Heavy Truck Clean Diesel (HTCD) Program 2007 Demonstrator Truck

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Andrew Kieser, Eric Fluga

DOE Contract DE-FC05-00OR22806

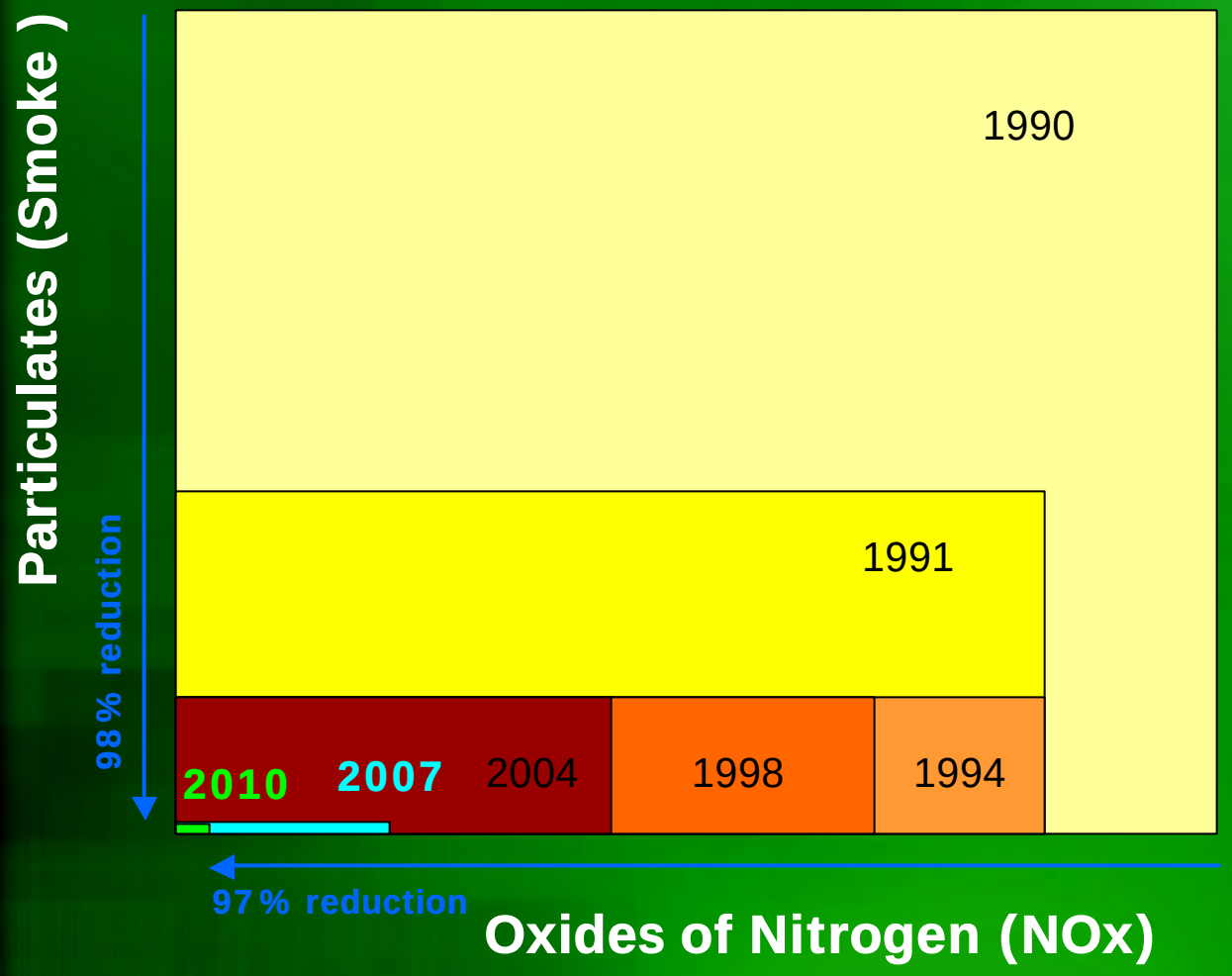
Contract Monitor – Roland Gravel

DEER Conference

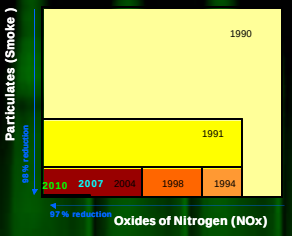
Newport, RI

