

# **STEPS Workshop**

## **Achieving Targets for 2030**

### **Technology & Fuels for Trucks**

**Jennifer Rumsey**  
**Vice President of Engineering**  
**Engine Business - Cummins Inc.**

**May 12, 2015**

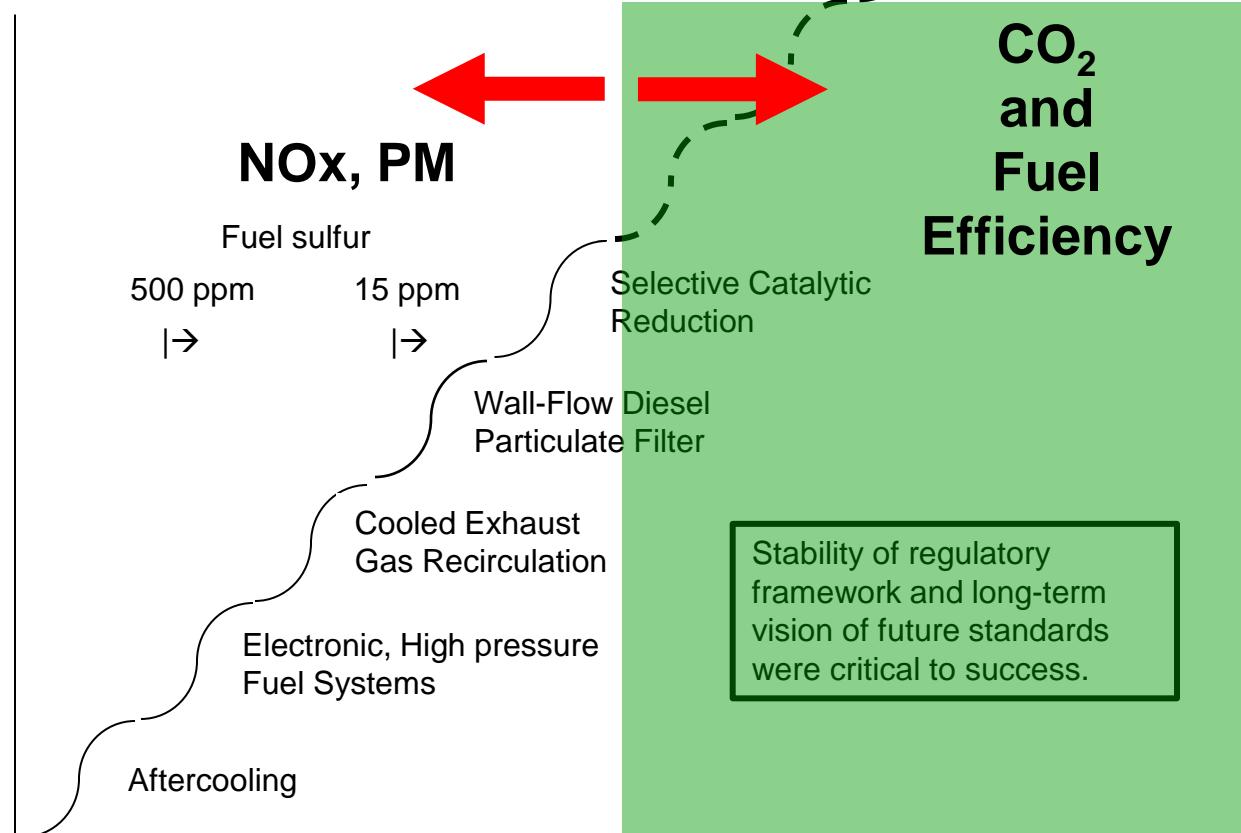


# Cummins' Products are Everywhere

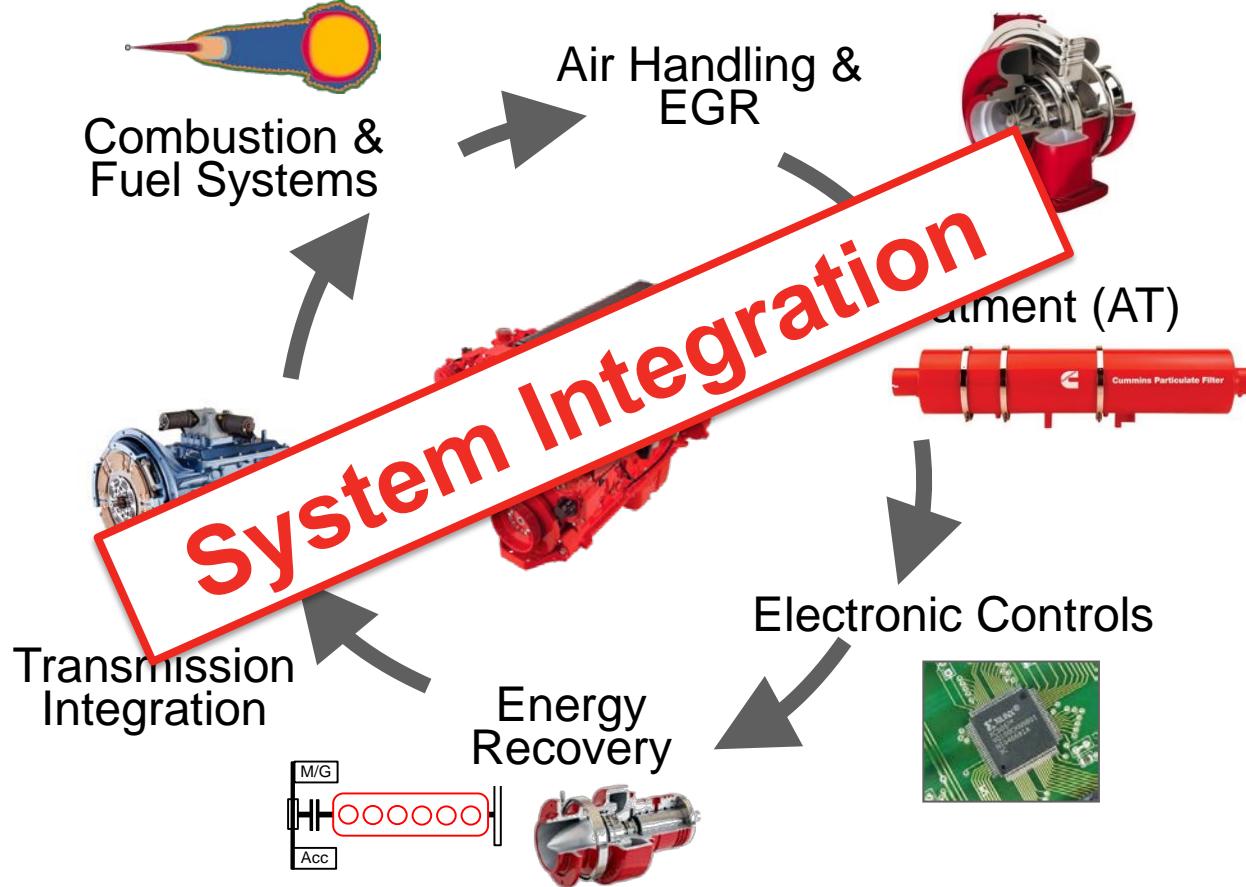
- The world's largest independent manufacturer of diesel engines
- Diesel & natural gas products 2.8 – 95L displacement
- Global manufacturing and support
- Over 1,200 OEM customers
- Powering more types of equipment in more markets than any other engine company



