Transportation and Climate Change Resource Center

REAL SOLUTIONS FOR CLIMATE CHANGE

Reducing GHG through Low-Carbon Fuels and Fuel-Efficient Vehicles

MAY 26, 2010

DAVID L. GREENE, Oak Ridge National Laboratory
STEVE MARSHALL, West Coast Corridor Coalition
ALAN JONES, Tennessee DOT

Questions for the Presenters

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During the webinar, please e-mail your questions to **melvinj@pbworld.com**.

Transportation and Climate Change Resource Center

REAL SOLUTIONS FOR CLIMATE CHANGE

Reducing motor vehicle GHG emissions:
Via fuel efficiency and low-C fuels

May 26, 2010

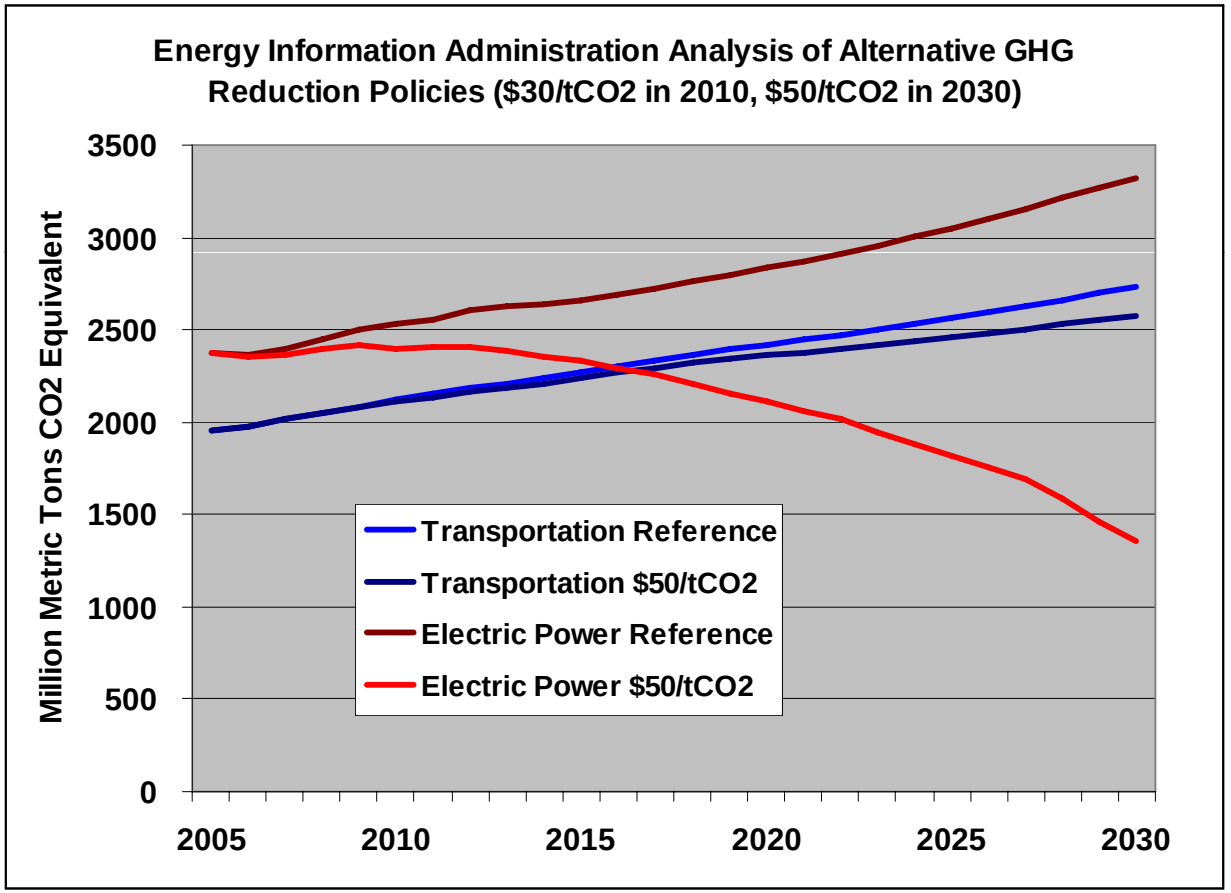
Presented by:

DAVID L. GREENE
Corporate Fellow, Oak Ridge National Laboratory
Senior Fellow, Howard H. Baker, Jr. Center for Public Policy, University of Tennessee

U.S. Department of Transportation
Federal Highway Administration

Will a tax or cap-and-trade price on CO_2 be sufficient?

A carbon price that would cut C emissions from electricity generation in half by 2030 would have little impact on transportation emissions. (EIA, 2006). \$50/tCO_2 approx. \$0.50/gal.



Fuel Economy Standards

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#1 policy for transportation energy/oil independence and GHG emissions since 1975

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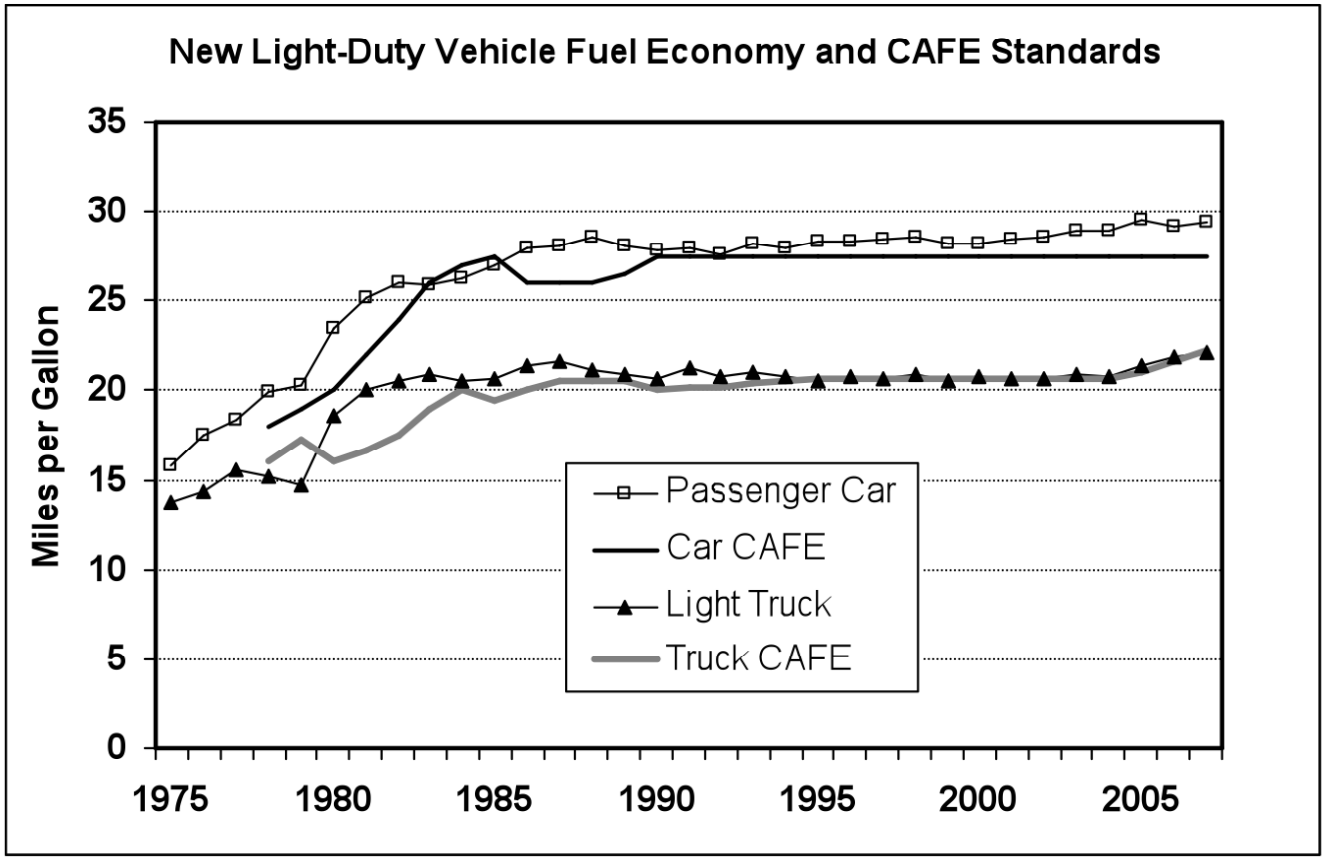
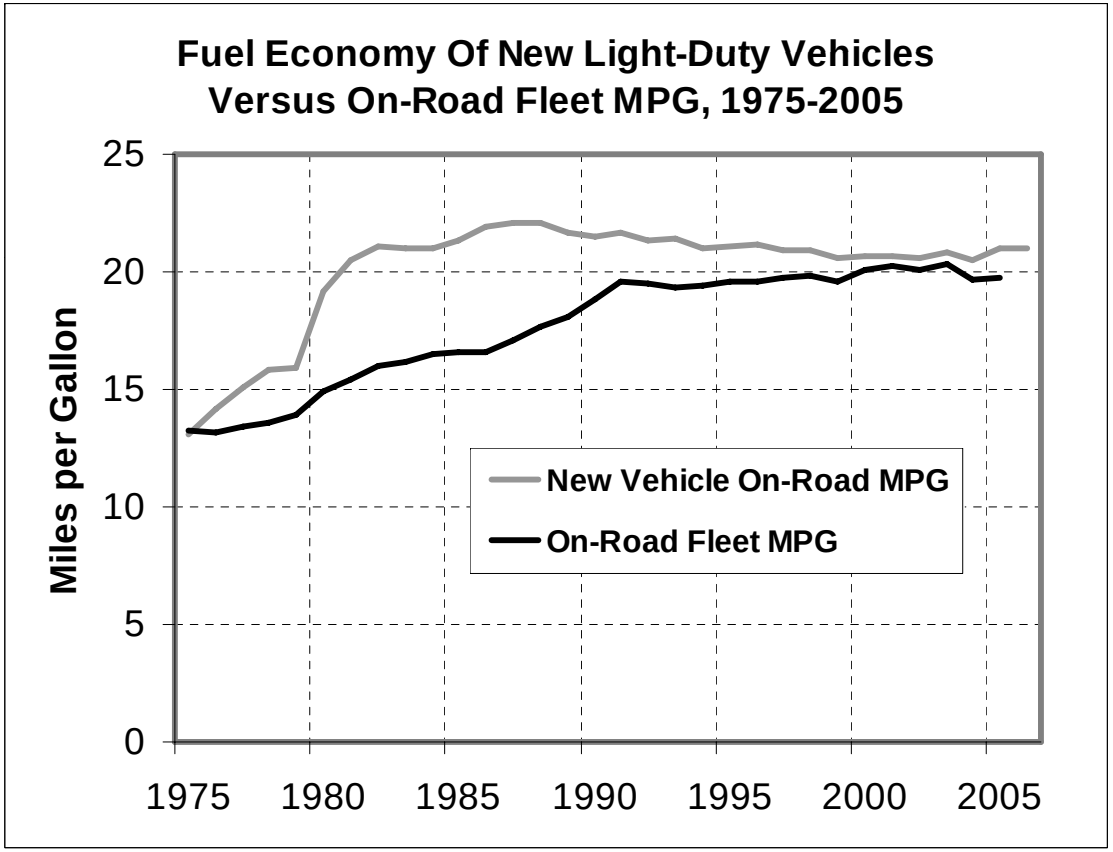
Success of CAFE

Essentially all of the fuel economy improvement in the US in the past 30 years can be credited to the Corporate Average Fuel Economy standards.



Success of CAFE

According to FHWA data, on-road fleet average fuel economy followed the new vehicle improvements with a lag of about 10 years.



