Blueprint for a Sustainable Future

Bob Holycross
Vehicle Environmental Engineering
September 17, 2008

Extraordinary, Rapid Changes in External Business Environment

Strong, Cyclical Downturn in Economy

Structural, Secular Shift in Product Mix

Extraordinary, Sharp Increases in Commodity Costs

ECOBOOST

HYBRID

PLUG-IN HYBRID

Ford's plan to address climate change and energy independence includes a comprehensive strategy to increase fuel economy and reduce emissions through the migration of advanced technology that is affordable and attainable in high volumes for all our customers.

Sustainability Strategy

2007 — 2012 — 2020 — 2030

Near Term

Migration of advanced technology across current product line

Mid Term

Full implementation of known technology

Long Term

Volume roll-out of emerging technologies and alternative energy sources

2007 2012 2020 2030

Near Term

Fuel Economy Leadership on the Road Today

2009 Escape

Class-Leading Compact SUV Fuel Economy

CITY MPG **20**

Fuel Economy Information DOE EPA

HIGHWAY MPG **28**

- 6-speed automatic
- Electric power assisted steering
- Lower rolling resistance tires
- Improved aerodynamics
- Variable intake cam timing

2007 2012 2020 2030

Near Term

Fuel Economy Leadership on the Road Today

2009 Flex

Unsurpassed Fuel Economy Among 7-Passenger Vehicles

CITY MPG **17**

Fuel Economy Information DOE EPA

HIGHWAY MPG **24**

- 6-speed transmission
- Aggressive deceleration fuel shut-off
- Improved aerodynamics

2007 2012 2020 2030

Near Term

Fuel Economy Leadership on the Road Today

2009 Focus

Beats smaller Nissan Versa & Chevy Aveo

CITY MPG **24**

Fuel Economy Information DOE EPA

HIGHWAY MPG **35**

- Weight reduction
- Improved aerodynamics
- Lower rolling resistance tires
- PZEV

2007 2012 2020 2030

Near Term

Fuel Economy Leadership on the Road Today

Ford Escape Hybrid

Mercury Mariner Hybrid

Most Fuel Efficient SUV on the Planet

CITY MPG **34**

Fuel Economy Information DOE EPA

HIGHWAY MPG **31**

- Atkinson cycle 2.5-liter 4-cylinder
- Improved battery-only operation
- SULEV II/AT-PZEV emissions certification

2007 2012 2020 2030

Near Term

Ford Fusion and Mercury Milan Arrive in Early 2009

Mazda Tribute Hybrid

Fusion Hybrid

Escape Hybrid

Milan Hybrid

Mariner Hybrid

Hybrid production volume doubled

2007 2012 2020 2030

Near Term

Leveraging Our Global Portfolio

Transit Connect

- Small
- Fuel efficient
- 4-cylinder engine
- Commercial applications

2007
2012
2020
2030
Near Term
Leveraging Our Global Portfolio
Fiesta
Focus
Coming From
2010
Europe
Ford
Total of six European small vehicles to be introduced in North America by the end of 2012

2007
2012
2020
2030
Near Term
Transition to Lighter Weight Unibody Construction
2009 Explorer
Explorer America Concept
Next generation
Explorer arrives
in 2010
Ford

2007 2012 2020 2030

Near Term

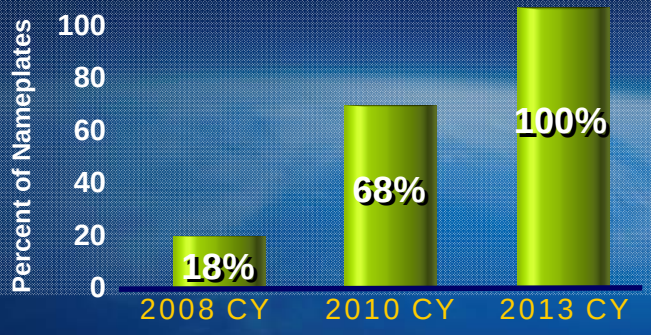
6-Speed Transmissions

- 4-6% fuel economy improvement
- Ford has more 6-speeds on the road than Toyota and Chevy

