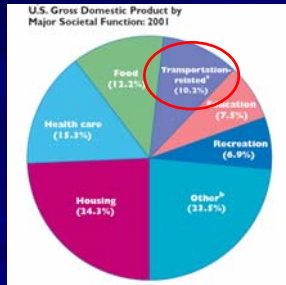


Clean Fuels, Clean Engines, and Clean Air

Chet France

Office of Transportation and Air Quality
U.S. Environmental Protection Agency

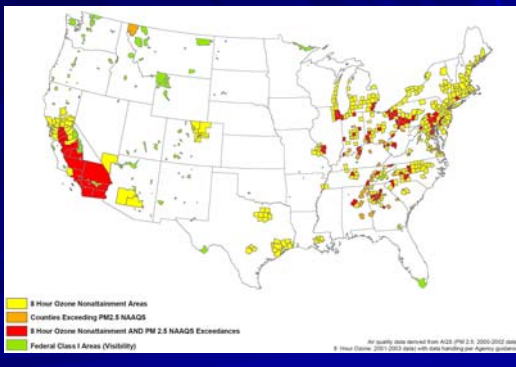
Transportation and the Economy



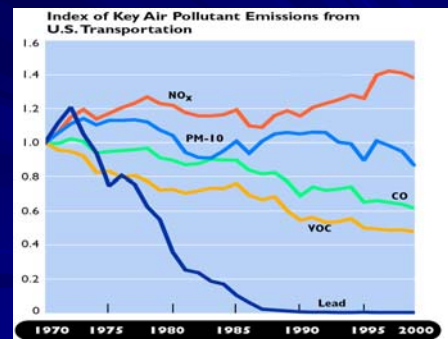
Mode	1970	1980	1990	2000	2001
Air carriers	2,679	3,808	6,083	8,055	8,477
General aviation	131,743	211,045	198,000	217,533	211,443
Highway vehicles	89,243,557	121,600,843	132,700,496	133,621,416	137,633,346
Motorcycles	2,824,998	5,493,940	4,257,462	4,344,048	4,260,977
Other trailers	42,035,911	27,875,934	48,274,555	76,084,979	81,187,438
Trucks Single-unit	3,681,402	4,373,794	4,486,988	5,924,111	5,703,500
Combination	955,082	1,416,819	1,708,895	2,096,141	2,154,179
Buses	377,562	528,789	626,987	746,123	745,434
Passenger rail					
Amtrak—Cars	N	2,128	1,863	1,894	2,084
Locomotives	N	419	318	378	401
Commuter railcars and locomotives	N	4,500	4,415	5,073	73,124
Transit	15,548	19,854	11,332	12,148	71,084
Freight rail					
Class I freight cars	1,422,921	1,148,114	658,902	560,154	499,860
Class I locomotives	27,077	28,994	18,835	20,028	19,745
Other freight cars	360,260	542,713	553,359	820,642	814,276
Nonself-propelled roadless freight	19,377	31,662	31,309	33,152	33,042
Self-propelled roadless	6,455	7,124	8,236	8,302	8,544
Overseas ships* (1,000 gross tons and over)	1,579	864	636	454	443
Recreational boats [†]	8,128,345	8,577,857	10,994,253	12,782,143	13,087,346

Source: U.S. Department of Transportation, Bureau of Transportation Statistics

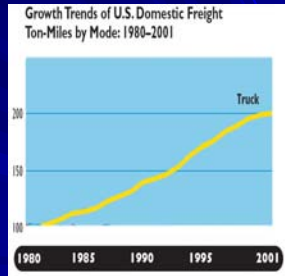
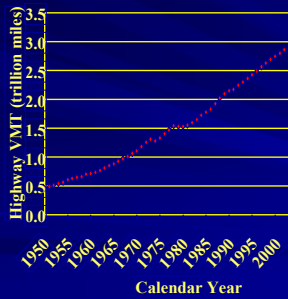
Transportation and the Environment



