California's Proposed Strategy to Reduce Emissions from On-Road Diesel Vehicles

December 11, 2008

California Environmental Protection Agency

Air Resources Board

Today's Presentation

- Introduction and overview
- Truck and Bus Regulation
- Truck and Trailer Efficiency Regulation
- Integration of the proposed regulations
- Availability of incentive funding
- Recap and closing

We Cannot Afford to Wait to Cleanup Exhaust Emissions

- Largest source of emissions
- State Implementation Plan (SIP)
  - Majority of reductions from trucks
- Cancer risk from diesel PM is high
- Thousands of lives lost each year
- No equivalent federal programs
- California leadership is critical

We Cannot Afford to Wait to Reduce Greenhouse Gas Emissions

- Discrete early action measure in Scoping Plan
- Progress towards meeting AB32 commitment
- Demonstrates California's leadership
- Substantial cost savings
- Benefits environment and economy

Timing is Challenging but the Need is Great

- Cost of inaction outweighs costs of clean-up
- Actions not required for several years
- Significant flexibility provided
- Minimizes costs and meets air quality goals
- Minimizes potential overlap of costs

Staff's Proposals

- Shaped by input from stakeholders
- Provisions to reduce costs
- Savings from improved efficiency
- Incentives
- No barriers to technology

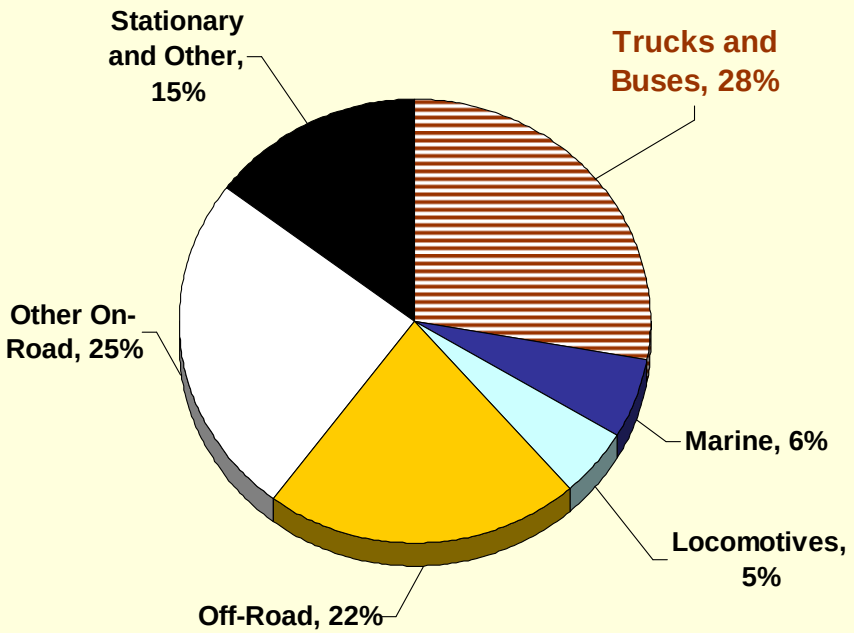
Proposed Truck and Bus Regulation

Truck and Bus Regulation Overview

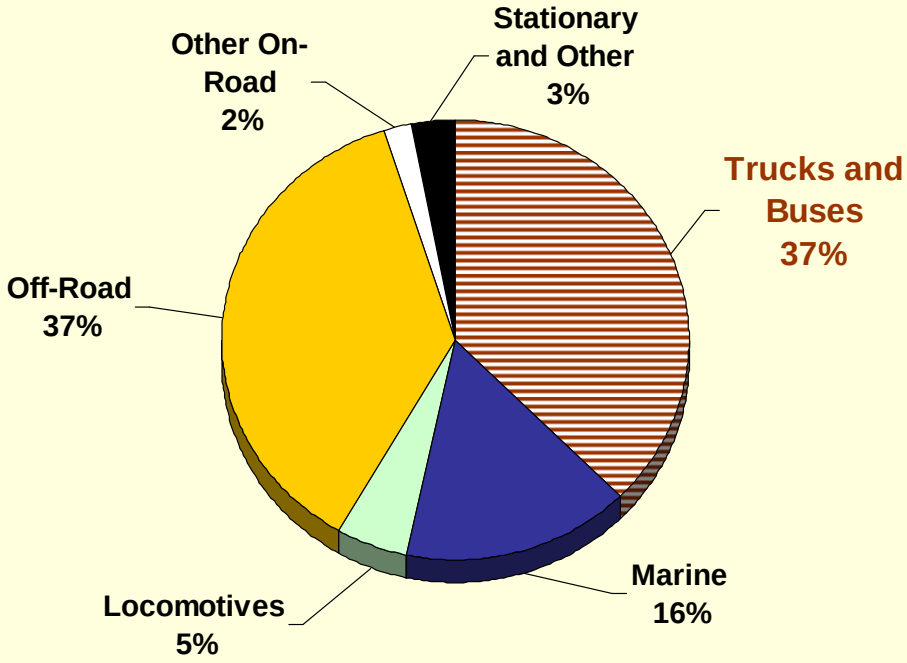
- Need for emissions reductions
- Proposed requirements
- Emissions benefits and costs
- Alternatives considered

Significant Contributors to Statewide Emissions: 2005