Success of CAFE

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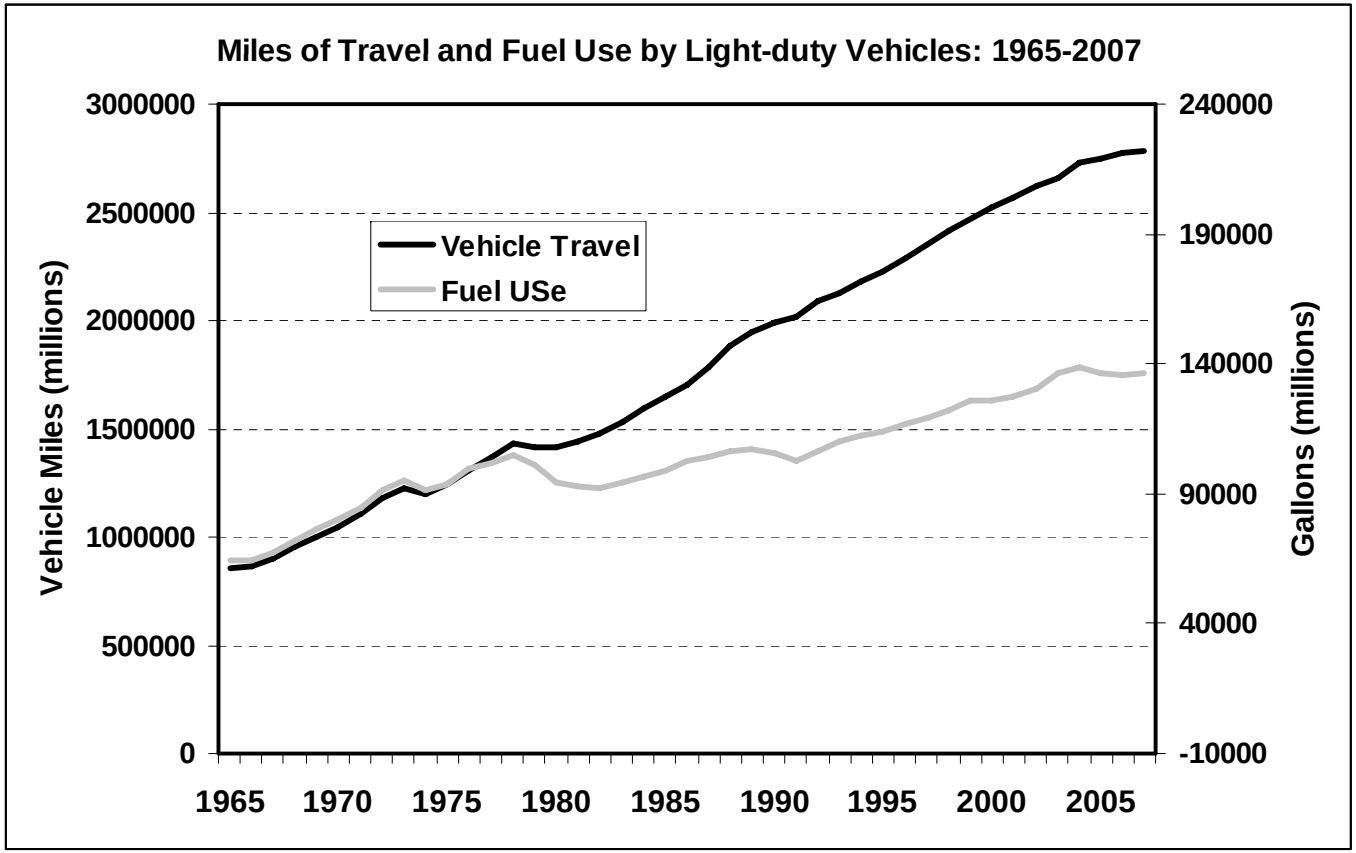
Past improvements in fuel economy now save consumers 70-80 billion gallons each year.

Public support for raising standards is usually 70-80%.



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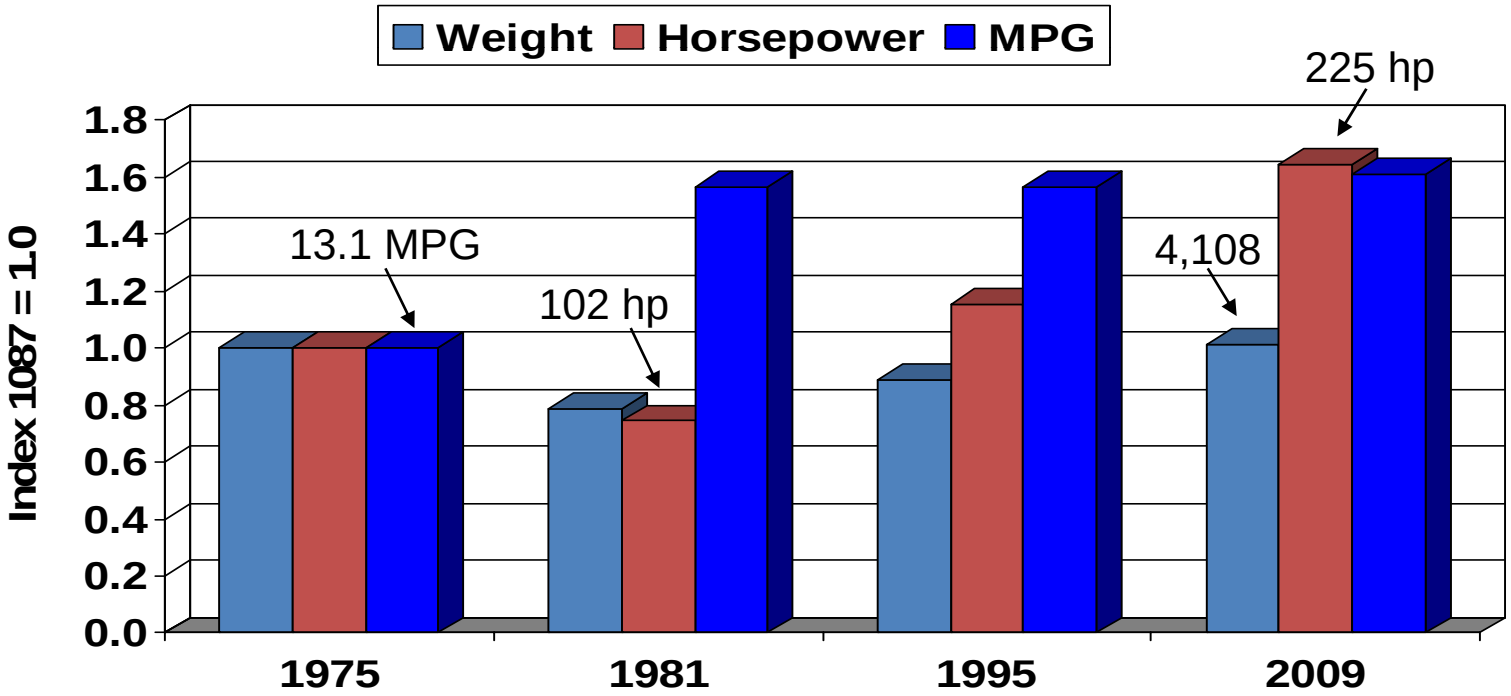
Changes in Vehicle Fleet Since 1975

From 1975 to 1981, LDV weight declined from 4,060 to 3,202 lbs. Since then it has risen to 4,108 lbs. Hp/lb. is up 60% over the 1975 level.



Source: U.S. EPA, Light-Duty Automotive Technology and Fuel Economy Trends: 1975-2007, p. ii.

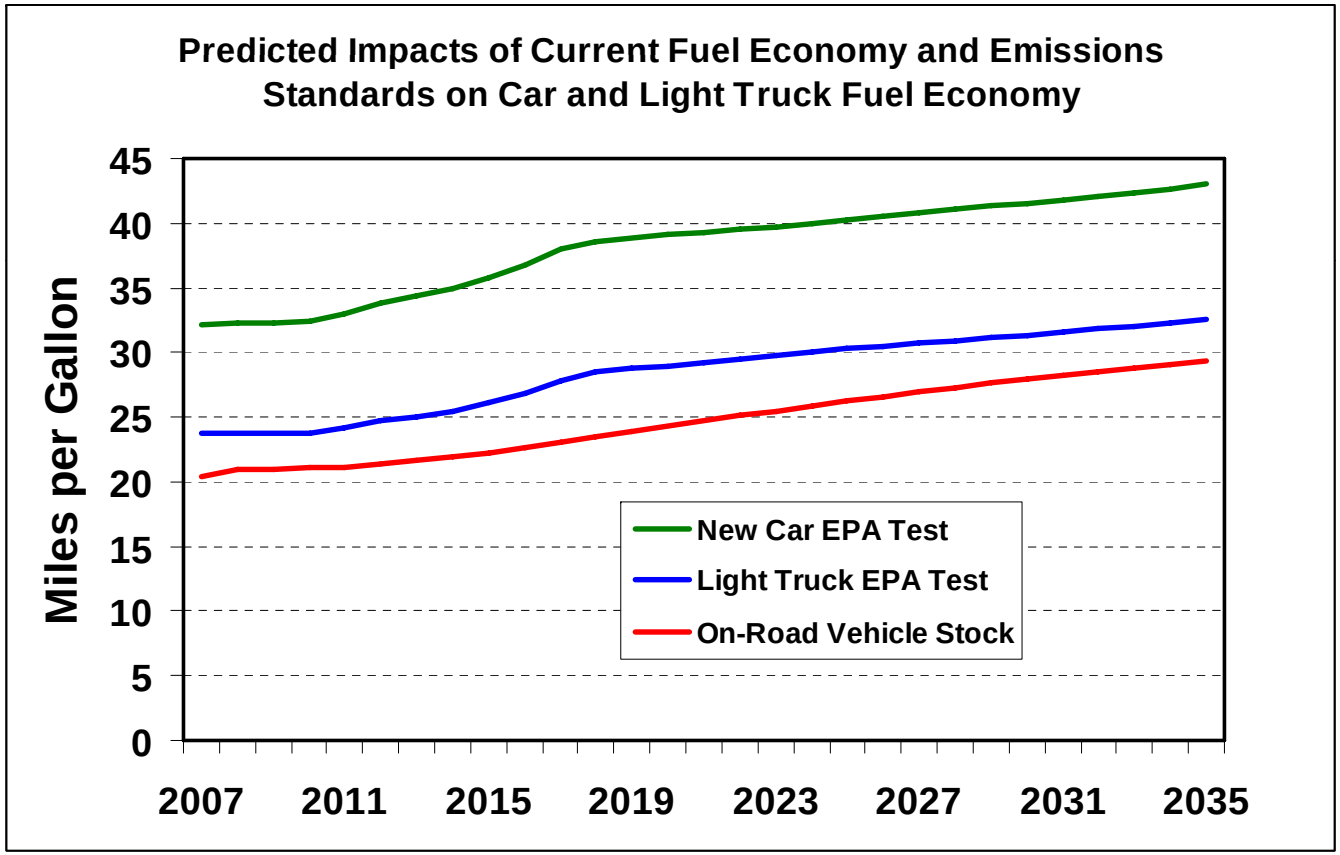
2010: New Rules

On April 1, 2010 the NHTSA and EPA established new rules for light-duty vehicle fuel economy and greenhouse gas emissions.

- 35.5 mpg by 2016 (26.4 in 2009) or 250 g/mi.
- Cars 37.8 mpg (30.9 in 2009)
- Light trucks 28.8 mpg (22.9 in 2009)
- Increased cost estimated at $926/vehicle
- Lifetime fuel savings estimated to be over $3,000 per vehicle.
- Will reduce greenhouse gas emissions by 21% by 2030.
- Further details at:
  - http://www.epa.gov/otaq/climate/regulations.htm

Effects of the New Standards

According to the Energy Information Administration, the new standards will raise new vehicle fuel economy by 40% by 2016, but on road fuel economy by only about 25% by 2020.



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Increased Flexibility and Strengthened Incentives for Alternative Energy Vehicles

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- Broader definition of passenger cars, narrower definition of work trucks
- More flexible use of fuel economy credits
- Footprint functions for passenger vehicles and light trucks.
  - More equitable to full product line manufacturers
  - Should improve highway safety
- Extension of FFV credits:
  - To 2019 for fuel economy standards
  - Must show alt. fuel use by 2016 for emission standards
- No limits or phase out of credits for dedicated alternative fuel vehicles
- Zero GHG ratings for EVs and Fuel-Cell Vehicles and the electric portion of PHEVs' energy use, plus a multiplier of from 1.2 to 2.0 so each vehicle counts more than once.

