

Reducing Petroleum Consumption: Technology & Alternative Fuels

**Reg Modlin
Director, Regulatory Affairs
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Automobile Industry Contribution

- Our objective is to achieve a sustainable road transportation system by focusing on technological advances in energy sources, efficiency and innovation
- Industry continues to develop and implement advanced technologies and alternative fuels
 - Optimization of conventional technologies
 - Hybrid technology
 - Fuel cell technology
 - Renewable fuels
- Large scale changes, such as a renewable fuel infrastructure, require the commitment of many stakeholders
 - Automobile Companies
 - Fuel Manufacturers/Distributors
 - Government
 - Investors
 - Consumers

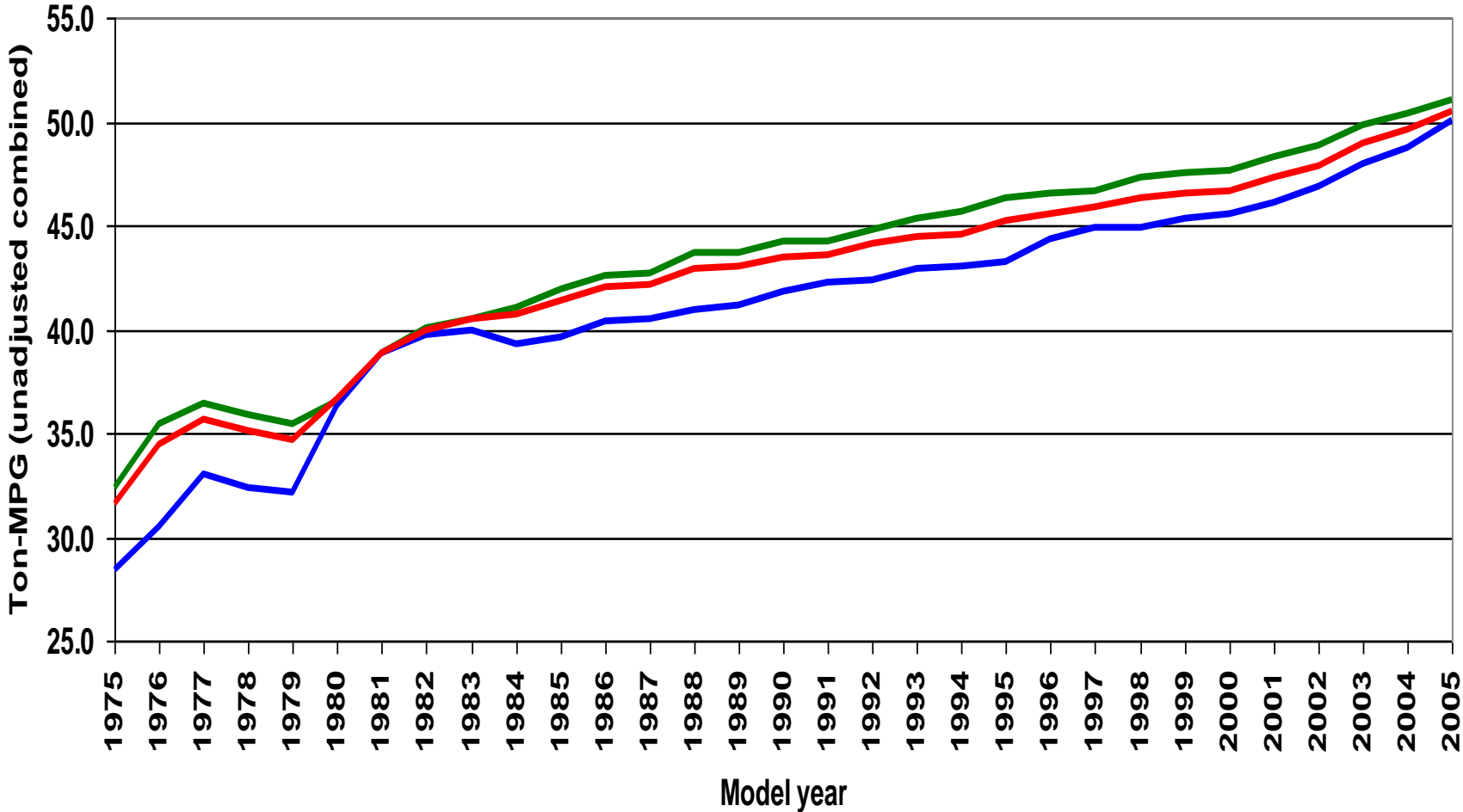


Our Commitment is Measurable



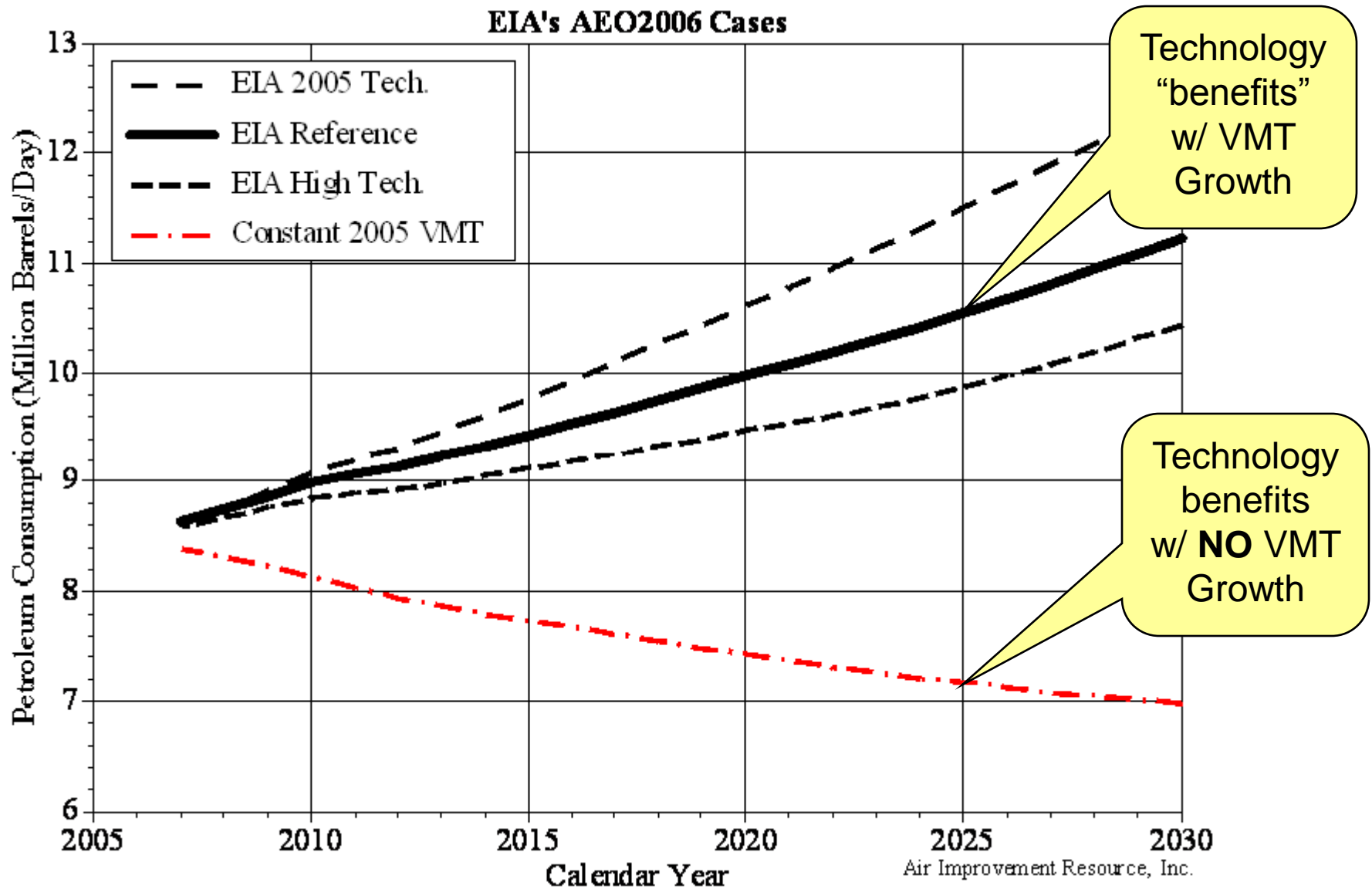
Ton-MPG for U.S. Fleet