NOx



Diesel PM



Diesel Particulate Matter Exposure

- Trucks and buses largest source of diesel PM
- 70% of known cancer risk from all air toxics
- Diesel Risk Reduction Plan adopted in 2000
  - Risk reduction goals by 2010 and 2020

Area Designations for National Ambient Air Quality Standards for Ozone and PM2.5

8-Hour Ozone

15 areas violate the standard

PM2.5 Annual

2 areas violate the standard

Nonattainment

Unclassified/Attainment

State Implementation Plan

- Approved in September 2007
- Trucks largest component of SIP
  - Most significant measure
- Critical to attaining ozone and PM standards
  - South Coast: 2014 and 2023
  - San Joaquin Valley: 2014, 2017, and 2023

Significant Health Impacts from Trucks and Buses (2008)

Effect	Number of Cases
Premature deaths	4,500
Asthma related and lower respiratory symptoms	71,000
Work loss days	450,000
Restricted activity days	2,600,000

Truck and Bus Regulation: Proposed Requirements



Proposed Truck and Bus Regulation

- Diesel vehicles operating in California
  - Interstate, intrastate, international, and other
- Vehicles over 14,000 GVWR and shuttle buses
- Any person, business, or government agency who owns, leases, rents, or sells a vehicle in California
- Excludes certain vehicles

Diverse Vehicle Types Covered

Concrete Mixer

Dump Truck

Drill Rig

Water Truck

Hay Squeeze

Tow Truck

Reefer Van

Fuel Tank Truck

Passenger Bus

Overview of Proposed Regulation

- Phase-in most PM requirements 2011-2014
  - No action if not available or not safe
- Phase-in NOx requirements 2013-2023
  - New vehicles never required
- Certain special provisions
- Three compliance options