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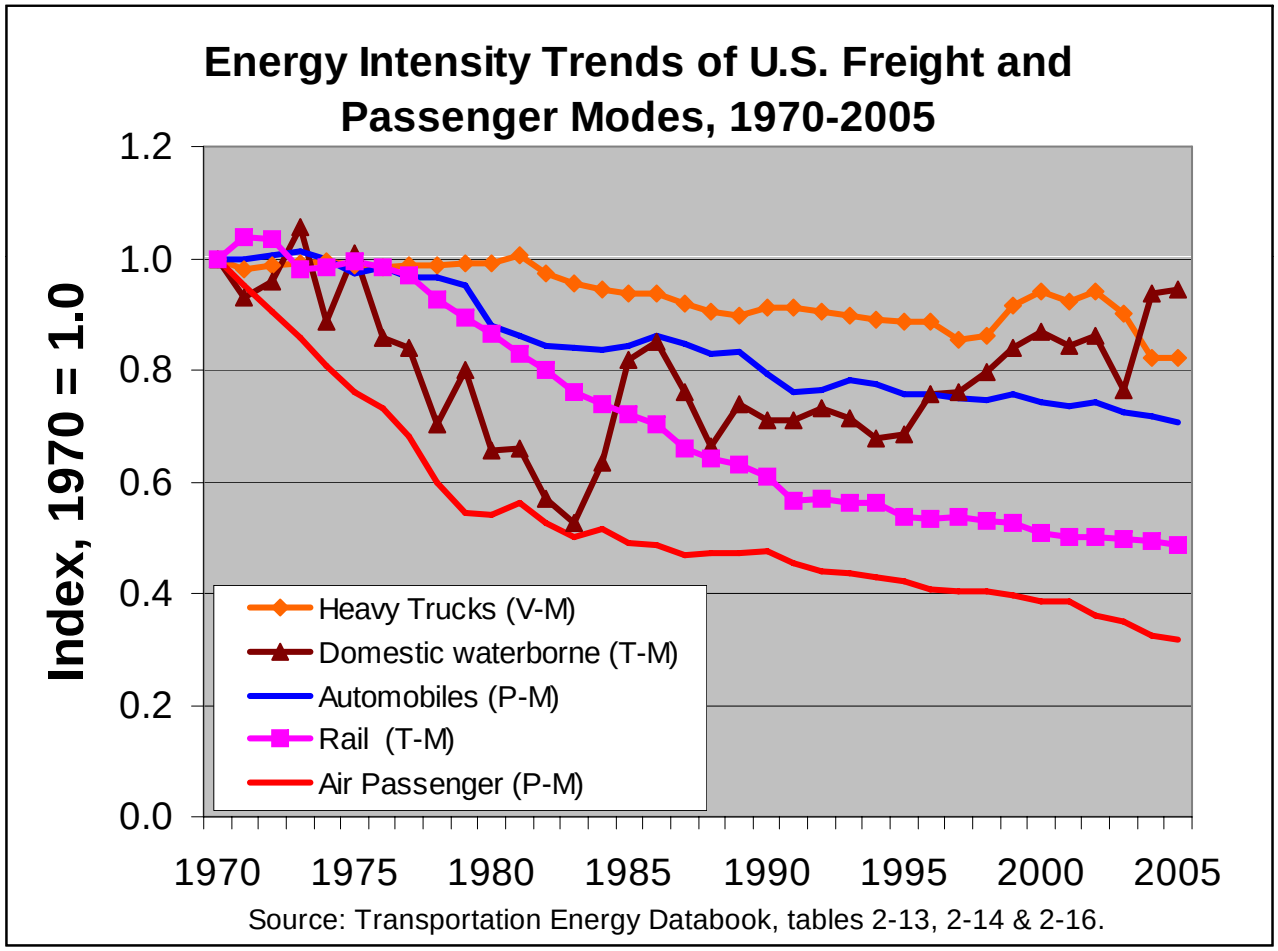
Federal Oversight of Motor Vehicle Efficiency

- The EISA of 2007 amended the CAFE law
- Supreme Court ruled that EPA had authority to regulate GHGs under the Clean Air Act.
- Now three agencies have authority to influence motor vehicle efficiency:
  - NHTSA: fuel economy
  - EPA: national GHG emissions
  - California Air Resources Board: CA GHGs
- EISA required study of heavy truck fuel economy standards.
- Last week, President Obama directed DOT and EPA to issue standards for medium and heavy trucks and extend LDV standards beyond 2016.

Freight Energy Intensity by Mode

Rail and air transport have reduced their energy intensity far more than heavy trucks. Why?



Fuel Consumption Reductions to be Realized in Trucks

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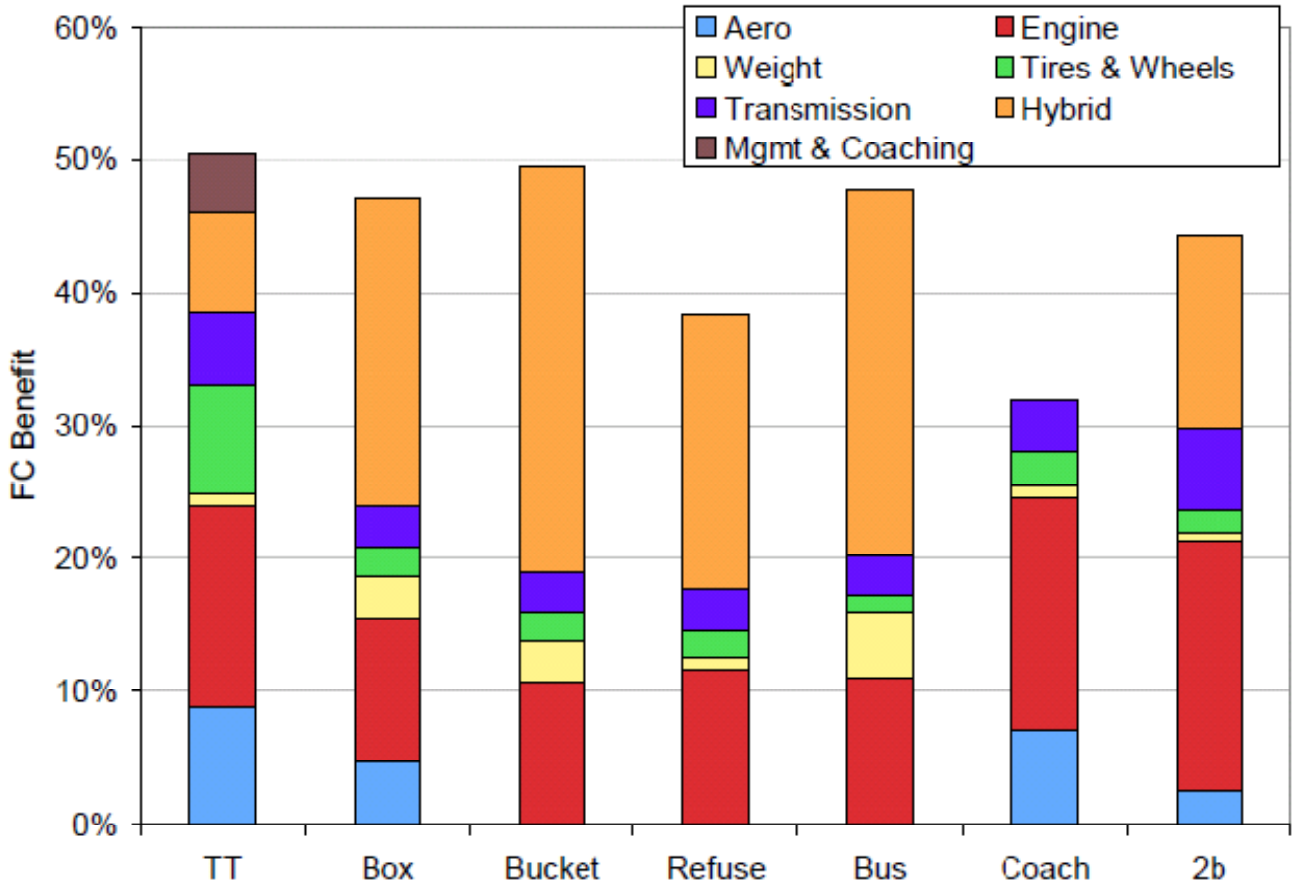
The President's directive was influenced by the NAS's heavy truck fuel economy study released in March. The committee believed that the improvements below could be achieved in new trucks in 2015-2020.



Cost-Effective Technologies

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	Short Term (2006-2012)		Medium Term (2013-2018)		Long Term (2019-2025)	
TECHNOLOGY TYPE	Cumulative GHG Benefit [%]	Cumulative RPE [US$]	Cumulative GHG Benefit [%]	Cumulative RPE [US$]	Cumulative GHG Benefit [%]	Cumulative RPE [US$]
Early Torque Converter Lockup	0.50	5	0.50	5	0.50	5
Rolling Resistance Reduction by 10%	1.99	25	1.99	25	1.99	25
Drag Reduction by 10%	3.95	53	3.95	53	3.95	53
Rolling Resistance Reduction by 20%	3.95	53	5.30	85	5.30	85
Drage Reduction by 20%	3.95	53	7.00	127	7.00	127
Aggressive Shift Logic	4.17	58	7.21	132	7.21	132
Improved Lube Oil	5.13	78	8.14	152	8.14	152
Engine Friction Reduction by 8% I4	5.13	78	8.14	152	8.14	152
Stoichiometric GDI I4	5.13	78	8.14	152	8.14	152
Weight Reduction by 5%	5.13	78	10.99	308	10.99	308
Engine Friction Reduction by 15% I4	5.13	78				
DOHC VVT (Intake) I4	5.13	78				
VVT (Intake plus Exhaust) DOHC I4	5.13	78				
Engine Friction Reduction by 8% V6	5.20	80				
Alternator Improvements	5.67	97				
VVL Discrete OHV-2v V6	5.67	97				
Stoichiometric GDI V6	5.85	104				
VVL Discrete OHC-4v I4	5.85	104				
Engine Friction Reduction by 8% V8	7.19	161				
Engine Friction Reduction by 15% V6	7.19	161				
VVLT Intake Continuous DOHC I4	7.19	161				
Engine Off at Idle(Manual Transmission)	7.19	161				
VVL Discrete OHV-2v V8	10.19	310				
Engine Friction Reduction by 15% V8	10.19	310				
Electric Power Steering	11.71	390				
Five Speed Automatic Transmissions	13.80	587				
Six Speed Automatic Transmissions	14.62	590				
Seven Speed Automatic Transmissions	14.62	590				
Continuously Variable Transmissions (Engines < 2.8L)	14.62	590				
4/5 Valves I4	14.62	590				
Camless Valve Actuation I4	14.62	590				
Stoichiometric GDI V8	14.62	590				
Weight Reduction by 10%	14.62	590				
Turbocharging & GDI with Engine Downsize V6 to I4	14.62	590				
DOHC VVT (Intake) V6	14.68	595				
DOHC VVT (Intake) V8	15.89	694				
VVT (Intake plus Exhaust) DOHC V6	15.89	694				
VVT (Intake plus Exhaust) DOHC V8	15.89	694				
VVL Discrete OHC-4v V6	15.89	694				
VVLT Intake Continuous DOHC V6	15.89	694				
Continuously Variable Transmissions (Engines > 2.8L)	15.89	694				
Turbocharging & GDI with Engine Downsize V8 to V6	15.89	694				
4/5 Valves V6	15.89	694				
VVL Discrete OHC-4v V8	18.61	950				
VVLT Intake Continuous DOHC V8	20.00	1089				
Cylinder Deactivation V6 with Noise Cancellation & Cont. VVLT	20.10	1104				
Cylinder Deactivation V8 & Cont. VVLT	20.10	1104				
Camless Valve Actuation V6 Incl. Cyl Deact.	20.10	1104				
Camless Valve Actuation V8 Incl. Cyl Deact.	20.10	1104				
Engine Off at Idle (Auto. Transmission & AC)	20.10	1104				
Weight Reduction by 15%	20.10	1104				
Electric Water Pump	20.10	1104				
Homogeneous Combustion Compression Ignition (HCCI) I4	20.10	1104				
Homogeneous Combustion Compression Ignition (HCCI) V6	20.10	1104				

At any given time, engineers found they could list many technologies that could improve fuel economy apparently cost-effectively.