— Cars — Trucks — Combined



VMT Growth Offsets

Benefits of More Efficient Technology



Transportation's Portfolio of Technologies

Enabling Technologies

Optimization of Combustion Engines



Vehicle Driveline Efficiencies



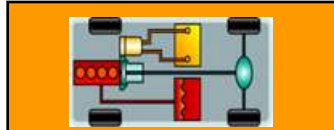
Diesel/Bio-Diesel Technology



Ethanol/E85 FFV technology



Hybrid Technology

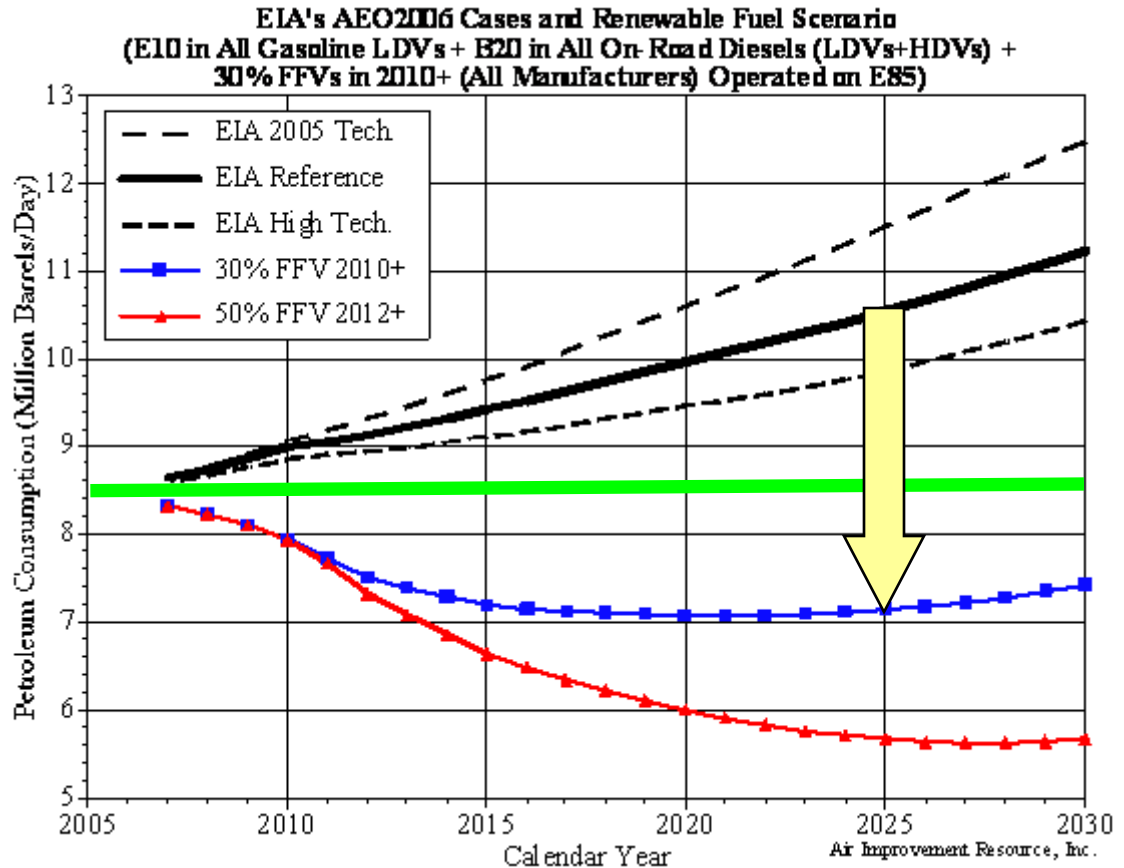


Fuel Cell Technology



How much petroleum can bio-fuels displace?