August 25, 2003

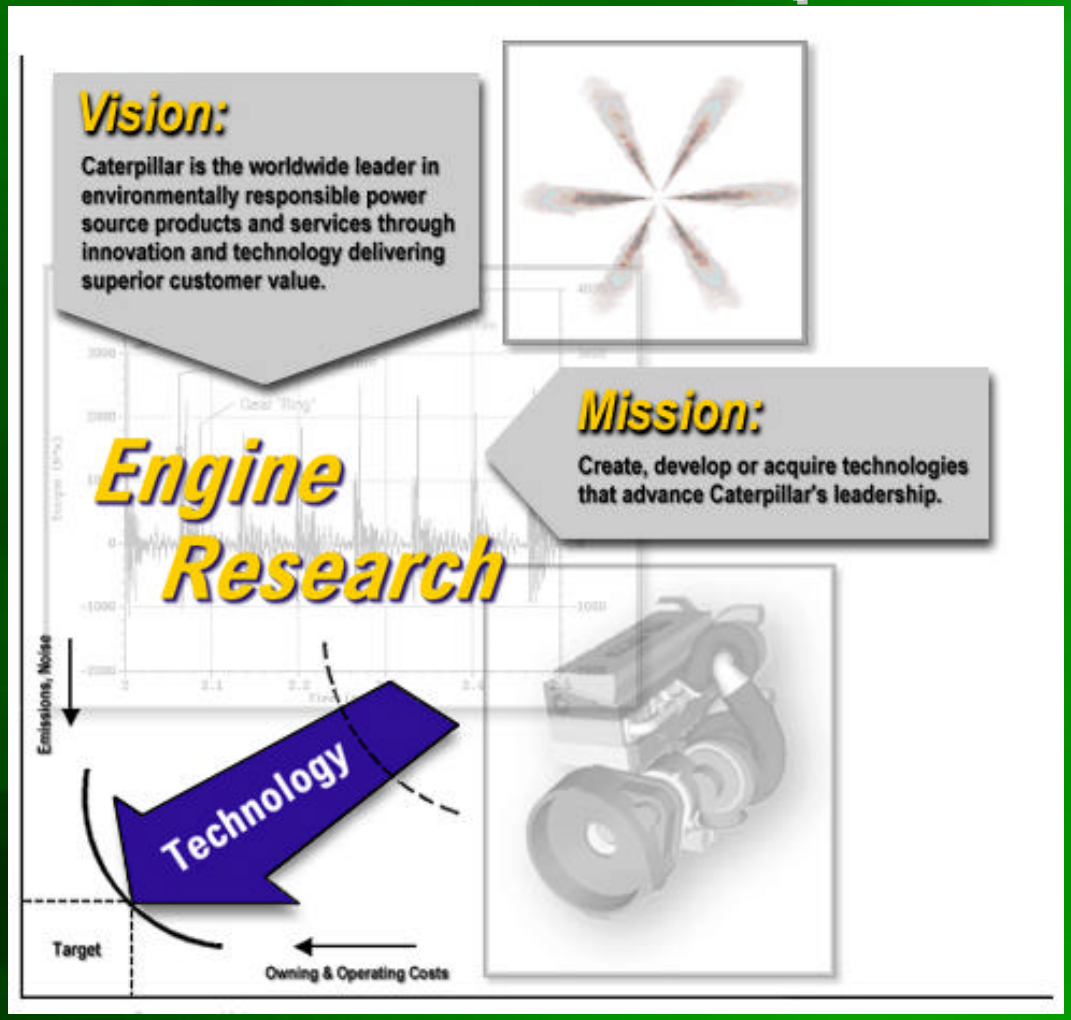
HTCD Program
2007 /2010 Development



HTCD Program
2007 /2010 Development

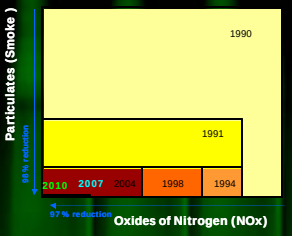


Environmental (inc. emissions)



Customer Value (inc. efficiency)

HTCD Program
2007 /2010 Development



Customer Value (inc. Efficiency)