Technology	Medium Term Potential Cumulative % FC Red.	Cost	% FE Incr.
Early Torque Converter Lock-up	0.50%	$5	0.503%
Rolling Resistance Reduction by 10%	1.99%	$25	2.030%
Drag Reduction by 10%	3.95%	$53	4.112%
Rolling Resistance Reduction by 20%	5.30%	$85	5.597%
Drag Reduction by 20%	7.00%	$127	7.527%
Aggressive Shift Logic	7.58%	$139	8.202%
Improved Lube Oil	8.50%	$159	9.290%
Engine Friction Reduction by 8% I4	9.52%	$189	10.522%
Stoichiometric GDI I4	12.13%	$278	13.804%
Weight Reduction by 5%	14.85%	$369	17.440%
Engine Friction Reduction by 15% I4	15.79%	$409	18.751%
DOHC VVT (Intake) I4	16.70%	$447	20.048%
VVT (Intake plus Exhaust) DOHC I4	17.25%	$467	20.846%
Engine Friction Reduction by 8% V6	17.55%	$479	21.286%
Alternator Improvements	17.96%	$496	21.892%
VVL Discrete OHV-2v V6	18.63%	$528	22.895%
Stoichiometric GDI V6	19.39%	$565	24.054%
VVL Discrete OHV-4v I4	21.42%	$676	27.259%

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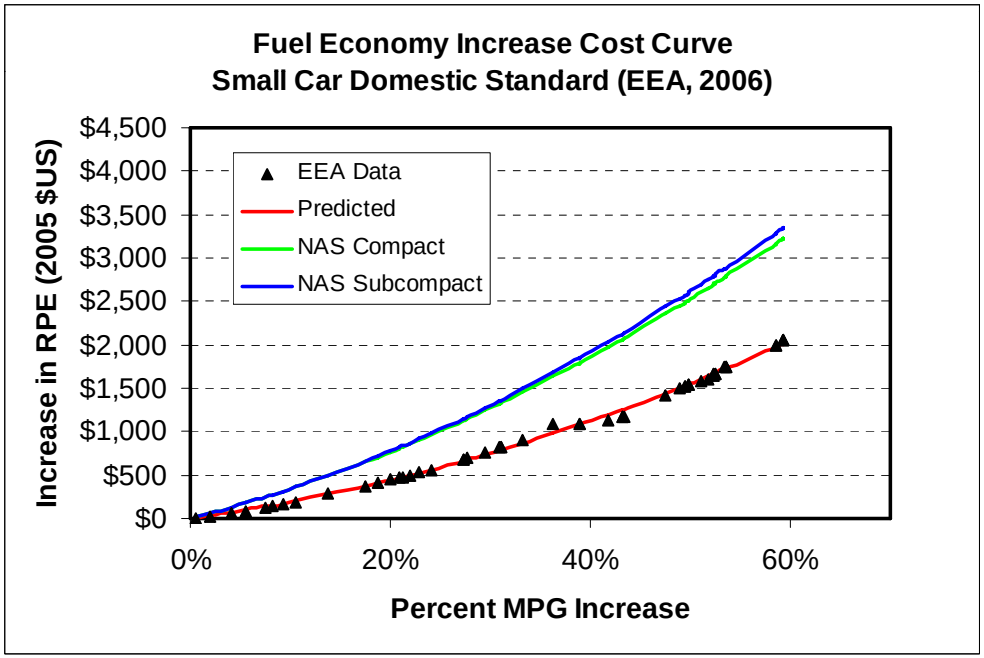
Cost-Effective Technologies

- When ranked by cost-effectiveness (with engineering constraints) the points fit a quadratic total cost curve.
- The EPA and DOT do not use cost curves, per se, but computer models (Volpe, OMEGA) with algorithms that treat each make and model of vehicle individually.
- In the future, there will be greater reliance on full vehicle simulation modeling to account for synergies.



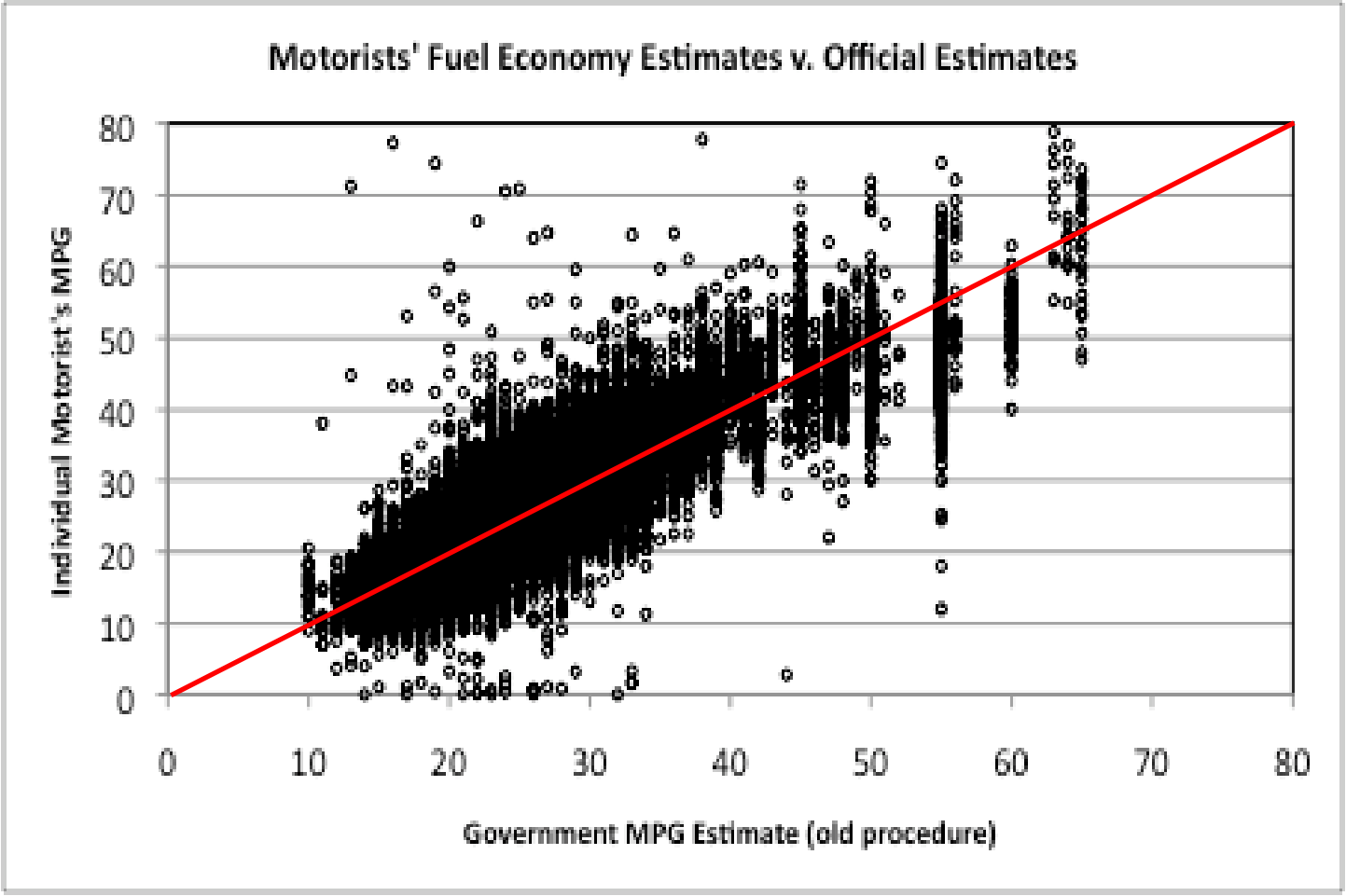
The Potential of Proven Technologies

Proven technologies can reduce gasoline vehicles' GHG emissions up to 30% by 2016 (+40% fuel economy).

- Engine:
  - Gasoline direct injection
  - Turbocharging
  - Cam phasing, variable valve lift
  - Downsizing w/o performance reduction
- Dual clutch (automated manual) transmission
- Electric power steering & accessories
- Stop-start or Integrated Starter Generator
- Drag, Mass and Rolling Resistance reductions

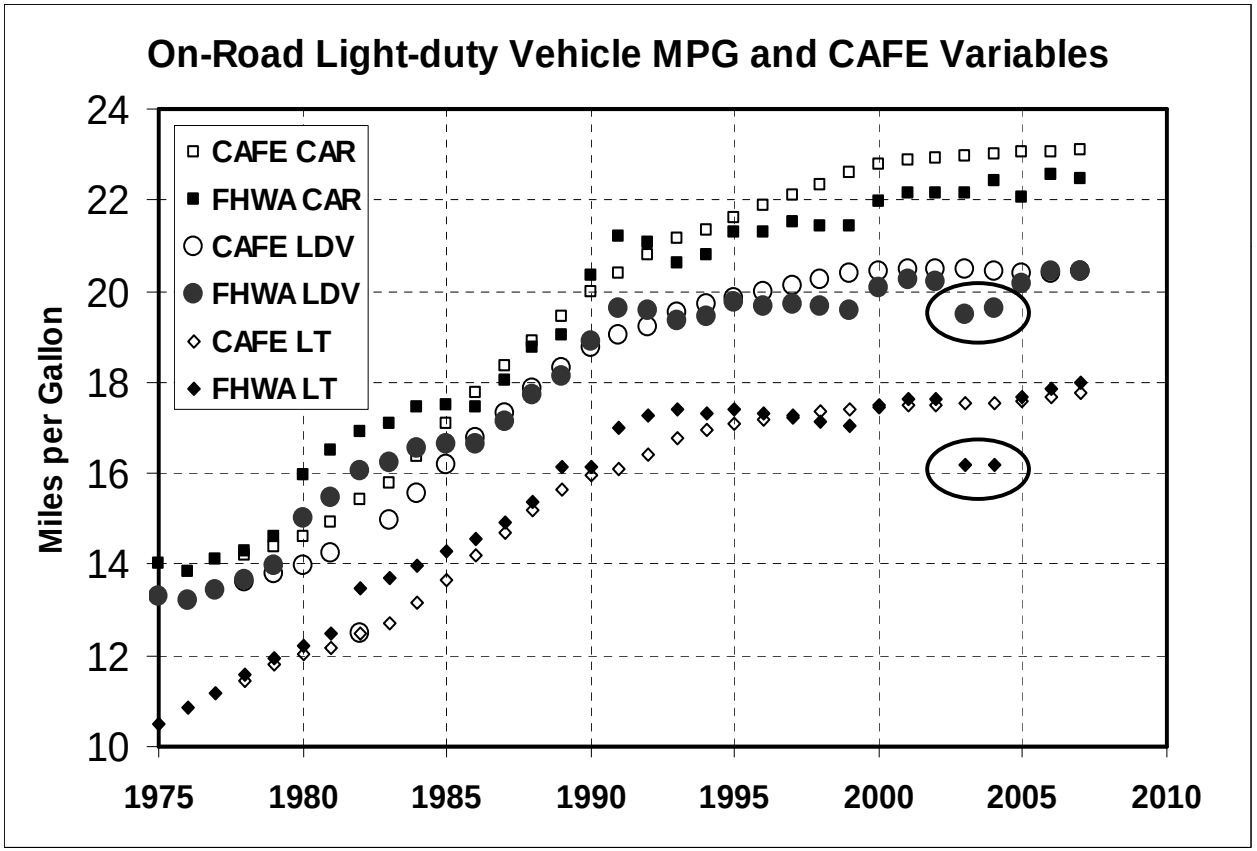
Can on-road fuel economy performance be improved?

The “old” (pre 2008) EPA ratings were nearly unbiased but highly inaccurate predictors of on-road fuel economy for conventional vehicles. (not true for hybrids).



Predicted vs Actual Fuel Economy

Historically, when gas prices are high, consumers beat the fuel economy predicted by EPA's numbers.



Tips to safely maximize on-road fuel economy are known.

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Can they become widely adopted and sustained?

Driving More Efficiently

Drive Sensibly

Aggressive driving (speeding, rapid acceleration and braking) wastes gas. It can lower your gas mileage by 33 percent at highway speeds and by 5 percent around town. Sensible driving is also safer for you and others, so you may save more than gas money.