Emission Trends



Growth In Transportation Offsets Gains from Cleaner Vehicles

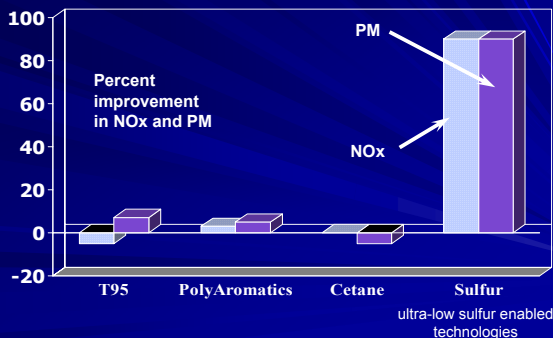


Source: U.S. Department of Transportation – Bureau of Transportation Statistics

EPA Clean Fuel & Vehicle Programs

- Tier 2 Standards (1999 rulemaking)
 - Gasoline sulfur control (30 ppm average)
 - Stringent light-duty vehicle standards (beginning in 2004)
 - Same standards for light trucks and cars
 - Same standards for gasoline and diesel
- Heavy-Duty 2007 Standards (2000 rulemaking)
 - Diesel sulfur control (15 ppm maximum, beginning 2006)
 - Stringent heavy-duty gasoline & diesel vehicle standards
 - PM filter forcing standards, NOx catalysts based standards
- Nonroad Tier 4 Standards (2004 rulemaking)
 - Diesel sulfur control (2 steps - 500 ppm in 2007, 15 ppm in 2010)
 - Stringent emission standards, based on on-highway standards
- Diesel Retrofit (ongoing)
 - Ultra-low sulfur diesel fuel enables diesel PM retrofits
 - Realize substantial air quality and health benefits earlier
- Locomotive and Marine Diesel Standards (rulemaking in process)
 - Marine diesel sulfur control (15 ppm maximum) in 2012
 - Considering requiring same technologies as on-highway and nonroad
 - Proposed rulemaking in 2005

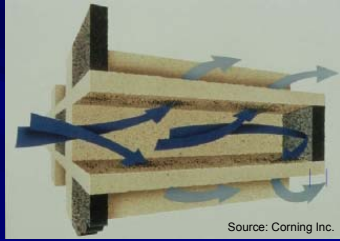
Why Focus on Ultra-Low Sulfur? Some Data On Fuel Effects



Why Ultra-Low Sulfur Fuels?

- Sulfur is a catalyst poison, harming catalyst function
- Removing sulfur, much like removing lead from gasoline, allows for maximum catalyst efficiency
 - All advanced catalyst technologies benefit from ultra-low sulfur fuel
- Reductions in fuel sulfur give immediate PM reductions
- Tier 2 Gasoline
 - New Tier 2 vehicles have near zero running emissions
 - Existing vehicles see significant improvement from the new fuel
 - Catalysts recover function lost due to sulfur in existing fuel
- Diesel (Highway and Nonroad) Diesel
 - Enables PM filters that can eliminate 99% of carbonaceous PM
 - Significant reductions of in-use PM due to near elimination of sulfate PM
 - Enables advanced NOx catalysts giving 90+% reductions
 - Enables diesel PM retrofit technologies

Enabling Near Zero Emission Levels

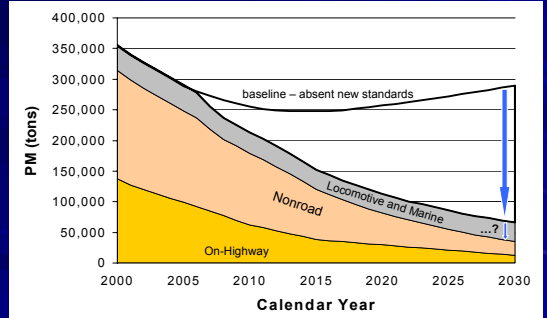


Source: Corning Inc.