DOE HTCD Program

Standard Commercial Program

Reliability & Durability

Design Integration

Fuel Economy

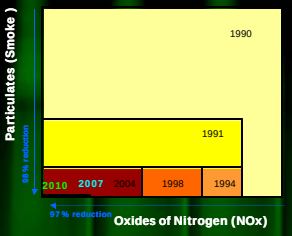
Emissions

Timeline

2007 Portion of HTCD

Production

HTCD Program
2007 /2010 Development



2007 Steady State

2007 Transient

Truck Demo

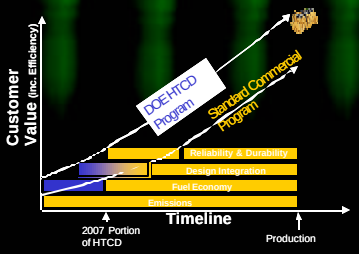
HTCD Timeline

2001 2002 2003 2004 2005

2010 Steady State

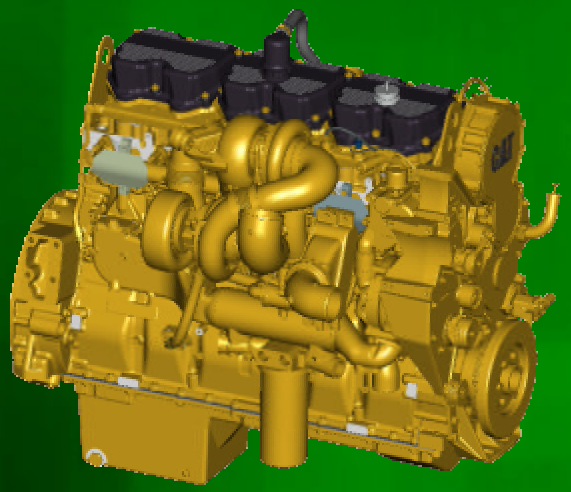
2007 Fuel Economy / Emissions Focus

2010 Fuel Economy / Emissions Focus



ACERT ™ Building Blocks Foundation for 2007 and 2010

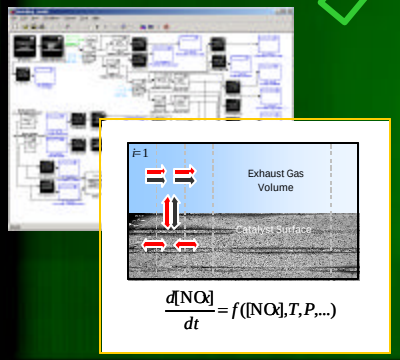
Combustion



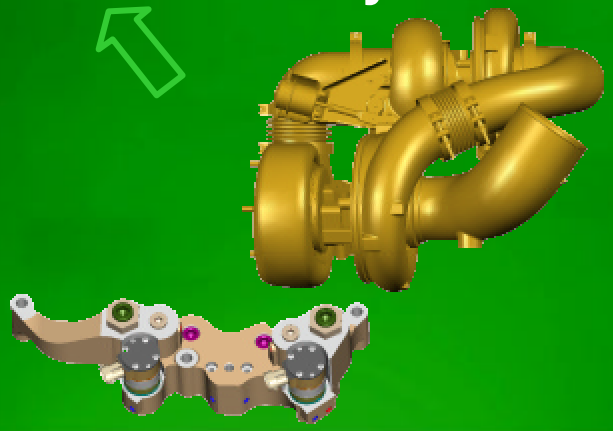
Integrated Engine System