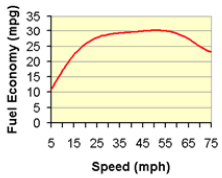
Fuel Economy Benefit:	**5-33%**
Equivalent Gasoline Savings:	**$0.13-$0.85/gallon**

Observe the Speed Limit

While each vehicle reaches its optimal fuel economy at a different speed (or range of speeds), gas mileage usually decreases rapidly at speeds above 60 mph.

You can assume that each 5 mph you drive over 60 mph is like paying an additional $0.24 per gallon for gas.

Observing the speed limit is also safer.



Fuel Economy Benefit:	**7-23%**
Equivalent Gasoline Savings:	**$0.18-$0.59/gallon**

Remove Excess Weight

Avoid keeping unnecessary items in your vehicle, especially heavy ones. An extra 100 pounds in your vehicle could reduce your MPG by up to 2 percent. The reduction is based on the percentage of extra weight relative to the vehicle's weight and affects smaller vehicles more than larger ones.

Fuel Economy Benefit:	**1-2%/100 lbs**
Equivalent Gasoline Savings:	**$0.03-$0.05/gallon**

Keeping Your Car In Shape

Keep Your Engine Properly Tuned

Fixing a car that is noticeably out of tune or has failed an emissions test can improve its gas mileage by an average of 4 percent, though results vary based on the kind of repair and how well it is done.

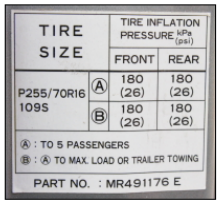
Fixing a serious maintenance problem, such as a faulty oxygen sensor, can improve your mileage by *as much as 40 percent.*

Fuel Economy Benefit:	**4%**
Equivalent Gasoline Savings:	**$0.10/gallon**

Keep Tires Properly Inflated

You can improve your gas mileage by around 3.3 percent by keeping your tires inflated to the proper pressure. Under-inflated tires can lower gas mileage by 0.3 percent for every 1 psi drop in pressure of all four tires. Properly inflated tires are safer and last longer.

The proper tire pressure for your vehicle is usually found on a sticker in the driver's side door jamb or the glove box and in your owner's manual. Do not use the maximum pressure printed on the tire's sidewall.



Fuel Economy Benefit:	**up to 3%**
Equivalent Gasoline Savings:	**up to $0.08/gallon**

Use the Recommended Grade of Motor Oil

You can improve your gas mileage by 1-2 percent by using the manufacturer's recommended grade of motor oil. For example, using 10W-30 motor oil in an engine designed to use 5W-30 can lower your gas mileage by 1-2 percent. Using 5W-30 in an engine designed for 5W-20 can lower your gas mileage by 1-1.5 percent. Also, look for motor oil that says "Energy Conserving" on the API performance symbol to be sure it contains friction-reducing additives.

Planning & Combining Trips

Combining errands into one trip saves you time and money. Several short trips taken from a cold start can use twice as much fuel as a longer multipurpose trip covering the same distance when the engine is warm. Trip planning ensures that traveling is done when the engine is warmed-up and efficient, and it can reduce the distance you travel.

Commuting

Stagger your work hours to avoid peak rush hours.

Drive your most fuel-efficient vehicle.

Consider telecommuting (working from home) if your employer permits it.

Take advantage of carpools and ride-share programs. You can cut your weekly fuel costs in half and save wear on your car if you take turns driving with other commuters. Many urban areas allow vehicles with multiple passengers to use High Occupancy Vehicle (HOV) lanes which are typically less congested, further improving your fuel economy.

Consider using public transit if it is available and convenient for you. The American Public Transit Transportation Association has links to information about public transportation in your state.

Traveling

A roof rack or carrier provides additional cargo space and may allow you to meet your needs with a smaller car. However, a loaded roof rack can decrease your fuel economy by 5 percent. Reduce aerodynamic drag and improve your fuel economy by placing items inside the trunk whenever possible.

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Potential to Improve Fuel Economy by 2030

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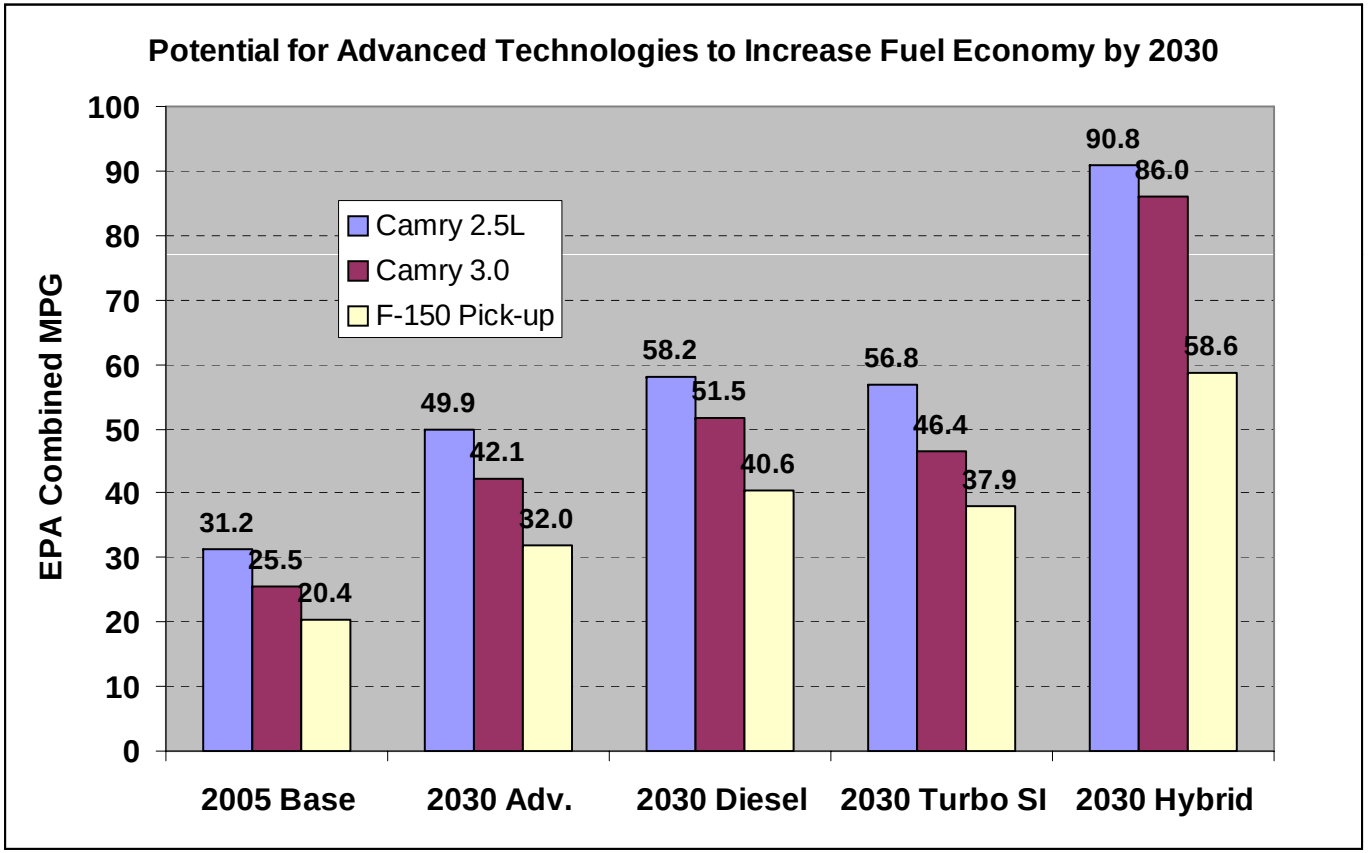
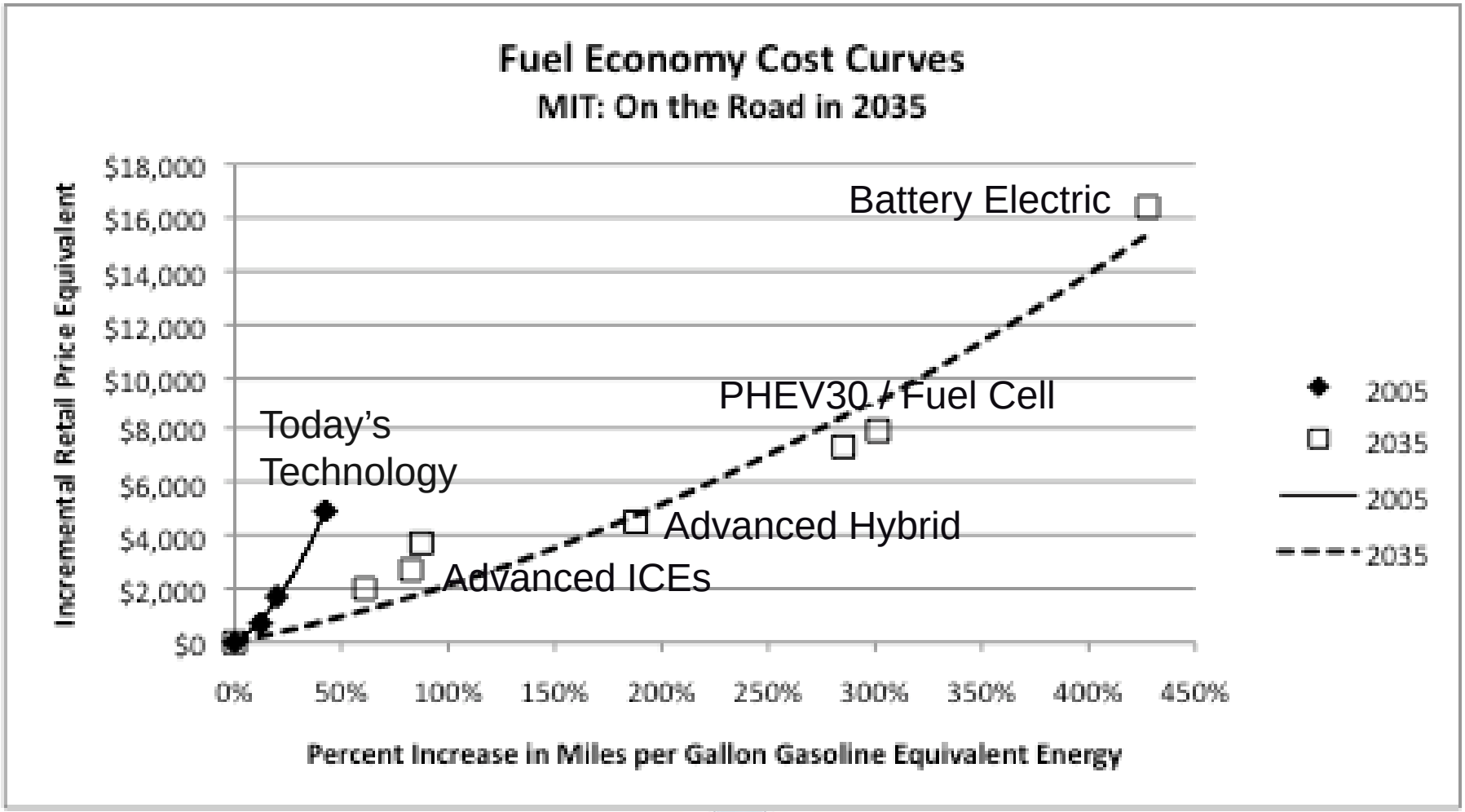
A 2007 MIT study predicts MPG gains of 80-85% for model year 2030 vehicles via continuous improvement of conventional technology at a rate of 2-2.5%/year.