# Evolution of Diesel Technology



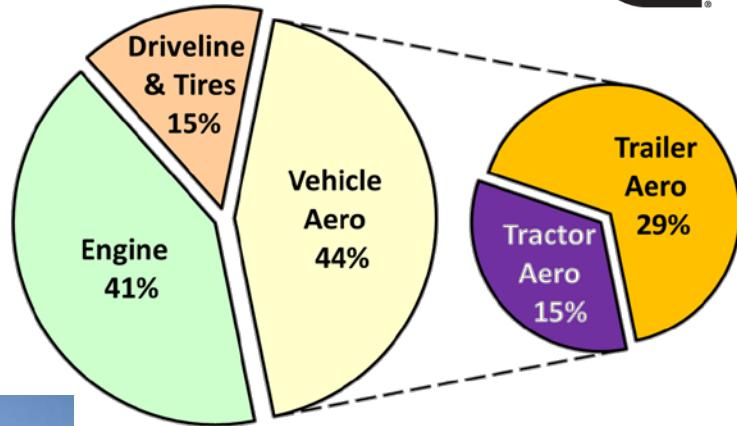
# Key Engine and Powertrain Technologies



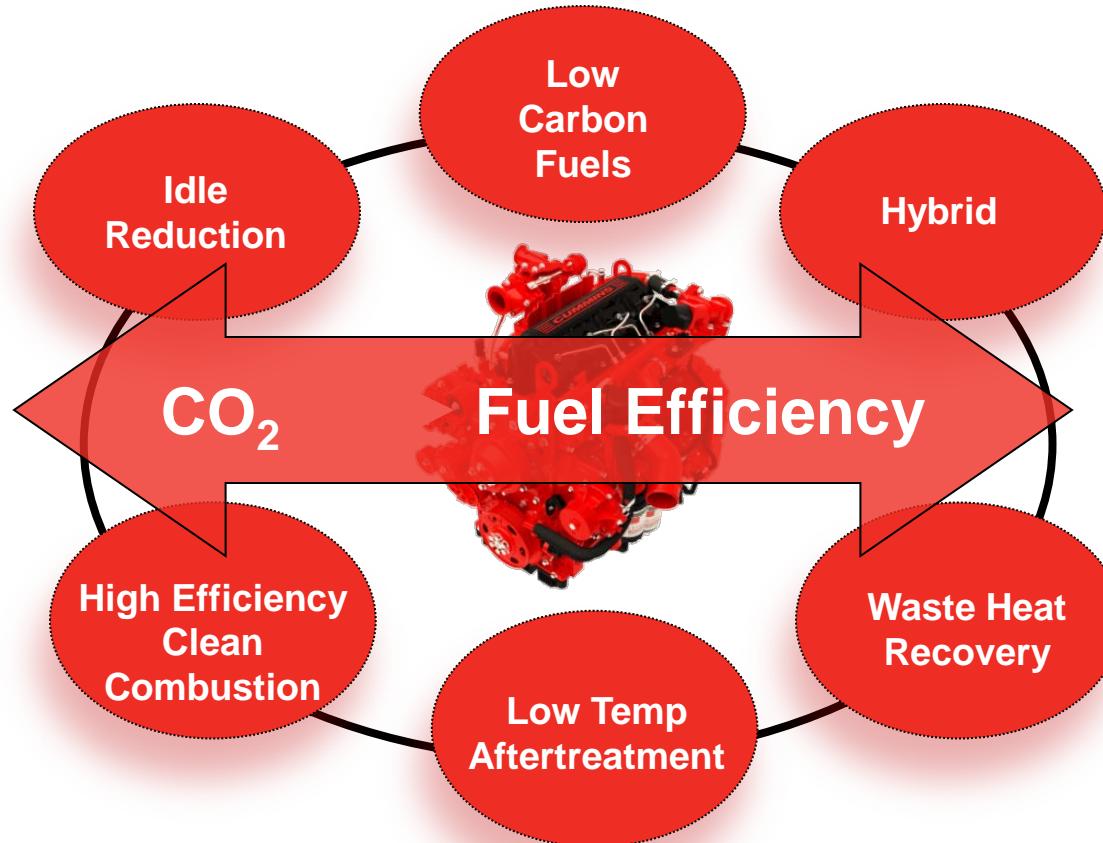
# Looking Ahead: Technologies



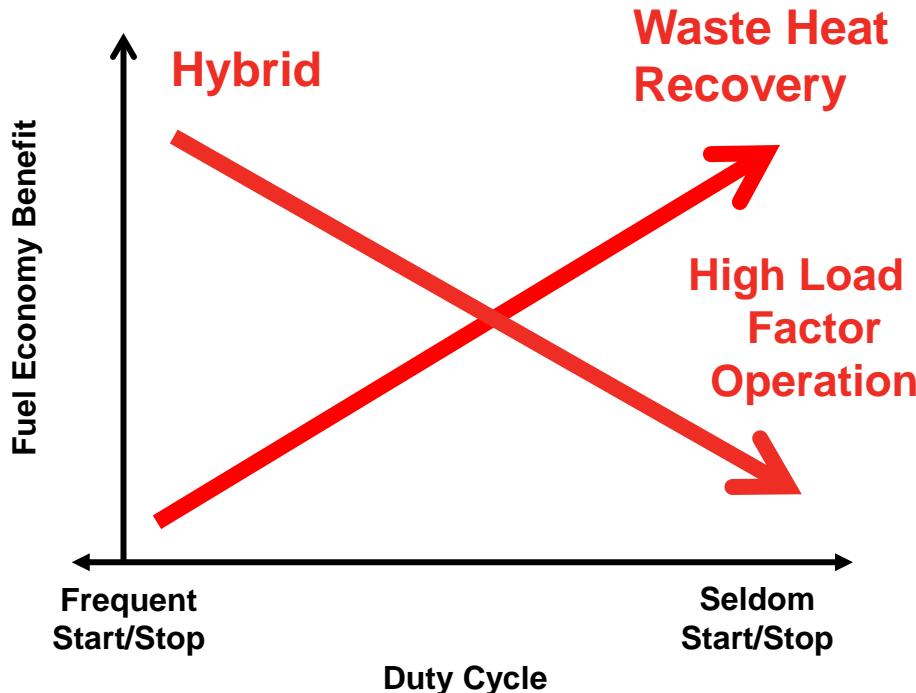
- SuperTruck averaged a 75% improvement in fuel economy over 2009 baseline truck
- Engine is significant contributor
  - GHG Phase 1 HD engine ~10% improved from 2009 baseline
  - Up to 15% CO<sub>2</sub> improvement over 2017 tractor engine standard possible in GHG Phase 2