Aftertreatment

Electronics and Controls

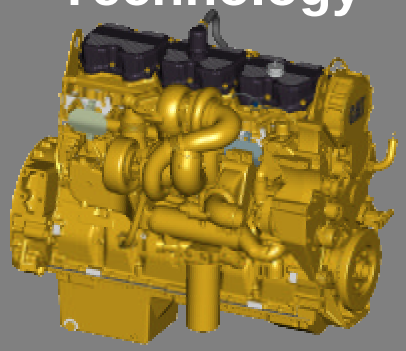


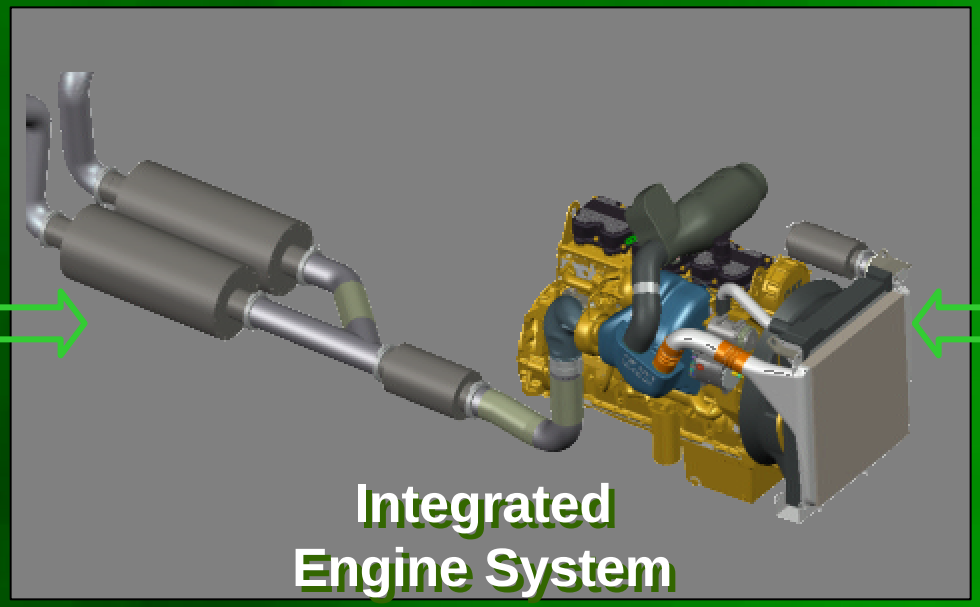
Air Systems



HTCD 2007 / 2010 Technology Options

Combustion Technology

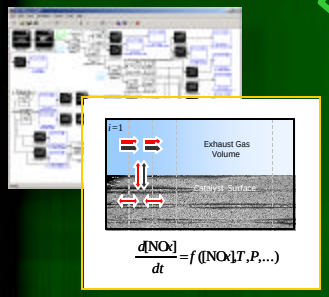




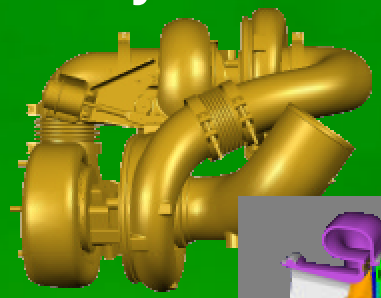
Integrated Engine System

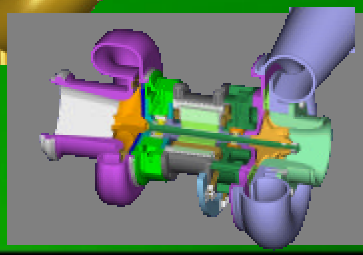
Aftertreatment

Electronics and Controls



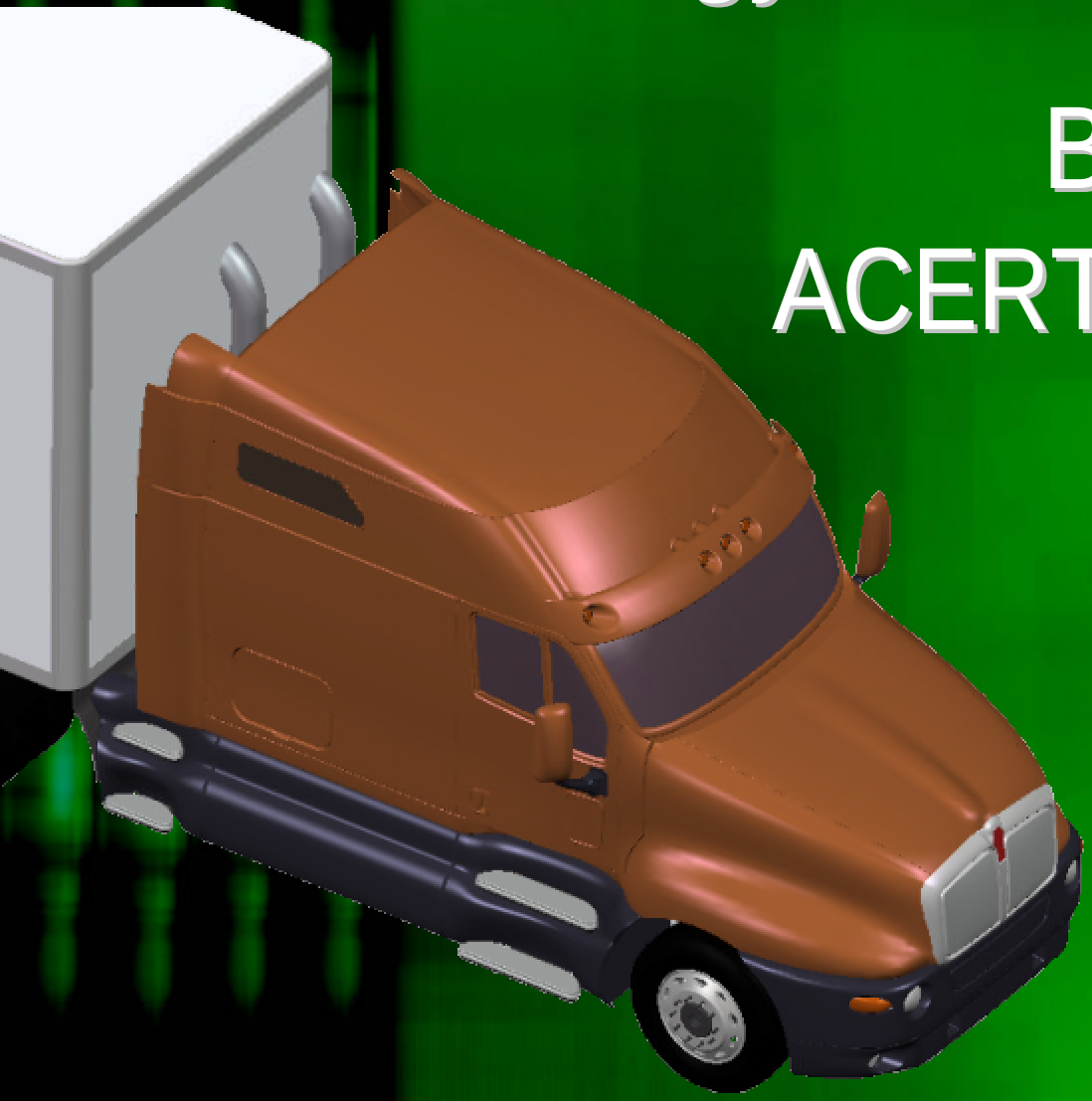
Air Systems



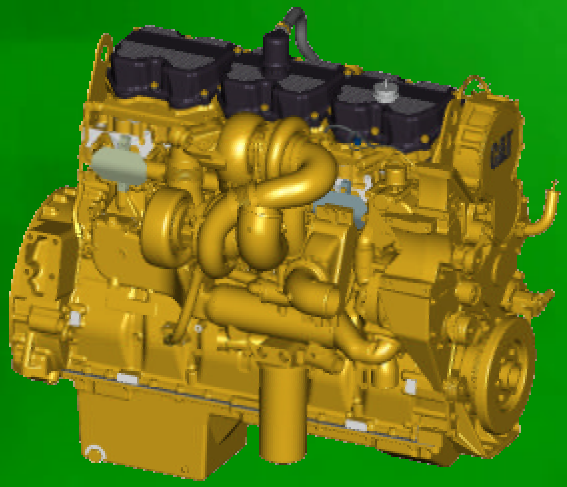


This project was undertaken pursuant to an agreement with the United States in connection with settlement of disputed claims in an enforcement action under the Clean Air Act