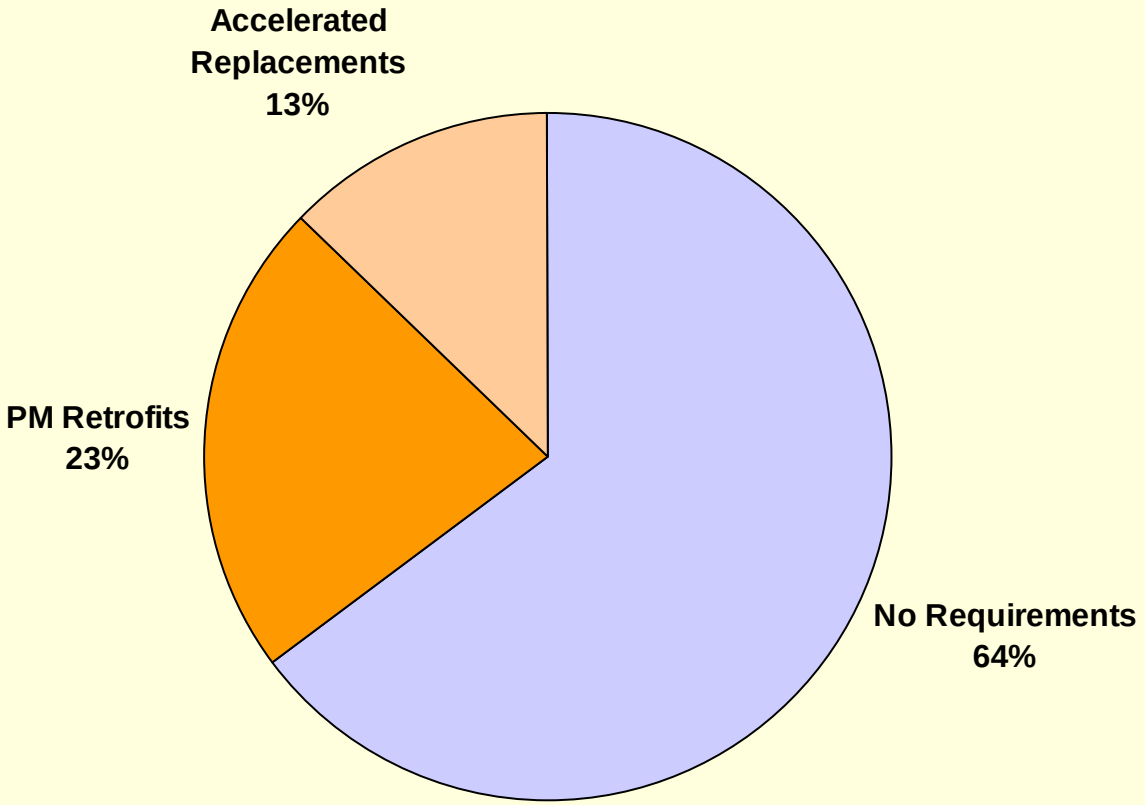
Compliance Options

- Best available control technology (BACT) schedule
- Percentage limits
- Fleet averaging

Only Older Vehicles Replaced

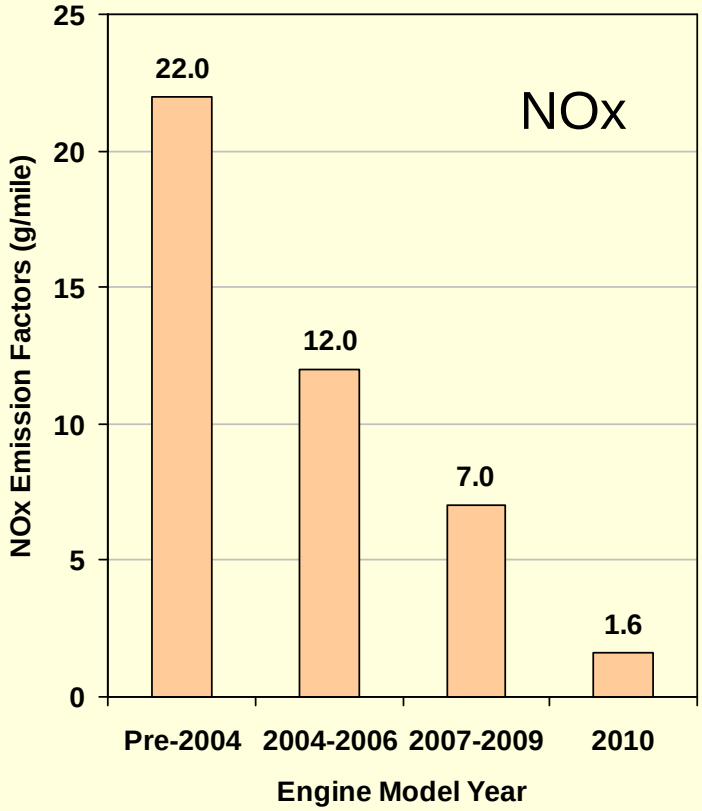
Calendar Year	Engine Age To Be Replaced (Years)
2013	14 -19
2014	12-14
2015	21+
2016	12-13
2017	11-12
2018	No replacement requirements
2019	
2020	
2021	14
2022	14
2023	14

