



Diesel Engine Electric Turbocompounding

ELECTRONIC

SYS INTERGRATION

ELECTRONIC CONTROLS

TURBOCOMPOUND EXPERIENCE

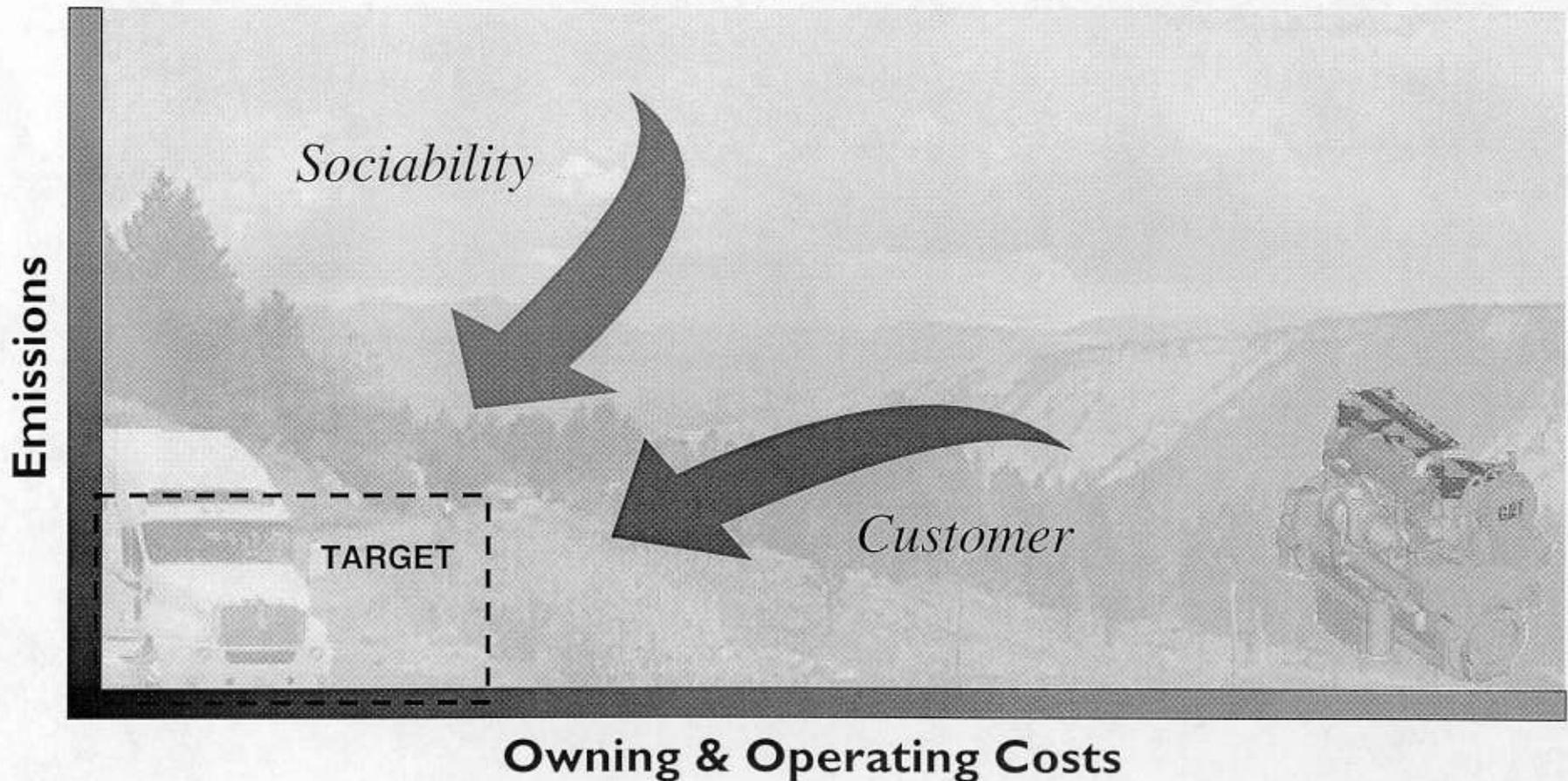
ENGINE MANUFACTURE

Diesel Engine Electric Turbocompounding

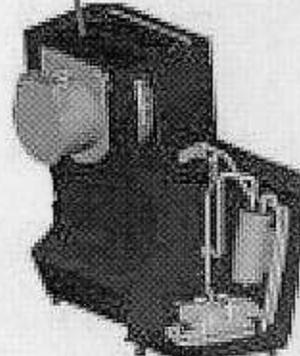
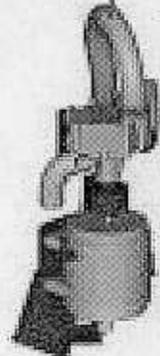
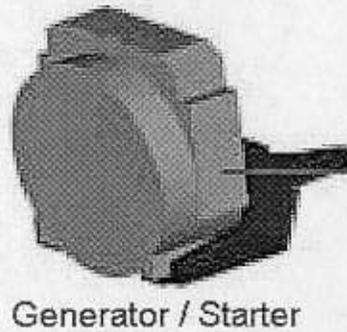
Cooperative Program Between DOE OHVT and Caterpillar Inc.