2007 System Integration for Technology Demonstrator Truck

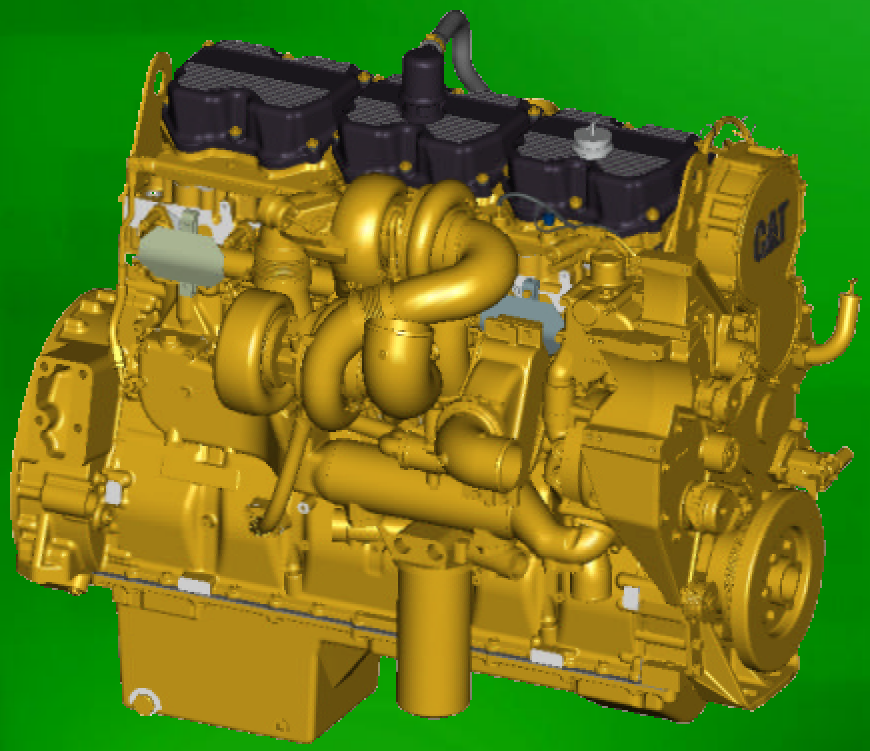


Building on ACERT ™ Technology



2003 Production C15 ACERT ™ Engine

- Combustion
- Air Systems