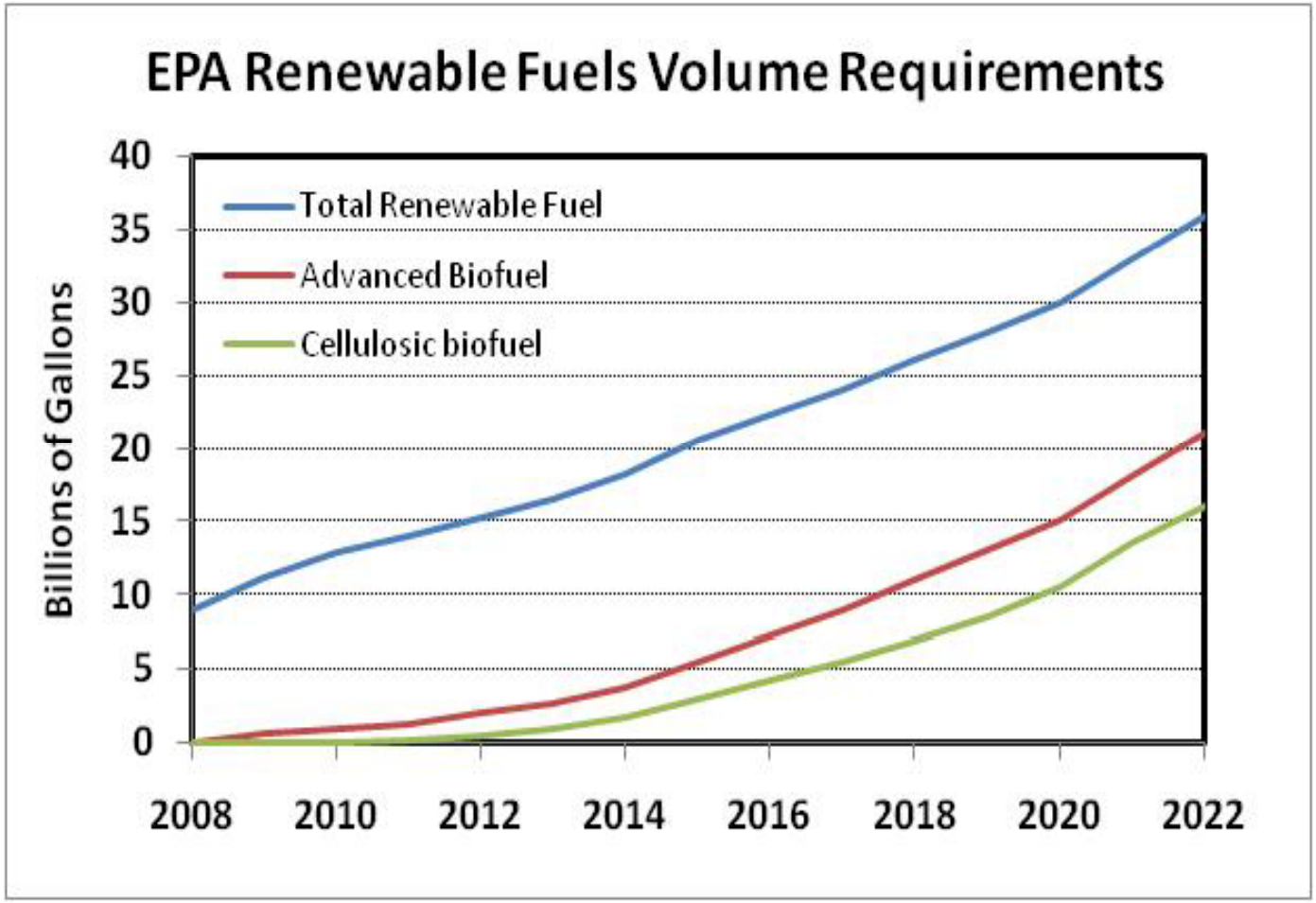
Source: Kasseris & Heywood, SAE Technical Paper 2007-01-1605, April, 2007.

Efficiency Improvement Alone Will Probably not be Enough.



EPA's Renewable Fuels Standards

EPA's Renewable Fuels Standards call for 21 billion gallons of advanced (-50%) biofuels and 16 billion gallons of cellulosic biofuel (-60%) by 2022 but the advanced fuels are already behind schedule.



Transition to Non-Liquid Fuels

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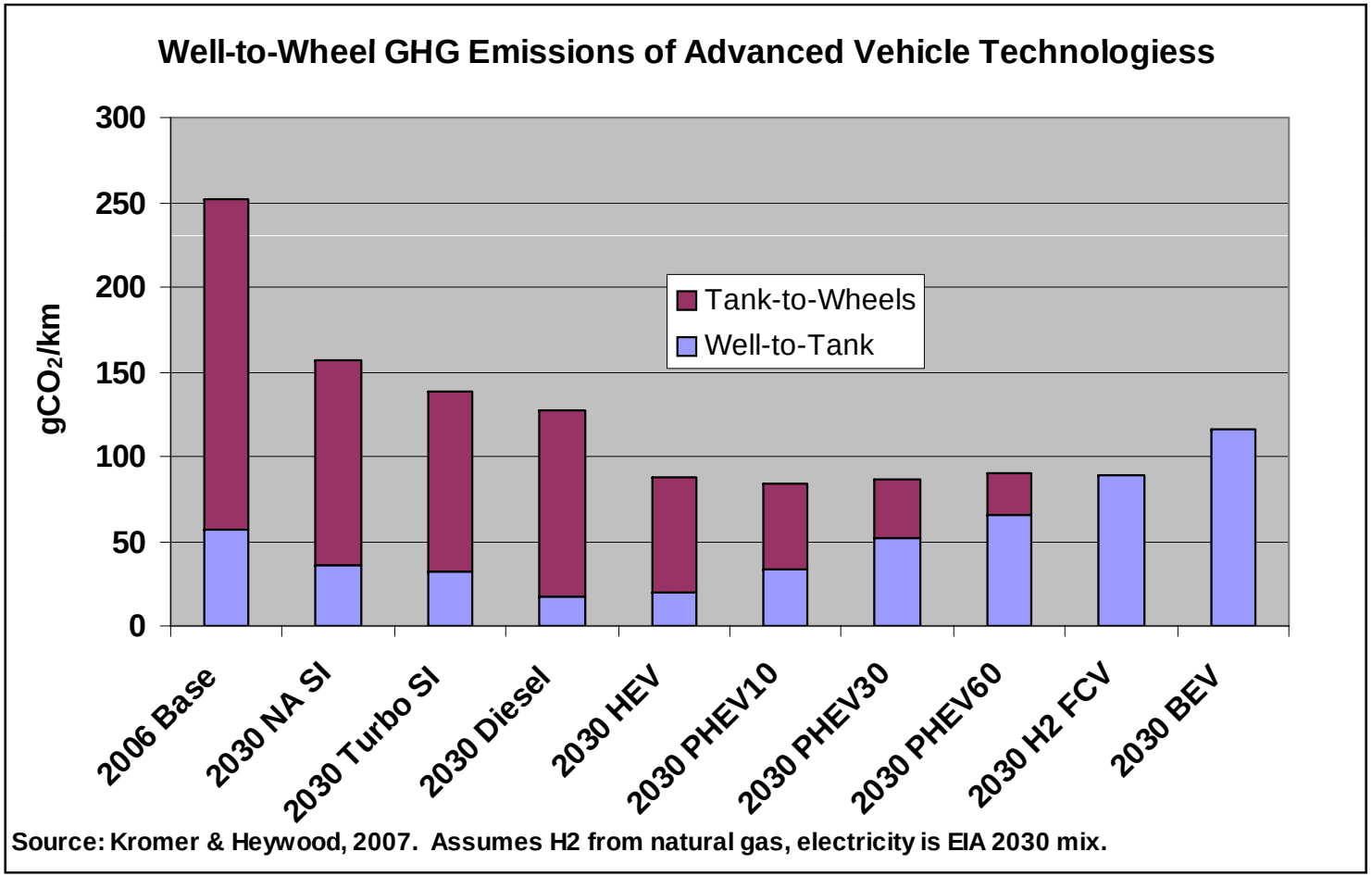
To reduce transportation GHG emissions by 70-80% by 2050, it seems that at least light-duty vehicles will have to transition to electricity or hydrogen produced from low carbon sources.



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Technology and Policy

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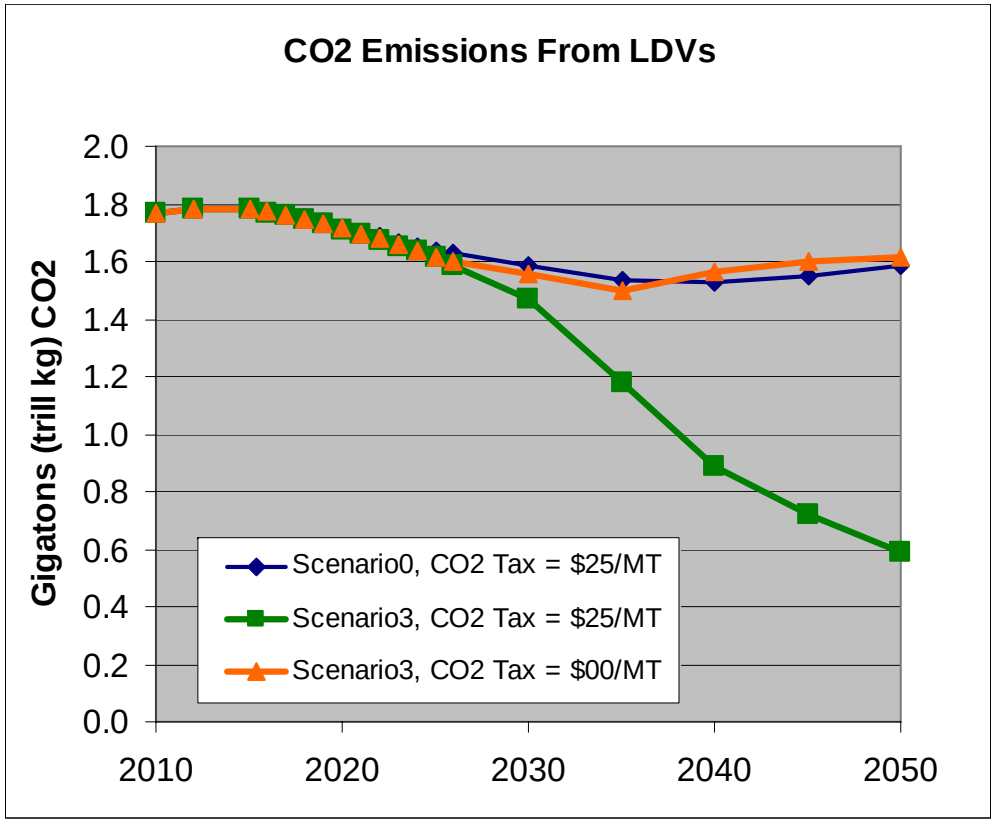
Both technological advances and serious carbon policies will probably be needed to reduce GHG emissions to levels necessary to avoid dangerous climate change.



- Scenario 0 : No transition to electric or hydrogen powered vehicles. C tax of \$25/tCO_2.
- In Scenario 3 : full transition to hydrogen fuel cell vehicles but without a carbon policy.
- In Scenario 3 with a carbon policy, significant reduction in carbon emissions will occur and will continue to decline beyond 2030.

Key Strategies

Fuel efficiency improvement, followed by low-carbon fuels will be the key strategies for mitigation GHG emissions from motor vehicles.

- 40% NEW vehicle MPG improvement by 2016
  - Mostly improvements to conventional vehicles
  - Some increased sales of hybrids
- Eventual 100% improvement for LDVs >50% for heavy trucks (2020?)
- Rethinking of biofuel policy necessary
  - Technological advances needed
  - Indirect impacts must be better understood
  - Optimize location, crops, conversion, end use
- Transition to electricity or hydrogen by 2050

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The Role of Grid Connected Vehicles

May 26, 2010

Presented by:

STEVE MARSHALL
West Coast Corridor Coalition

"The electric car is likely to emerge as one of the most transformational products of the current era, as important, perhaps, as the personal computer and the Internet." --Business Week, October 19, 2009

"To reduce oil dependence, nothing would do more good more quickly than making cars that could connect to the electric grid.— David Sandalow, Assistant Secretary for Policy and International Affairs, U.S. Department of Energy

"We know that our dependence on foreign oil endangers our security and our economy.

We know that climate change poses a threat to our way of life – in fact we are already beginning to see its profound and costly impact.

And we know that our economic future depends on our leadership in the industries of the future."

--President Obama May 21, 2010

Presidential Directive of May 21, 2010

"President Obama ordered tougher fuel-efficiency standards for cars and trucks, advancing the fight against climate change

Under last month's rules, new cars must get at least 35.5 miles to a gallon of fuel by 2016. The president's new plan would order further improvements in fuel efficiency for cars and light trucks made in 2017 and beyond, and in medium and heavy trucks made in 2014 through 2018.