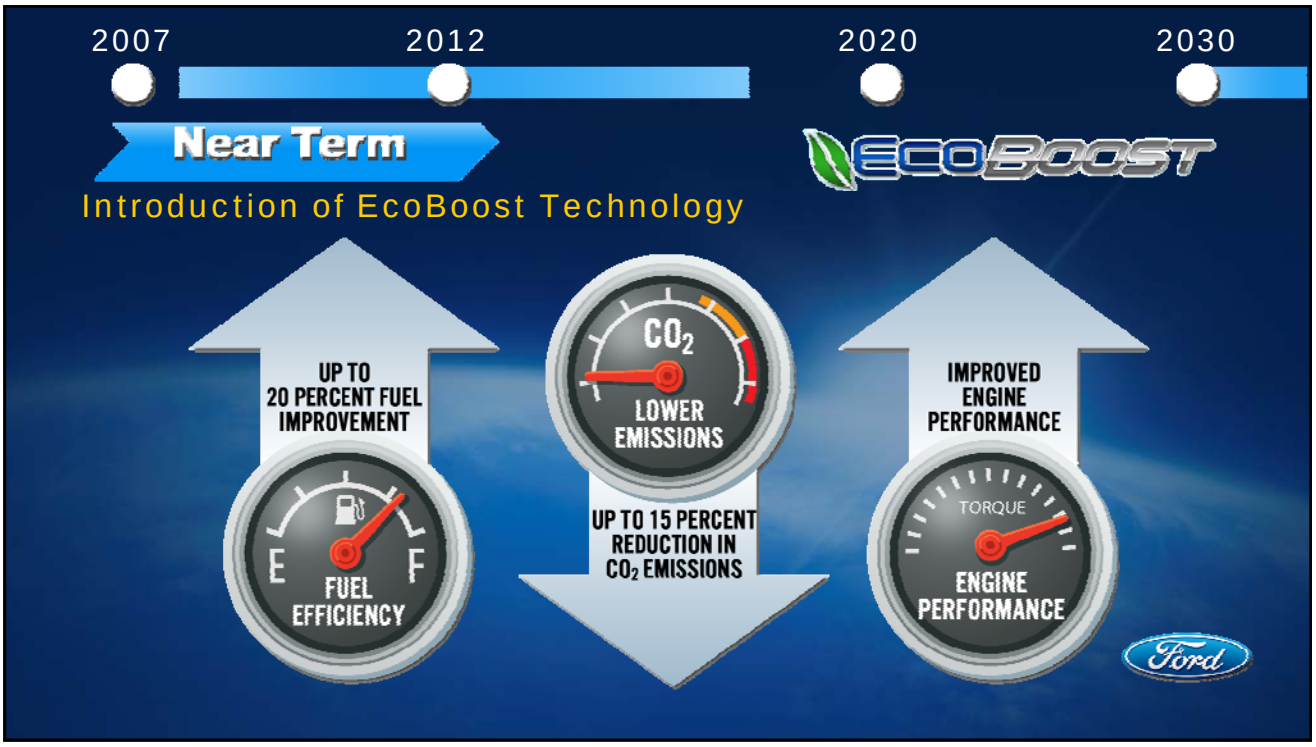
2007 2012 2020 2030

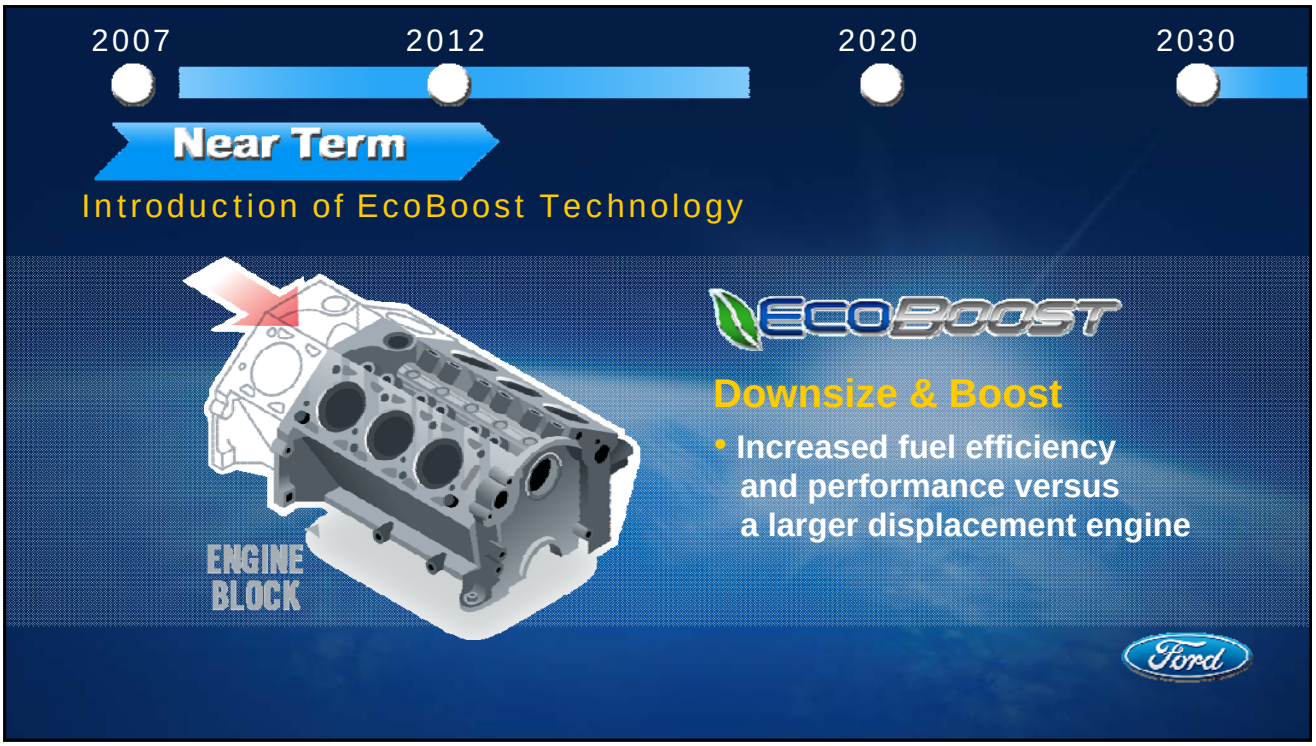
Near Term

Electric Power Assisted Steering



- 3-5% fuel economy improvement
- Lighter weight


2007
2012
2020
2030
Near Term
Introduction of EcoBoost Technology
ECOBOOST
UP TO 20 PERCENT FUEL IMPROVEMENT
E
F
FUEL EFFICIENCY
CO2
LOWER EMISSIONS
UP TO 15 PERCENT REDUCTION IN CO2 EMISSIONS
IMPROVED ENGINE PERFORMANCE
TORQUE
ENGINE PERFORMANCE
Ford


2007