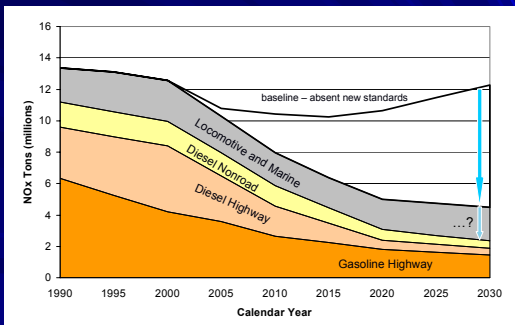
Catalyzed Diesel Particulate Filters (CDPFs) can eliminate 99% of solid particles (soot & metals) and eliminate >90% of semi-volatile hydrocarbons



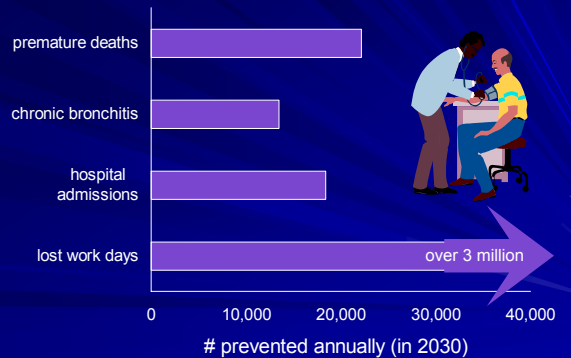
Clean Fuel and Vehicle Programs Diesel PM Reductions



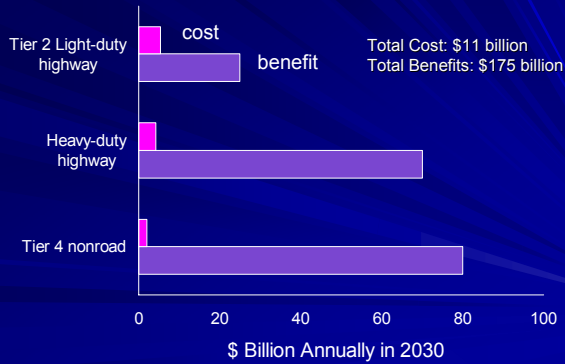
Clean Fuel and Vehicle Programs NOx Reductions



Benefits of Clean Fuel and Vehicle Programs



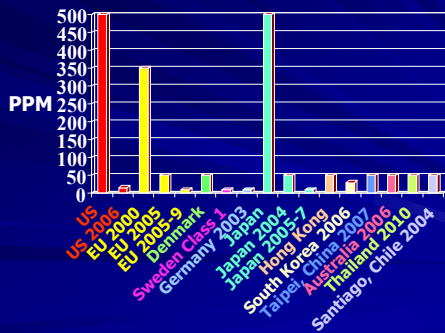
Costs & Benefits of Clean Fuels and Vehicles



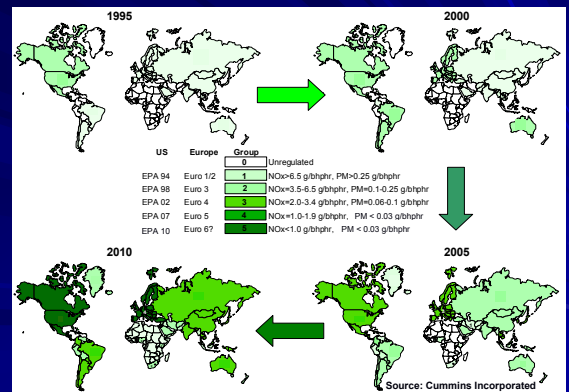
Retrofits – Why Wait for Benefits?

- Ultra-Low Sulfur Diesel Enables PM Retrofits
 - Realize significant environmental benefits from existing fleet
 - Don't have to wait for new vehicle fleet to turnover
- Technologies addressing diesel PM emissions
 - Diesel Oxidation Catalysts (DOCs)
 - Catalyzed Diesel Particulate Filters (CDPFs)
- EPA's Voluntary Diesel Retrofit Program
 - Building a market for clean diesel concepts
 - Accelerating the delivery of ultra-low sulfur diesel fuel
 - Developing business partnerships and relationships

Air Quality Needs Driving World to Ultra-Low Sulfur Diesel



Engine Standards Follow Ultra-Low Sulfur Fuel



Clean Fuels

It All Starts with Clean Fuels

Clean Vehicles

Clean Air

- Around the world, people are realizing the substantial public health hazards posed by diesel & gasoline vehicles
- The solution is in clean fuels and clean vehicles
 - remove the sulfur to enable PM and NOx catalysts
- Clean fuels also open the door for retrofits
 - to accelerate benefits and prove-out new technologies