The directive orders more federal support for new vehicles like advanced electric cars, and it instructs the EPA to reduce emissions of other kinds of pollutants by motor vehicles, besides greenhouse gases." --New York Times May 21, 2010

Car Facts About China

- China now has the largest market for cars.
- There are 9 cars for every thousand Chinese of driving age.
- There are 1,148 cars for every thousand Americans of driving age.
- China wants to be like the U.S.
- To run its cars China imports most of its oil, as does the U.S.

Pacific Coast Collaborative Action Plan on Green Highways: February 12, 2010

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- Build a Pacific Coast "Green Highway" with alternative fueling stations, including electricity, along I-5 and into Canada
- Promote public-private partnerships
- Share standards and best practices for alternative fuels
- Collaborate on all electric and plug-in electric hybrid vehicles
- Maximize impact of public fleets policies
- Maximize results from research and commercialization efforts
- Create consistent roadside signage for alternative fuel stations

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The West Coast Green Highway

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Imagine driving down Interstate 5 – all 1,350 miles of it from British Columbia to Baja, California – without using a drop of gas or releasing an ounce of harmful carbon emissions.

There's no need to imagine much longer. Soon, I-5 will become the first U.S. interstate specifically equipped to carry electric vehicles border-to-border, threading Washington, Oregon and California with recharging stations spaced within the range of standard electric vehicle (EV) technology.

http://www.wsdot.wa.gov/Partners/GreenHighways

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Transportation Produces 51% of Puget Sound Greenhouse Gas Emissions

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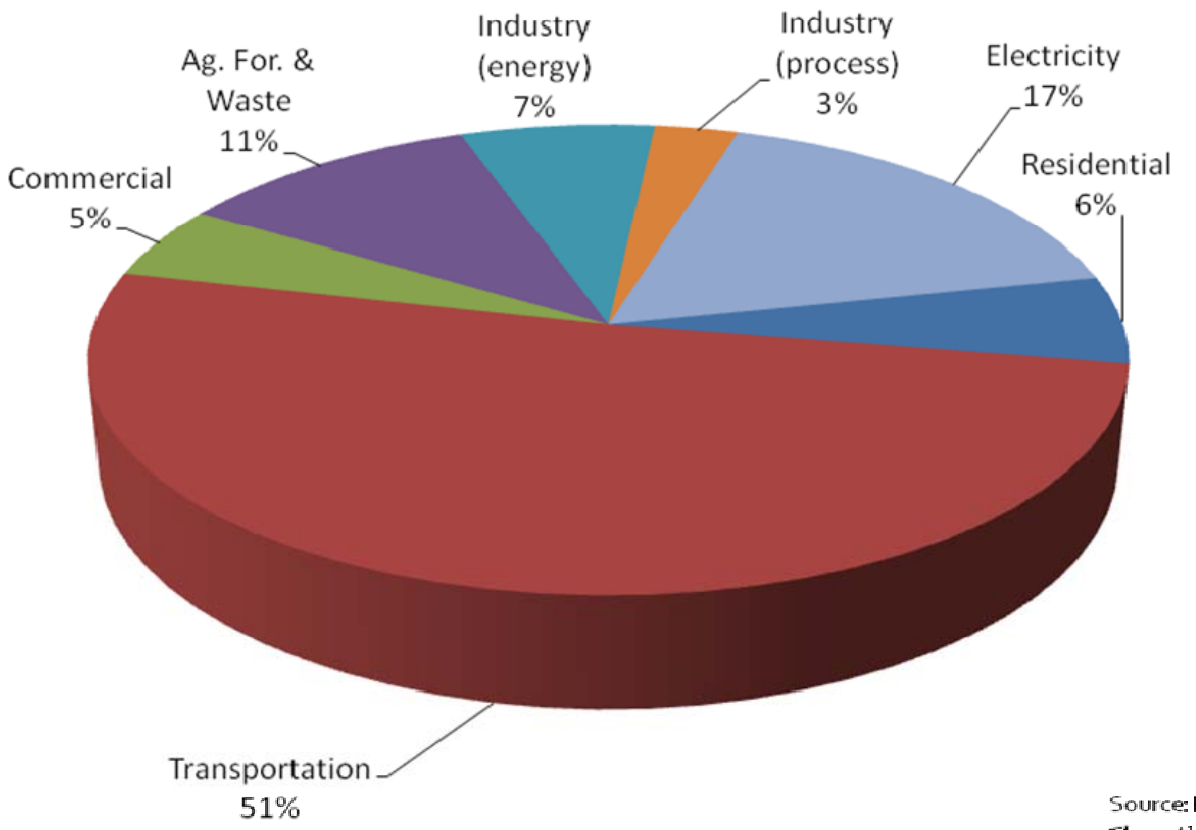

Source: Puget Sound Clean Air Agency

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All-Electric Vehicles on the Way

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COURTESY: FORD MOTOR CO.

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Tesla Roadster and Model S

Ford CEO Alan Mulally said that "over time we are going to see ever-increasing prices for energy." On Ford's plans, Mulally said:

"You'll see more hybrids, but you will really see a lot more electric vehicles."

"By 2020, [Ford] expects that 10% to 25% of its global model lineup will be composed of such models." Wall Street Journal May 25, 2010

Integrating Electric Vehicle Infrastructure

REAL SOLUTIONS FOR CLIMATE CHANGE

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West Coast Corridor Conference

REAL SOLUTIONS FOR CLIMATE CHANGE

On September 16-17th the West Coast Corridor Coalition and Stanford's Precourt Energy Efficiency Center will sponsor a conference at Stanford's McCaw Hall

"Climate Policy, Innovation and Transportation: Building a Clean, Green and Smart West Coast Corridor"

Visit www.westcoastcorridors.org for details

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Transportation and Climate Change Resource Center

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Vehicle and Fuel Strategies in Tennessee:
Biofuels, Energy Conservation and Diesel Retrofits

May 26, 2010

Presented by:

ALAN JONES
Manager, Environmental Policy Office
Tennessee Department of Transportation

Biofuels, Energy Conservation and Diesel Retrofits

REAL SOLUTIONS FOR CLIMATE CHANGE

- Biofuels are part of the solution
- Improved fuel economy (e.g., hybrid electrics, plug-in hybrids, clean diesels)
- Energy conservation (e.g., reduce VMT, use transportation alternatives, reduce idling)
- Retrofit control technologies

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Green Corridors

- Working with EPA Region 4 and the Southeast Diesel Collaborative to establish “Green Corridors” across the Southeast
- Encouraging SE states, truck stops and others to provide resources and infrastructure along interstate corridors
  - Biofuels availability
  - Truck stop electrification technology
  - Electric vehicle charging infrastructure

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Southeast Diesel Collaborative

REAL SOLUTIONS FOR CLIMATE CHANGE

- A voluntary public-private partnership working to reduce diesel emissions in eight states
  - Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina and Tennessee
- Part of EPA's National Clean Diesel Campaign
- Goal is to improve air quality and public health
  - Encouraging the use of clean, renewable energy and technology
  - Reducing diesel emissions from existing engines

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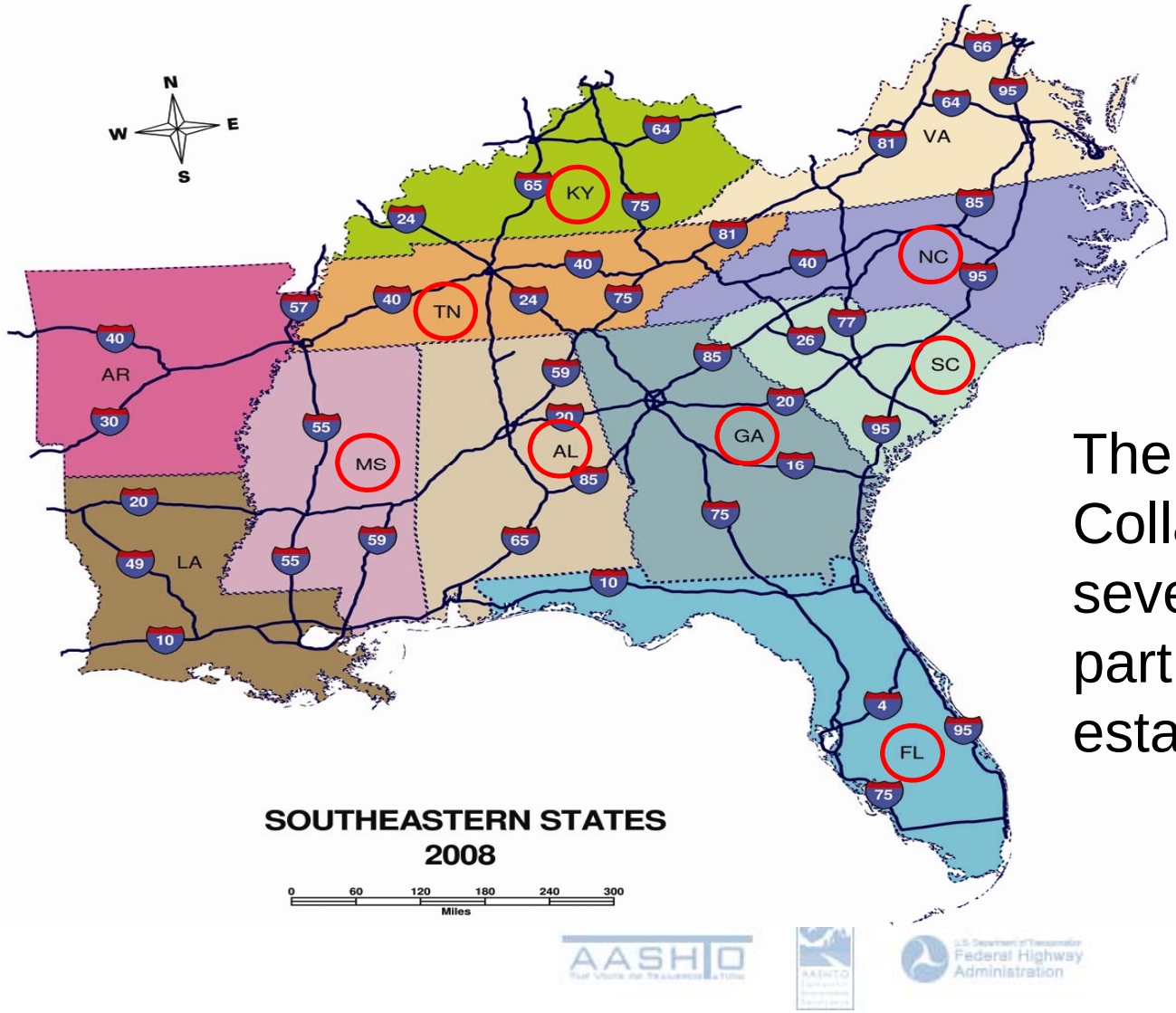
Interstate Corridors in the Southeast

REAL SOLUTIONS FOR CLIMATE CHANGE



The Southeast Diesel Collaborative is one of seven regional partnerships established by EPA.