2012
2020
2030
Near Term
Introduction of EcoBoost Technology
ECOBOOST
Downsize & Boost
• Increased fuel efficiency and performance versus a larger displacement engine
ENGINE BLOCK
Ford

2007 2012 2020 2030

Near Term

Introduction of EcoBoost Technology
Launching Lincoln MKS and Ford Flex in 2009

Lincoln MKS

Ford Flex

ECOBOOST

3.5L Twin-Turbo V-6

F-150 coming in 2010

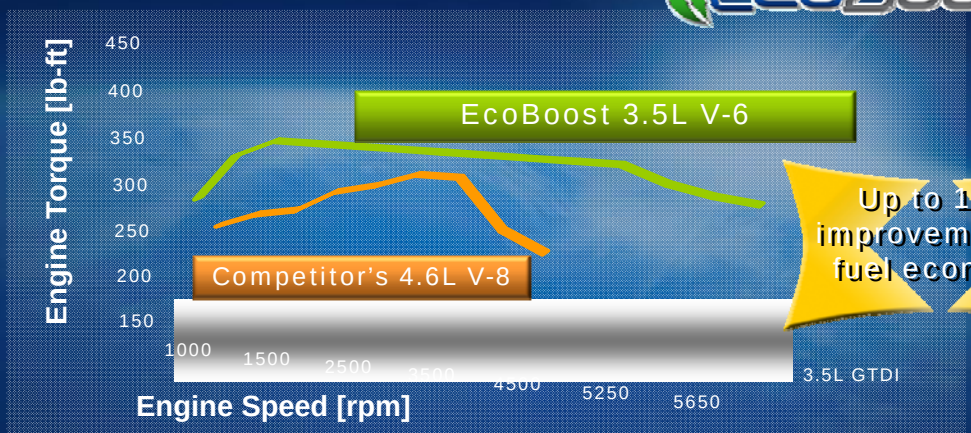
- **Power of a V-8, fuel efficiency of a V-6**