- The US Dept of Energy projects that petroleum consumption will increase 25% over the next 20 years
 - Mostly due to increases in population and VMT
- Various bio-fuels scenarios demonstrate that petroleum consumption can in fact be reduced
- Petroleum consumption can be reduced by over 30% compared to DOE's projections if:
 - Gasoline was E10
 - Diesel fuel was B20
 - 30% FFV production in 2010 with 100% E85 use
 - 50% FFV production in 2012 with 100% E85 use



Over 30% Reduction

Barrier: Inefficient Ethanol / Biomass-to-Liquid (BTL) Diesel Production Processes



- Neither ethanol or BTL are currently cost competitive on an energy content basis with petroleum-based fuels
- Need continuation of tax exemption for corn-based ethanol in gasoline until cellulosic ethanol is widely available
- Need incentives to develop refueling infrastructure
- Need R&D incentives for more efficient cellulosic ethanol/BTL production processes
- Need temporary production incentives for cellulosic ethanol/BTL to spur investment

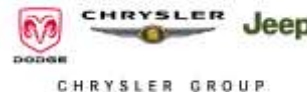


Barrier: Undefined B20 Fuel Specification

- A consensus specification is needed to support the use of B20 in retail applications, which can be used in diesel vehicles that are currently on the road
- DaimlerChrysler, GM and Ford are partnering with Next Energy, Bosch, Delphi, Biodiesel Industries, DoE, DoD, Michigan State University, and Wayne State University to develop a consensus specification for B20
- Parameters and limits which are not yet clearly understood include:
 - Stability
 - Density
 - Viscosity
 - Cold Operability
 - Emissions impacts



Enabler: Fully Fund Biofuels Provisions



**Table 1: Required Actions to enable Transportation Sector Road Map Goals
(List comprises a 10-year plan)**

Responsible Party	Category	Type	\$ National Investment	Timeframe	Total National Investment
Government (Appropriation of funding authorized in EPAAct 2005 -- the majority of these actions represent the full implementation [i.e., appropriation at the full level authorized] of the funding for cellulosic ethanol/BTL R&D and production which is already authorized under EPAAct 2005.)	Ethanol/BTL fuel production credit (Section 942 EPAAct of 2005): \$1.50 - \$0.75/gallon for cellulosic ethanol and BTL production to reach goal of 1 billion gallons of cellulosic ethanol	200 million gallons @ \$1.50/gallon PTC	\$300 million	FY 2008	\$2,830 million
		400 million gallons @ \$1.25/gallon PTC	\$500 million	FY 2009	
		600 million gallons @ \$1.00/gallon PTC	\$600 million	FY 2010	
		800 million gallons @ \$0.85/gallon PTC	\$680 million	FY 2011	
		1 billion gallons @ \$0.75/gallon PTC	\$750 million	FY 2012	
	R&D incentives	Biomass Research and Development Act of 2000, for research to increase biomass yield/acre and available acreage as amended by Section 941 of EPAAct of 2005	\$200 million/year	FY 2008 - FY 2015	\$1,600 million
		Section 1510, 1511(b) of EPAAct 2005 -- loan guarantees for commercial byproducts from municipal solid waste & cellulosic biomass; demonstration projects	\$250 million/proj.	4 projects: FY 2008 - FY 2011	\$1,000 million
		Section 1511(d) of EPAAct 2005 -- Renewable Fuel Production R&D Grants in RFG States	\$25 million/year	FY 2008 - FY 2010	\$75 million
		Section 1512 of EPAAct 2005 -- conversion assistance for cellulosic biomass, waste-derived ethanol, approved renewable fuels	\$400 million	FY 2008	\$400 million
		Additional research for cellulosic ethanol production process efficiency/yield improvements	\$1,000 million	FY 2010 - FY 2015	\$1,000 million
	Infrastructure incentives	Preprocessing and harvest demonstration grant program - Section 946 of EPAAct of 2005	\$5 million/year	FY 2008 - FY 2010	\$15 million
		E85 fueling station tax credit expansion - goal of E85 dispensing pump(s) at 10% of service stations nationwide	\$100 million/year	FY 2008 - FY 2012	\$500 million
	Fuel tax exemption	Continuation of the tax exemption for ethanol in gasoline		Phased out as improved biofuel processes achieve cost-competitiveness with gasoline	
		Continuation of the \$1.00/gallon subsidy for biodiesel			
	FFV CAFE credit	Continue FFV CAFE credit at maximum level of 1.2 mpg		FY2011MY +	
B20 CAFE credit	Establish CAFE credit for B20 capable diesel vehicles				
Auto Industry	FFV Production Commitment	Commit to 30% - 50% FFV production	\$100-\$425 million/year	2007 - 2012	\$1,500 million
Refueling Industry	E85/B20 Availability Commitment	Commit to E85 availability at 10% of stations nationwide by 2012	\$200 million/year	2008 - 2012	\$1,000 million
	Total All Investment				\$9.920 billion