Tennessee's Biofuel Green Island Corridor Network

REAL SOLUTIONS FOR CLIMATE CHANGE

- Goal to establish statewide network of publicly accessible B20 and E85 refueling stations ("Green Islands") along Tennessee interstates and major highways
- Help locate biofuel stations no more than 100 miles apart along major corridors
  - At least one E85/one B20 pump in priority counties
  - At least three E85 and three B20 pumps in urban areas

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Tennessee's Biofuel Green Island Corridor Network

REAL SOLUTIONS FOR CLIMATE CHANGE

- Green Island infrastructure grant program began fall of 2006
  - $1.5 million in state funds from Governor's biofuels budget; $480K in CMAQ funds
- In 2006, one E85 pump in Nashville; several biodiesel pumps in East Tennessee
- Today
  - 33 E85 pumps and 32 B20 pumps

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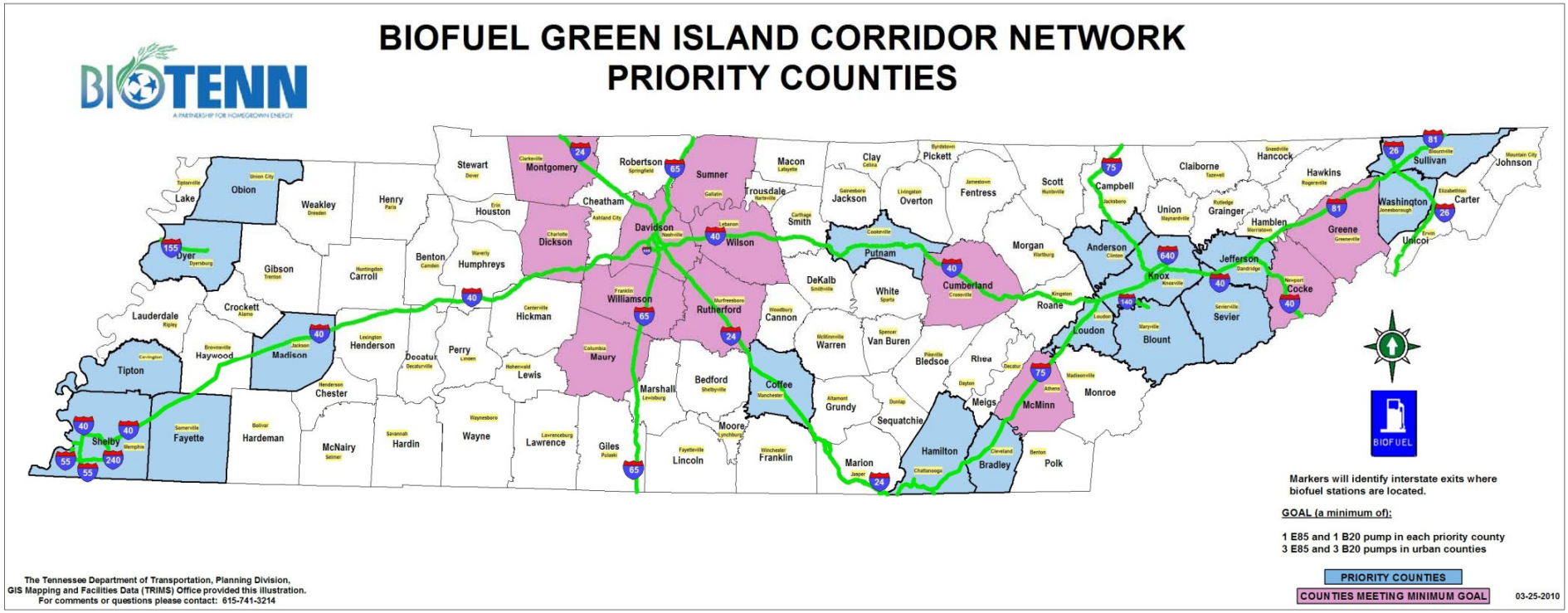
Green Island Corridor Network

REAL SOLUTIONS FOR CLIMATE CHANGE



- Blue indicates priority counties for E85 and/or B20
- Pink counties have met minimum goals

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Biofuel Green Island Grants

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- Competitive grant process administered through TDOT
- TDOT pays up to 80% of total cost; grantee pays at least 20% of project cost
- Maximum funding $45,000 per pump and $90,000 per location
- Most recent competition closed April 30, 2010
- Proposals for 15 E85 pumps and 3 B20 pumps

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Interstate Biofuel Signage for Marketing and Public Awareness

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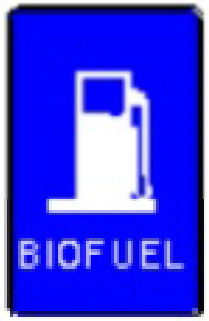
- Visible, easily recognizable signage along interstates
- Pump image and “BIOFUEL” added to GAS blue logo signs at interstate exits with B20 and/or E85 stations
- One sign on interstate and one on exit ramp
- Stations place B20 and/or E85 on their logo sign
- Arrows on ramp signs direct motorists to station locations



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Biofuel Signs on I-75

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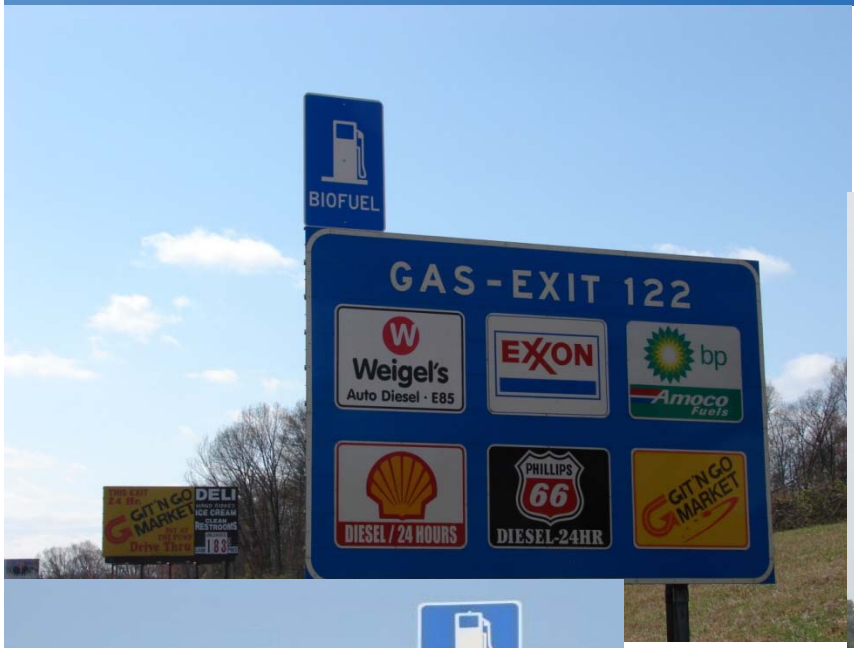

Mainline and ramp signs

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State Mandates to Reduce Petroleum Use

- Public Chapter 489 directed state agencies to reduce or displace 20 percent of petroleum use by January 2010
  - Increasing biofuels use a major TDOT strategy
- Public Chapter 532 requires 30% of newly purchased state passenger vehicles to be energy efficient
  - Flexible fuel vehicles
  - Hybrid-electric vehicles
  - At least 25 mpg

University of Tennessee Biofuels Initiative

REAL SOLUTIONS FOR CLIMATE CHANGE

- $72 million state government investment
- Univ. of Tennessee partnership with DuPont Danisco
- Cellulosic ethanol demonstration facility in Vonore, TN began production January 2010
- Using corn cobs and then switchgrass to produce 250,000 gallons of ethanol each year
- UT contracts with farmers to grow switchgrass on over 7,000 acres within 50 mile radius
- Optimizing technology for planned commercial-scale production facility

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Truck Stop Electrification

REAL SOLUTIONS FOR CLIMATE CHANGE

- $2 million discretionary ARRA grant from EPA in 2009
- Funding to purchase and install truck stop electrification (TSE) technology at truck stop parking spaces along interstate corridors
- Could add up to 150 TSE parking spaces
- Requesting proposals from truck stops and TSE technology vendors
- Up to 100 percent ARRA funds

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TDEC IdleSmart APU Rebate Program

REAL SOLUTIONS FOR CLIMATE CHANGE

- Eligible truck owners may receive up to 50 percent of the cost of purchasing and installing qualified auxiliary power units (APUs) on sleeper berth trucks
- Provides APU rebates (ARRA funding) up to a maximum of $4,000 per truck
- Available to Tennessee common, contract and private motor carriers with 30 or fewer trucks

IdleSmart Tennessee's APU Rebate Program

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Electric Vehicle Recharging Infrastructure

REAL SOLUTIONS FOR CLIMATE CHANGE

- Federal ARRA grant to establish electric vehicle recharging infrastructure
- Five participating states
  - California, Oregon, Washington, Arizona, Tennessee
- Tennessee Partners
  - ECOtality, TVA, Oak Ridge, State and Nissan
- Over 2,500 recharging units in and between Chattanooga, Knoxville and Nashville
  - 1,000 home recharging units
  - 1,500 at rest areas, restaurants, fuel stations and employers

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Diesel Retrofits

REAL SOLUTIONS FOR CLIMATE CHANGE

- Repower heavy construction equipment
- Idling reduction and automatic stop-start technologies for switchyard locomotives
- School bus retrofits
- TN DOT vehicle retrofits
- Statewide competition for retrofits and idling reduction technology ($4.8 million in CMAQ funds plus 20 percent match from partner)

Clear the Air Tennessee

REAL SOLUTIONS FOR CLIMATE CHANGE

- Raising public awareness essential
- Clear the Air Tennessee – a CMAQ air quality public education campaign
- Focused on driver actions to reduce emissions
- Designed to encourage behavior changes (e.g., ecodriving **and** idling reduction)

TDOT Clear the Air TENNESSEE

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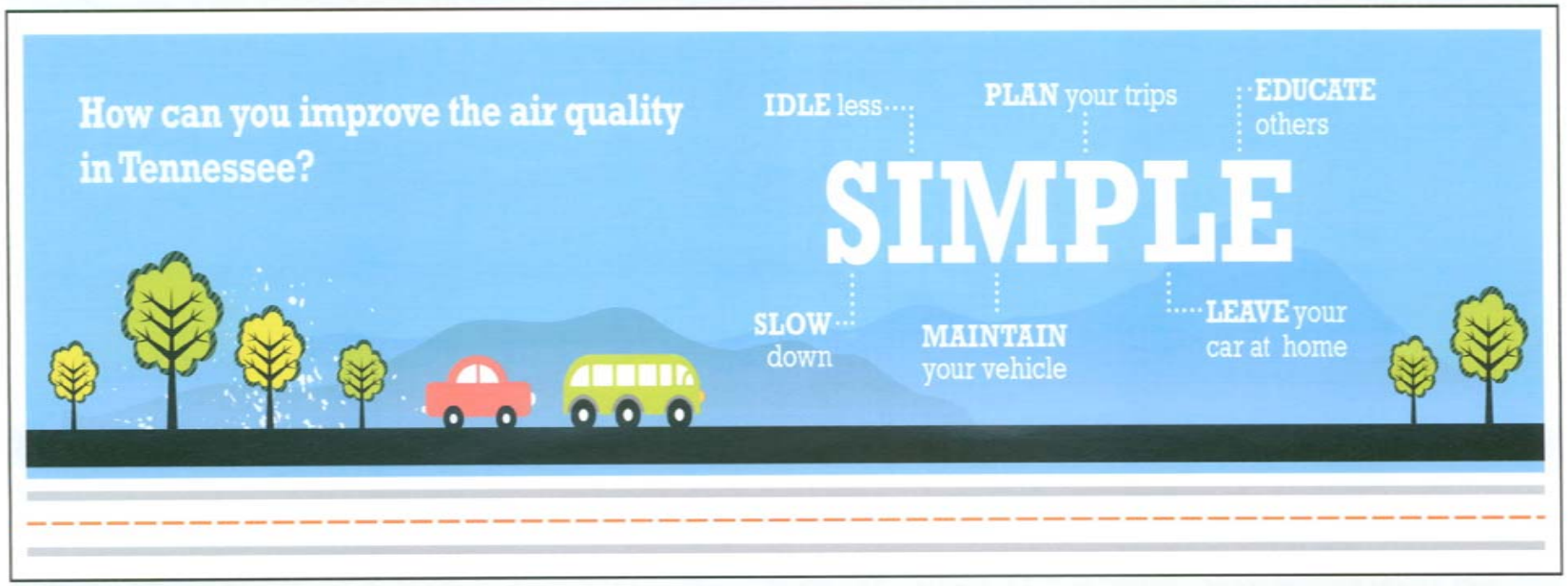
SIMPLE Campaign

REAL SOLUTIONS FOR CLIMATE CHANGE

www.cleartheairtn.org



For More Information…

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Alan Jones, Manager

Environmental Policy Office

Environmental Division

Tennessee Dept. of Transportation

615 741-6832

Alan.Jones@tn.gov

For copies of these slides and webinar recording, go to AASHTO's website:
http://environment.transportation.org/center/products_programs/climate_change_webinars.aspx

These materials will also be available on AASHTO's climate change website, where you can also find more information on climate change:
http://climatechange.transportation.org/webinars/

Thank you!

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