- Aftertreatment
- Electronics and Controls

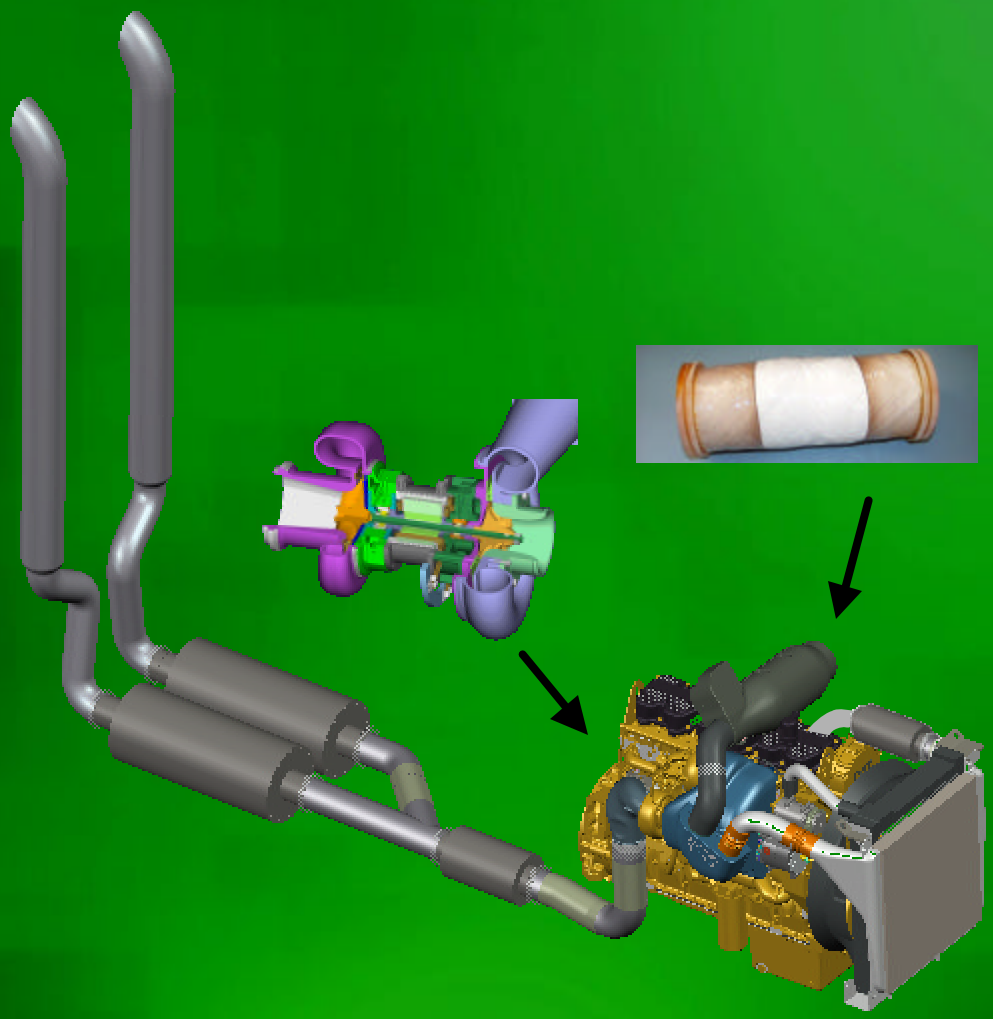


Combustion Development

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

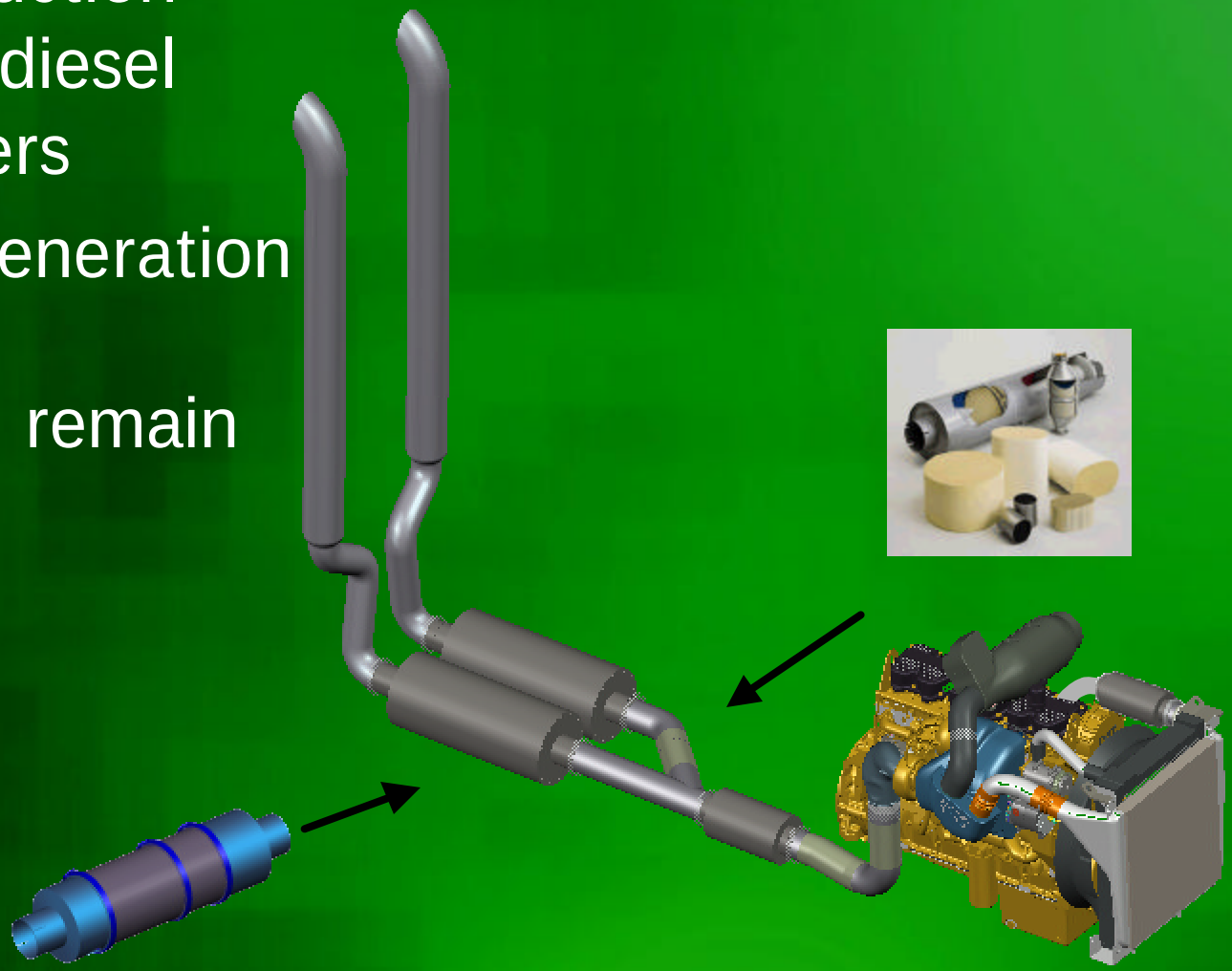