# Reducing CO<sub>2</sub>

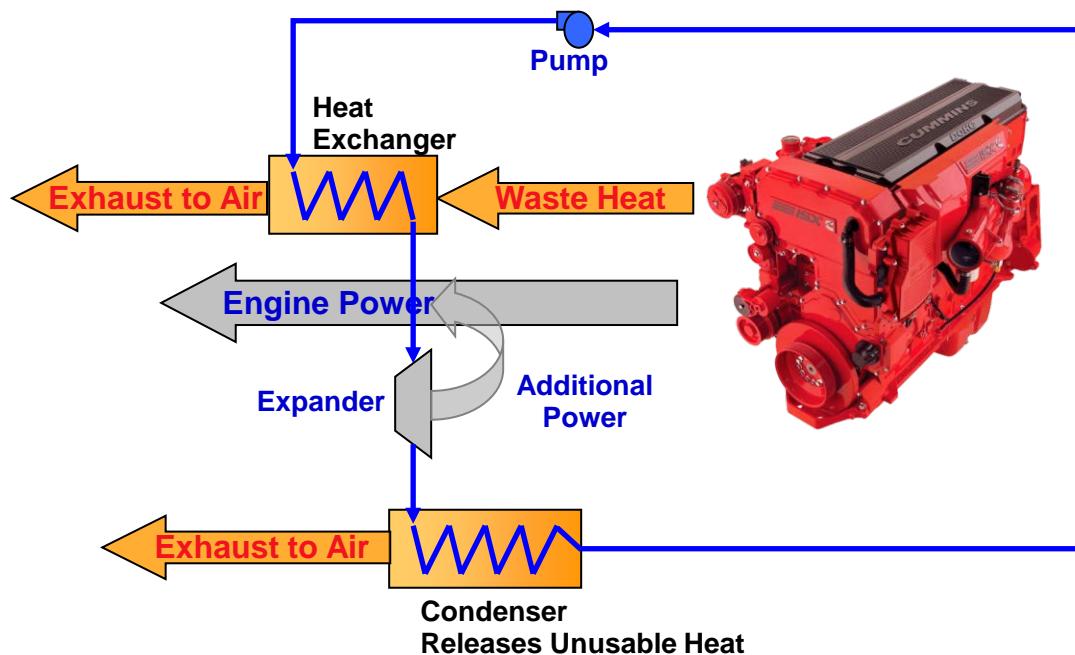


# Waste Heat Recovery vs. Hybrid



# Waste Heat Recovery Technology

4-5% Fuel Consumption Benefit

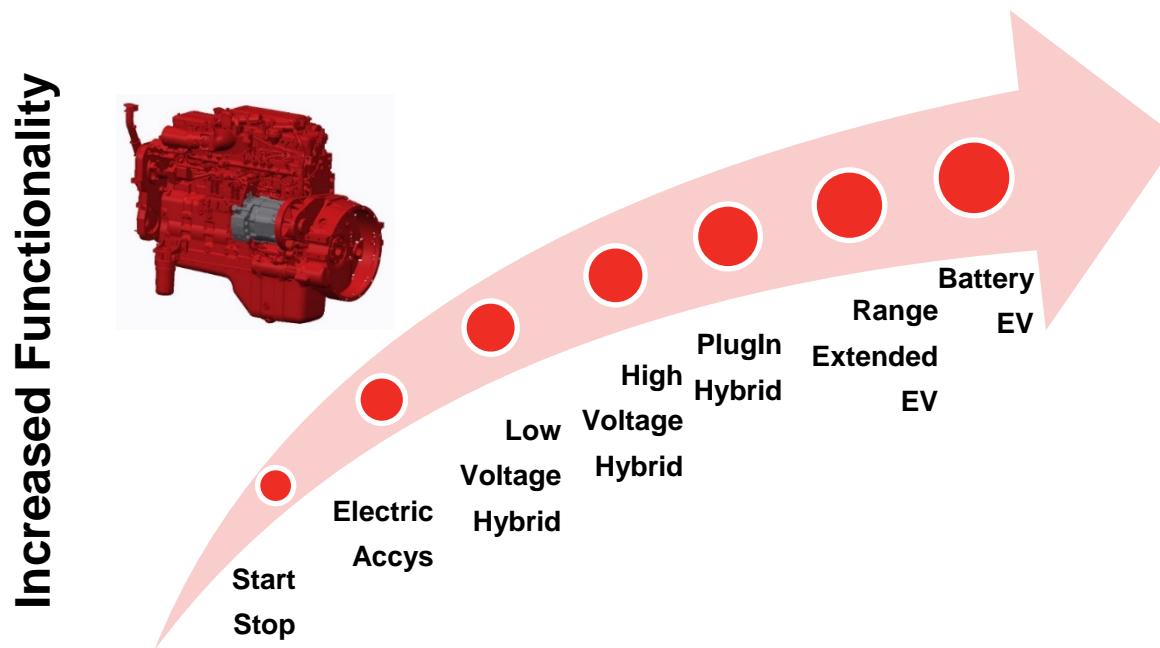


## Beyond SuperTruck

- 4<sup>th</sup> generation design
- Improvements for packaging, cost, reliability
- End-user testing planned for late 2015
- Production possible by ~2020