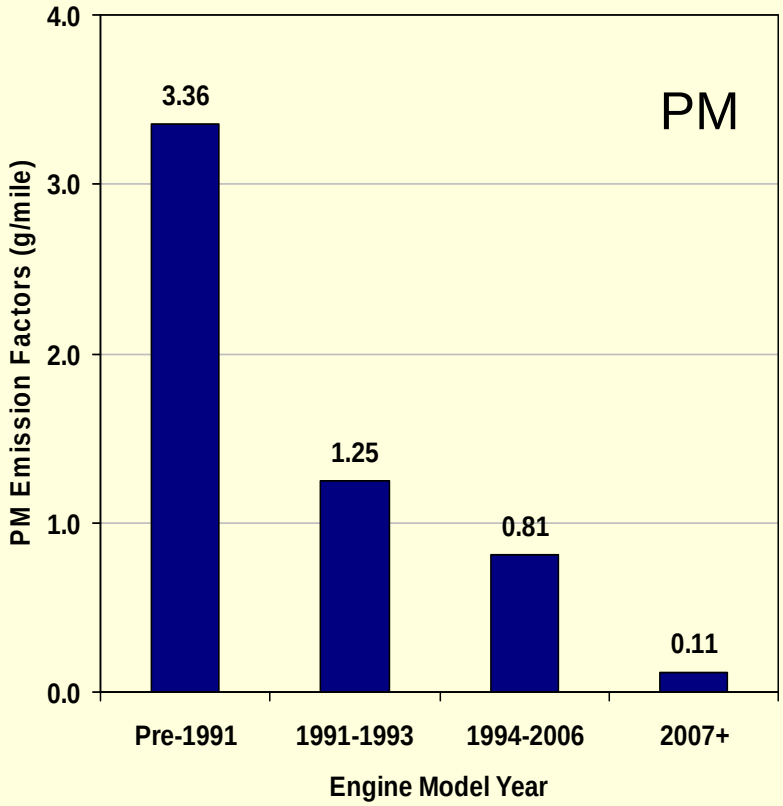
Accelerated Replacement Not Required for Every Truck



Number of Different Trucks Operating in California in 2008 = 941,000

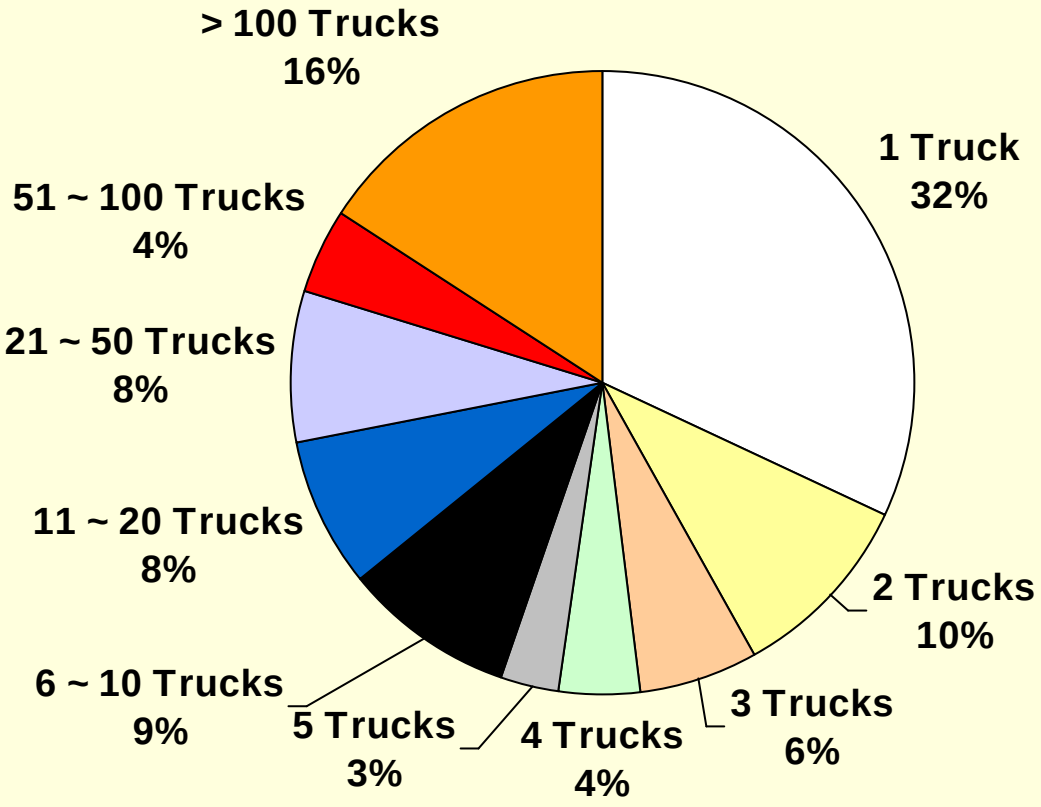
How Emissions Change with Engine Model Year