Air-System Development

- 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

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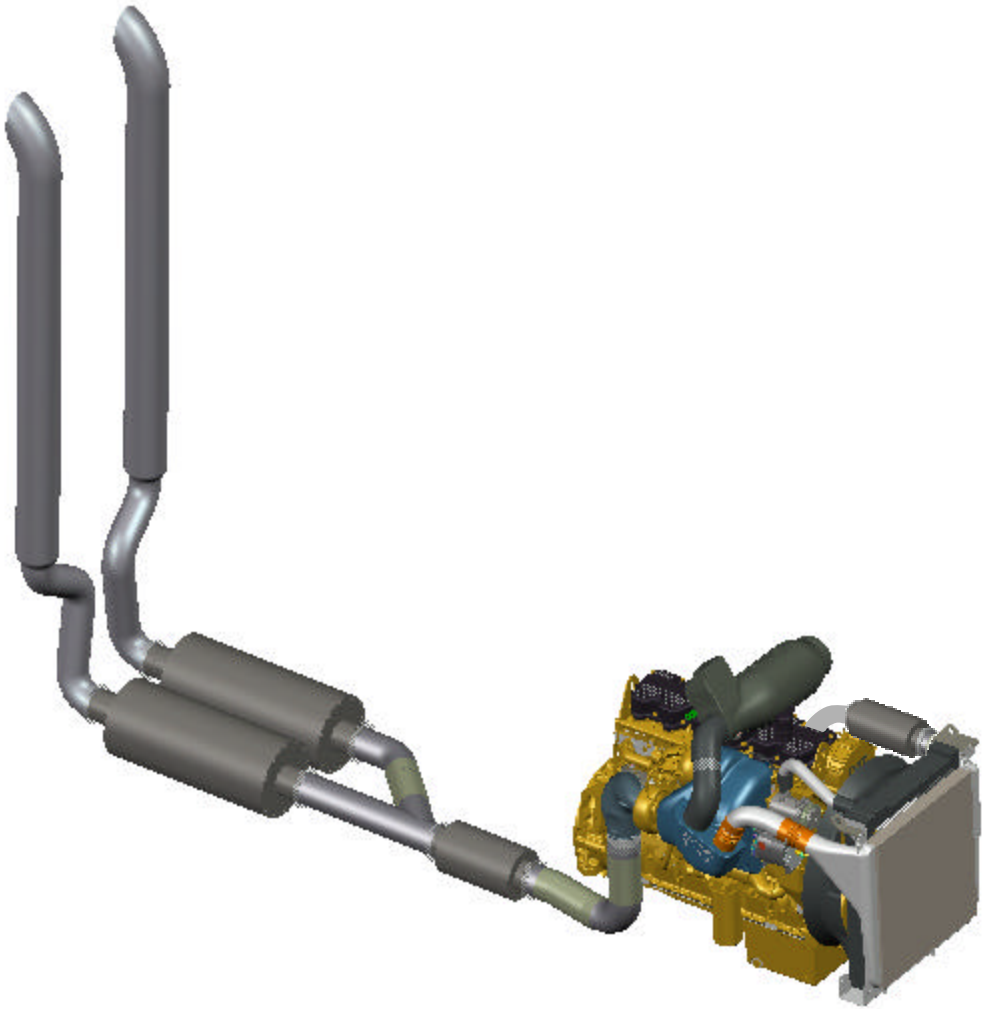