# Long Term Approach to Electrification



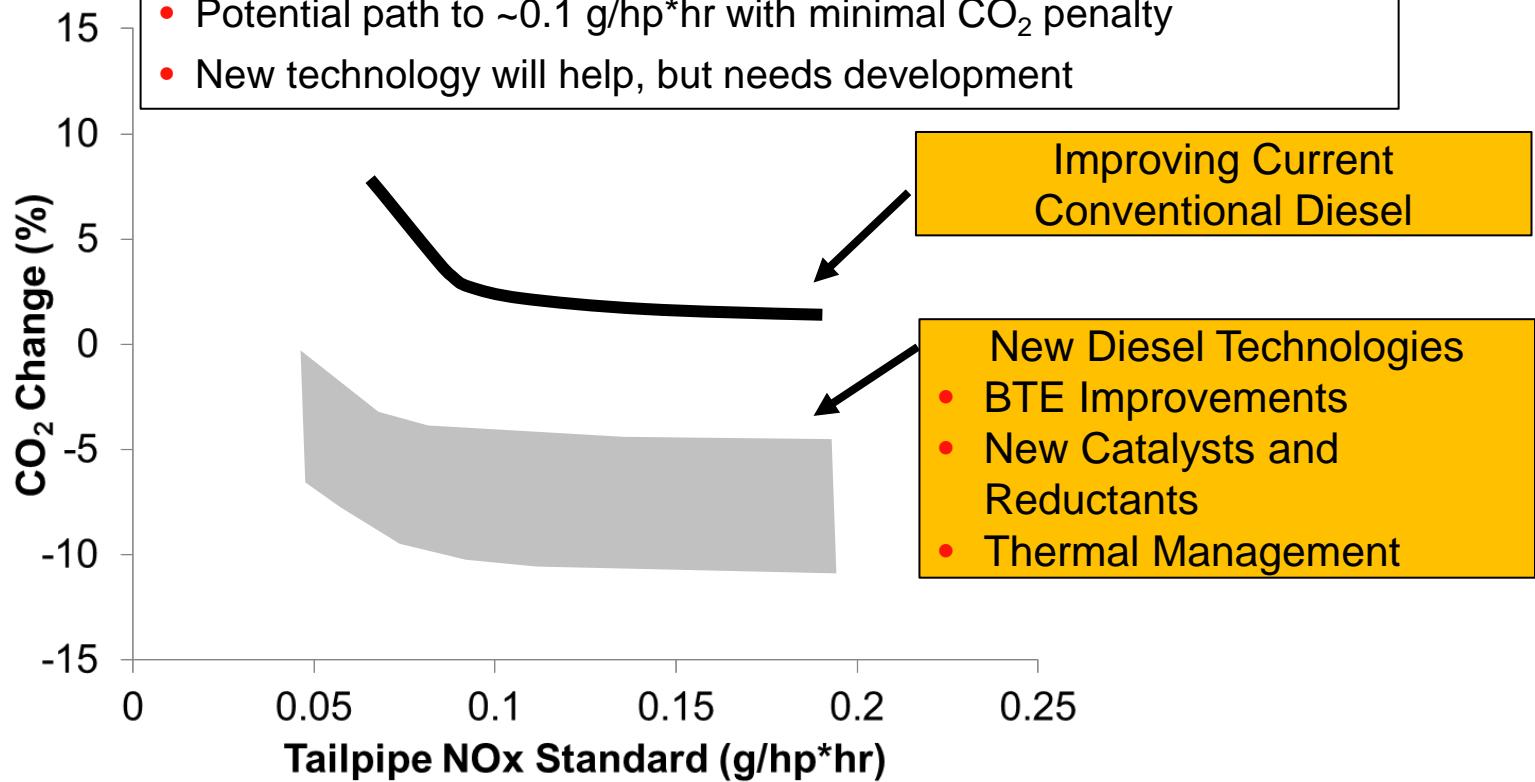
Lower Initial Cost

Lower Operating Cost

# GHG Penalty at Low Tailpipe NOx



Diesel

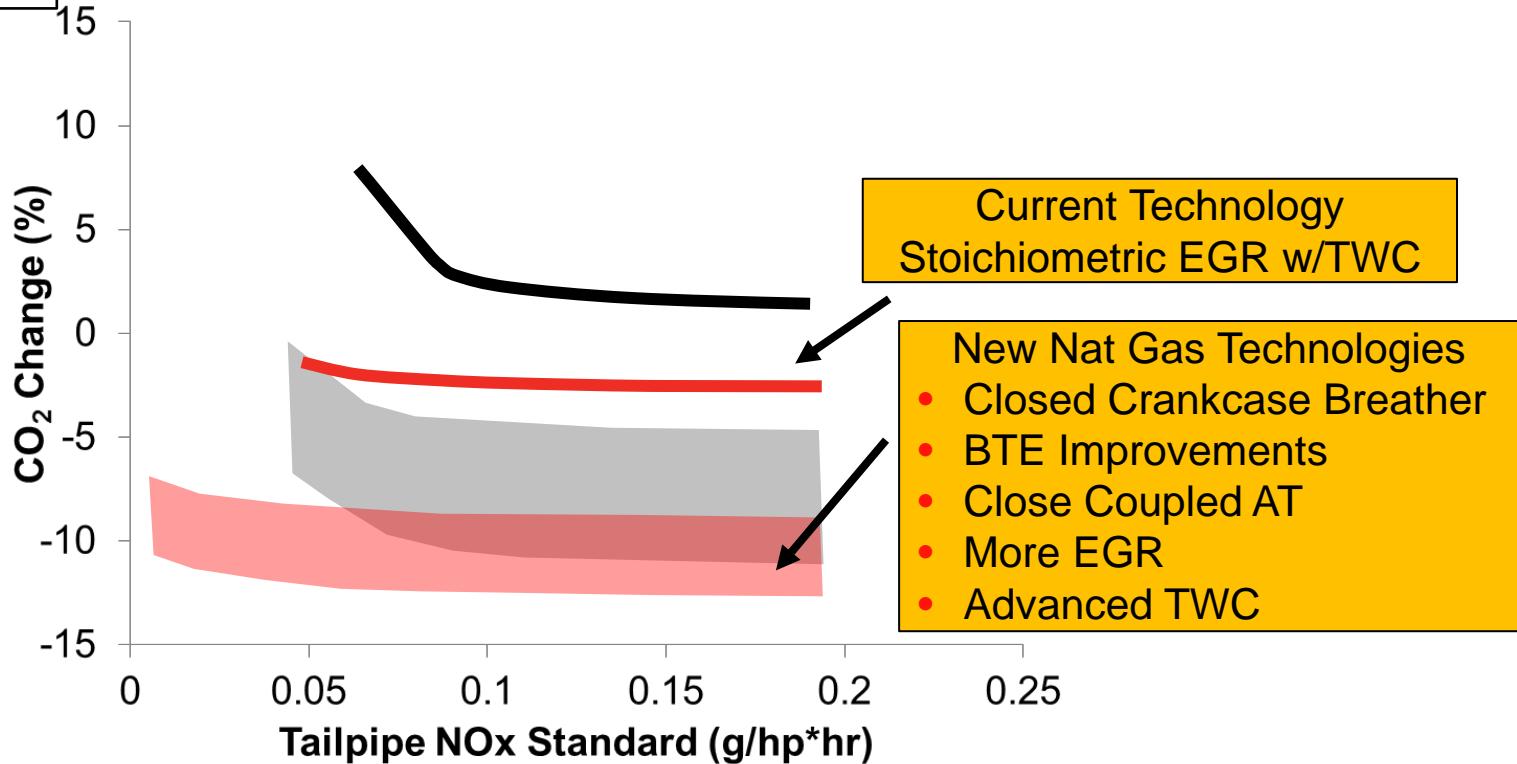


# GHG Penalty at Low Tailpipe NOx



Diesel  
Natural Gas\*

- Path to 0.02 g/hp\*hr with natural gas with small CO<sub>2</sub> penalty



\* Includes methane emissions as equivalent CO<sub>2</sub>

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