Note: For Heavy Heavy-Duty Vehicles (GVWR >33,000 lbs)

Percentage of California Trucks by Fleet Size



2006 DMV DATA: Heavy Heavy-Duty & Medium Heavy-Duty vehicle population

Optional Small Fleet Provisions

- Additional time for fleets up to 3 vehicles
- No clean up requirements before 2013
  - First vehicle with 2004 model year engine and filter until 2018
- Remaining vehicles upgraded 2014-2016
- Cleanest engines by 2023

Provisions to Delay Replacement Requirements

- Unique vehicles
- Cab-over engine truck tractors
- Early credit for filters
- Lower usage vehicles
- Attainment area operation

Attainment Area Counties - Alpine, Colusa, Del Norte, Glenn, Humboldt, Lake, Lassen, Mendocino, Modoc, Monterey, Plumas, San Benito, San Luis Obispo, Santa Barbara, Santa Cruz, Shasta, Sierra, Siskiyou, Trinity, Tehama, and Yuba

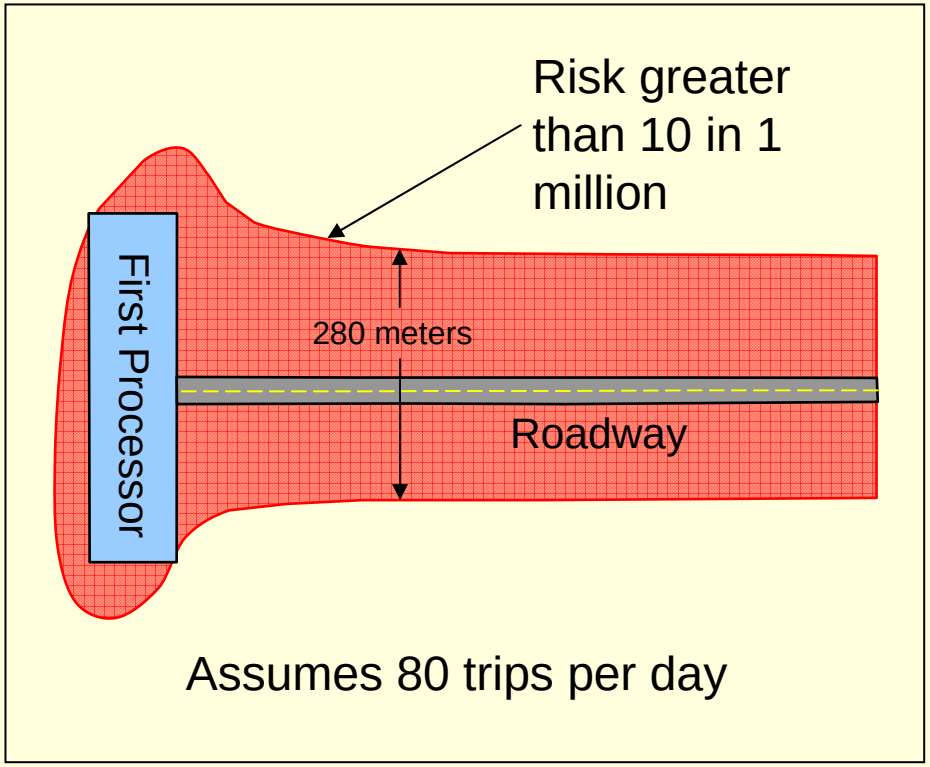
Other Key Provisions

- Very low use vehicles exempt from clean-up
- Credits for hybrid and alternative fueled vehicles
- Retrofit safety
- Manufacturer delays
- Three day pass for out-of-state trucks

