacks
- Lab demonstrated BSFC equal to today's ACERT product
- Uses low sulfur fuel
- SCR not required

Visit our display table, see our truck and join us for the Ride & Drive