2007 2012 2020 2030

Near Term

Torque Comparison
EcoBoost V-6 vs. Large V-8

ECOBOOST



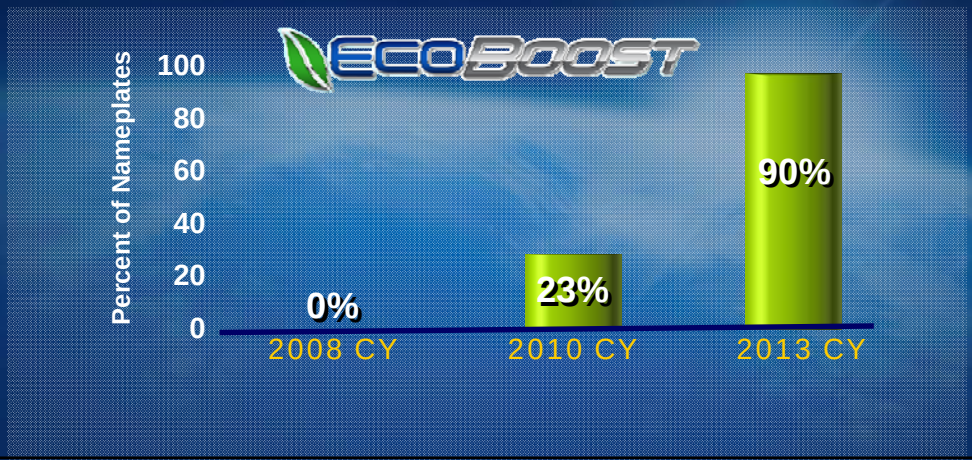
Up to 10% improvement in fuel economy

Ford

2007 2012 2020 2030

Near Term

EcoBoost Migration



Sustainability Strategy

2007 2012 2020 2030

Mid Term

- EcoBoost across line-up
- Increased use of hybridization
- Significant weight reduction
- Low volume introduction of plug-in hybrids

2007 2012 2020 2030

Mid Term

Weight Reduction of 250–750 lbs.

- Smaller displacement engines
- Smaller components
- Lightweight materials

2007 2012 2020 2030

Mid Term

Research Today Leading to Low Volume Introduction of Plug-in Hybrids

Partnership with Southern California Electric (SCE) and Electric Power Research Institute (EPRI)

SOUTHERN CALIFORNIA EDISON
An EDISON INTERNATIONAL® Company

EPRI ELECTRIC POWER RESEARCH INSTITUTE

2007 2012 2020 2030

Mid Term

Low Volume Introduction of Plug-in Hybrids

- 20 Escape PHEV test fleet
- Battery-only operation up to 30 miles
- Estimated fuel economy: 120 mpg
- Lithium-ion battery

Sustainability Strategy

2007 2012 2020 2030

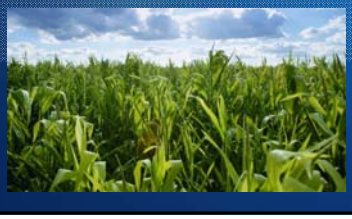
Long Term

- Higher percentage of bio fuels
- Increased electrification
- Hydrogen

2007 2012 2020 2030

Near Term | **Mid Term** | **Long Term**

- 1st generation biofuels ramp up to capacity (i.e. corn based ethanol)
- Domestically produced, renewable fuel
- US automakers commitment to flexible fuel capable vehicles



- 2nd generation biofuels become viable (cellulosic based ethanol)
- Domestically produced, renewable fuel
- Greater volumes of FFVs if infrastructure in place

- Fossil fuels ramp down
- Higher percentage of biofuels

2007 2012 2020 2030

Long Term

Research Today in Hydrogen Vehicles

- 30 vehicle hydrogen fuel cell test fleet
- Over 865,000 test miles driven

- Hydrogen internal combustion V-10 engine
- 30 shuttle bus test fleet

- Edge with HySeries drive
- World's first driveable hydrogen fuel cell plug-in hybrid

Drive green: Go Farther, Use Less