Agricultural Vehicle Provisions

- Used exclusively in agricultural operations
- Exempt below mileage thresholds
  - 15,000/20,000/25,000 annual miles until 2017
  - 10,000 miles starting 2017
- Specialty farm vehicles exempt until 2023
- All trucks cleaned up by 2023

Screening Evaluation of Localized Risk



- Analysis of first processing center
- Potential for localized risk
  - Dependent on uncontrolled truck activity
- Further analysis and report to Board

School Buses

- PM requirements necessary
  - Pre-1977 bus replacements
- $200 million in Lower-Emission School Bus Program funding
  - Sufficient for 95% of costs
- Staff will monitor implementation

Technology Already Exists

- PM control technology
  - New engines equipped with filters nationwide
  - Thousands of retrofit filters in use
- NOx control technology
  - 2010 model year engines on schedule
  - SCR retrofit systems being demonstrated
- Sufficient new and used trucks available

Changes to Existing Regulations

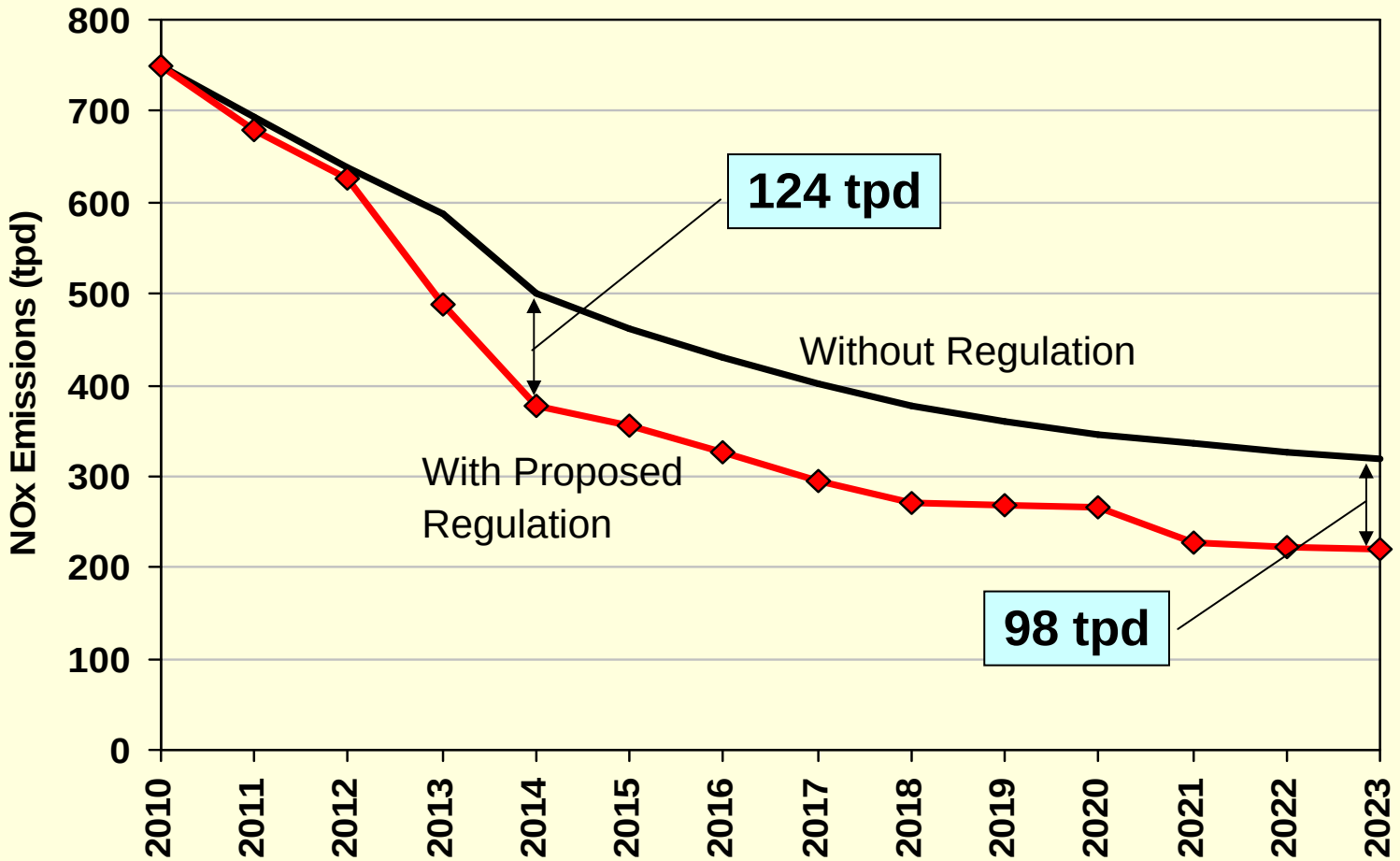
- Improve enforceability and clarity
- Includes:
  - Drayage truck regulation
  - Public fleet and utility regulation
  - Off-road vehicle regulation
  - Cargo handling regulation
  - Idling provisions
  - Portable Engine Registration Program
  - Portable engine regulation