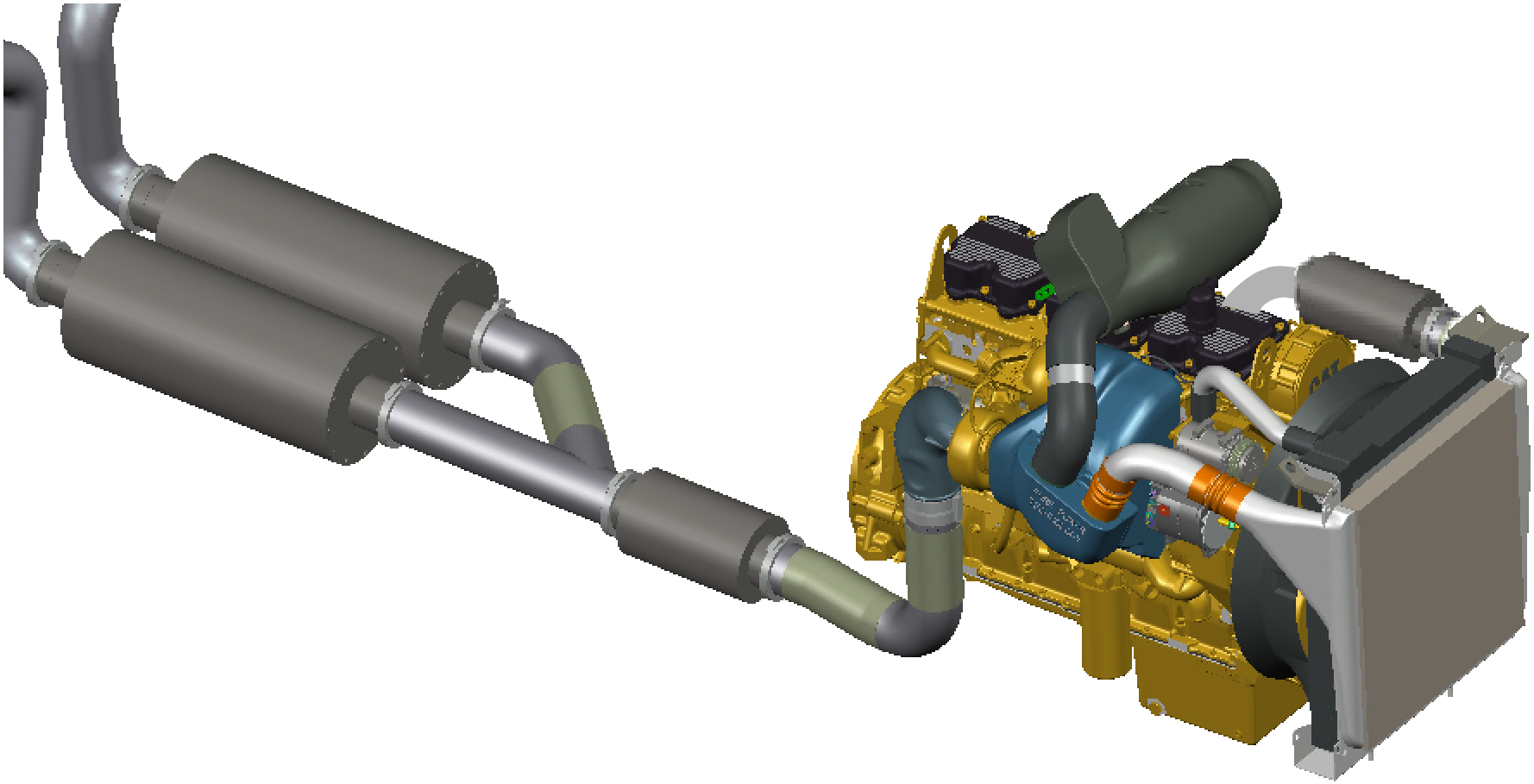
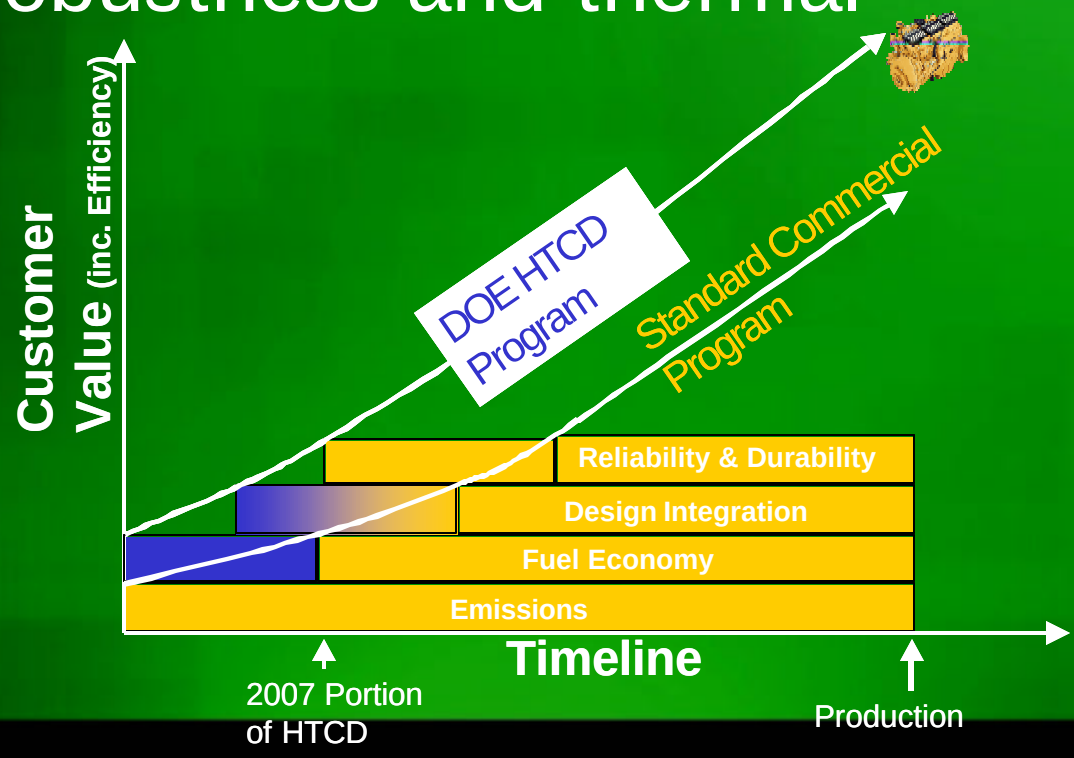


The Packaged Solution



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

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