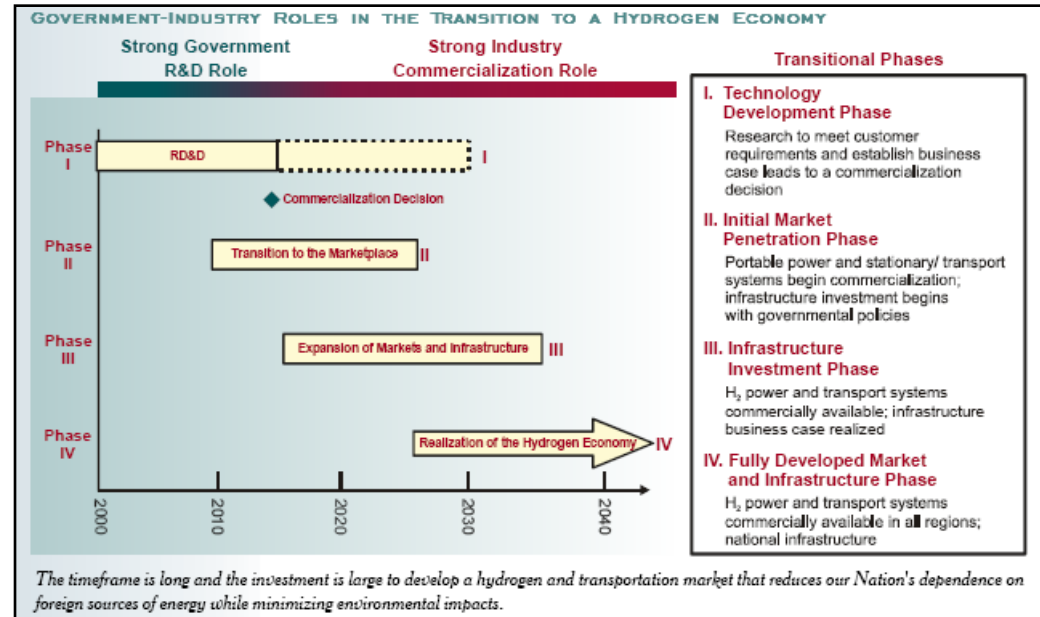
Enabler: Long-Term Funding of Hydrogen Economy

Barriers to Hydrogen Economy

- **Cost of hydrogen infrastructure**
 - Production
 - Delivery
 - Storage
- **Renewable Hydrogen Production**
- **Fuel Cell Technology Development**
 - Reduced cost (dollars per kilowatt-hour)
 - Extended range through
 - Improvements in onboard hydrogen storage to extend range
- **Codes and Standards**

Enablers for Hydrogen Economy

- **Core R&D Programs**
- **Outreach & Education**
- **Demonstration Programs**



- EAct funding to enable:
 - OEMs to commit to offer fuel cell vehicles no later than 2015
 - Energy companies to commit by 2015 to build a hydrogen infrastructure by 2002
- EAct Funding
 - Hydrogen supply-related activities of more than \$1 billion between FY 2006-2010, and such sums as necessary between 2011-2020.
 - Fuel cell technologies activities of more than \$850 million between FY 2006-2010, and such sums as necessary between 2011-2020.

- **Continue to develop and deploy advanced vehicle technology to achieve “maximum feasible” efficiency gains as economics and consumer preferences allow**
- **Commit to produce half of new vehicles capable of using alternative fuels by 2012**
- **Need price competitive biofuels to realize significant petroleum reductions:**
 - **Incentivize cellulosic ethanol/BTL and their production processes**
- **Develop needed B20 fuel specifications**
- **Develop processes needed to offer ethanol and biodiesel at a price at the pump at least equivalent to conventional gasoline and diesel on an energy equivalent basis without subsidy**