Truck and Bus Regulation: Emissions Benefits and Cost

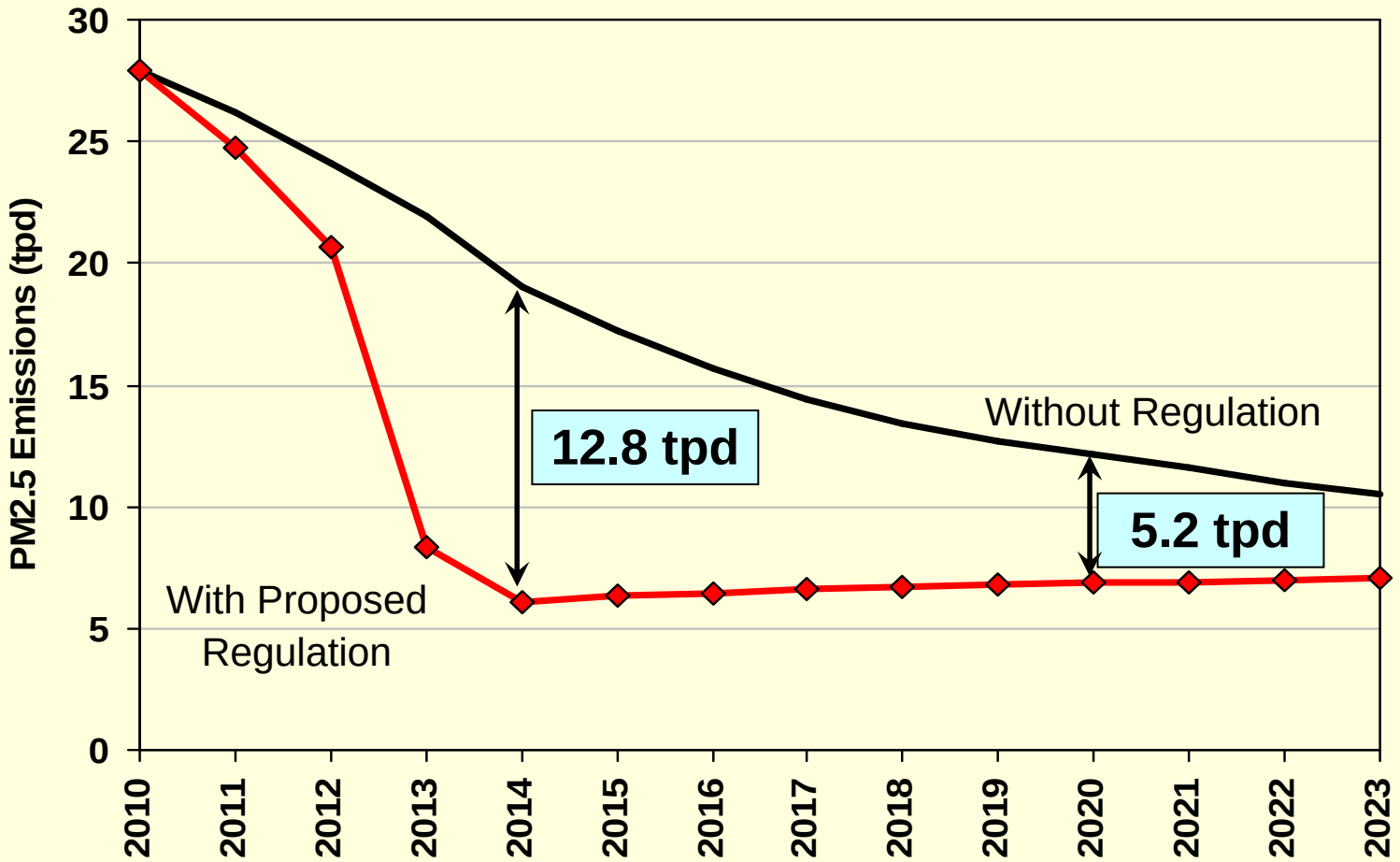
Updated Truck and Bus Emissions

- Builds on EMFAC2007
- Reflects multiple new data sources
- More detailed truck and bus categories
- Category-specific population, age distribution, and mileage accrual

Statewide NOx Emissions



Statewide PM2.5 Emissions



Overall Health Benefits

- Provides major health benefits
  - About 9,400 fewer premature deaths
  - 150,000 fewer lower respiratory and asthma-related symptoms
  - 950,000 fewer lost work days
- Value estimated to range from $48 to $68 billion