Overall Program Objective:

- Demo Lower Owning & Operating Costs by Recovering Exhaust Energy
- Demo Lower Emissions by Integrating w/ Diesel Engine Low NOx Systems



Past Experience at Caterpillar
Potential Uses of Electric Turbocompound Power



Past Experience at Caterpillar (90's)

*LE 55(Low Emissions 55% Thermal Efficiency)
series turbo intercooled power turbine*

RESEARCH DOE PROGRAM TO MINIMIZE

**HEAT REJECTION
EMISSIONS
FUEL CONSUMPTION**

{goal : 152 g/kW-hr measured : 171 (49%TE)}

{funds depleted before demonstrating program goals}

Past Experience at Caterpillar ('80's)

TURBO COMPOUNDING
ON HIGHWAY TRUCK (CLASS 8)
{COMPARED TO AN EQUAL POWERED 3406}

5% AVE FUEL ECONOMY IMPROVEMENT
{OVER 600 MILES I-80 (IOWA) AVE SPD 62 MPH}

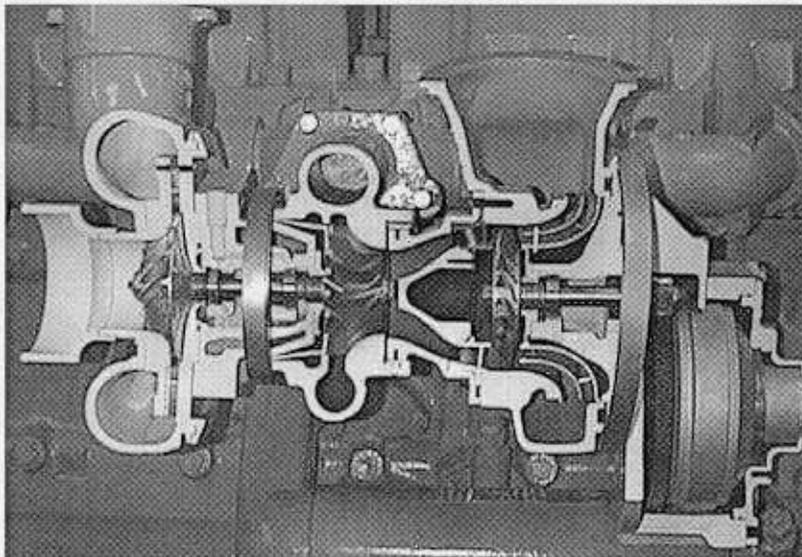
LOWER EMISSIONS
PARTICULATES 13%
NMHC 42%
CO 14%

QUIETER
{OVER 3dB(A) PASS-BY NOISE TESTS}

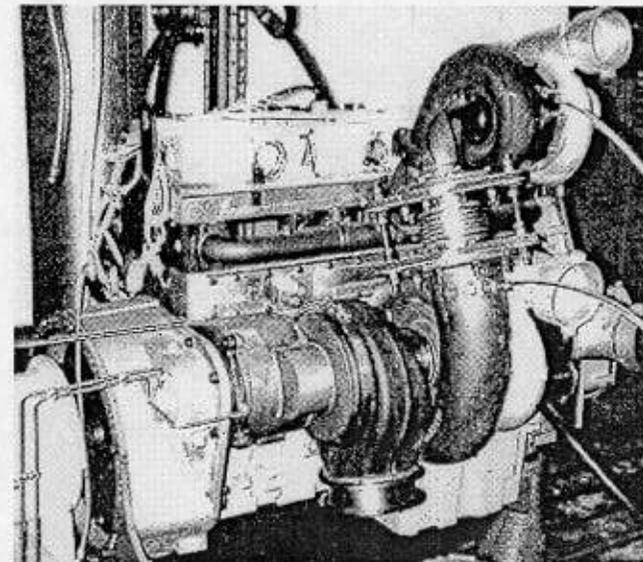
Past Mechanical Turbocompounding

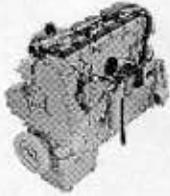
- Previous Caterpillar Experience w/ Turbocompounding
 - 3406 Low Fuel Consumption Program in 80's
 - DOE LE55 Turbocompounding Program in 90's
 - Powered Returned to Crankshaft Mechanically in Both Programs
 - 5% Fuel Economy Improvement

3406 Low Fuel Consumption



LE 55





Past Generator EPG Applications

- Solar Direct Drive Turbine Generator
 - 300 kWe / 150 lb / 37,000 RPM Package
 - Successful Demonstration
 - IGBT Power Converter
- Solar Direct Drive Generator Program for Mercury 50 (4.2 MWe) Turbine
- Direct Drive at 14179 RPM