- Meets combined PM and NOx SIP targets for all years
- No other measures can provide same benefits

Statewide Costs

- Estimate at $5.5 billion (2010-2025)
  - $4.5 billion for California registered vehicles
  - $1.0 billion for out-of-state vehicles
- Cost effective compared to other regulations

Vehicle Prices Vary by Age

Conventional Truck Without Sleeper

Price (thousands of $)

120
100
80
60
40
20
0

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

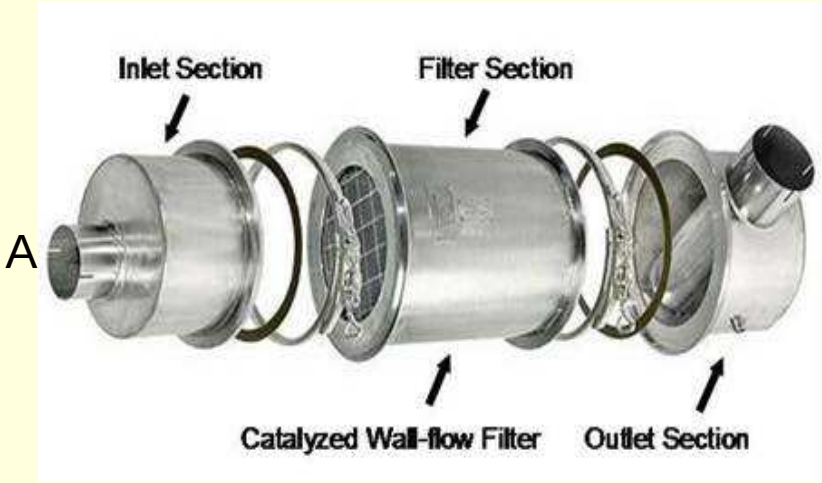
Vehicle Age

PM Retrofit Costs

PM Retrofits	Installed Cost
1994 and newer	$12,000*
Pre-1994	$15,000

* $11,000 for medium heavy-duty vehicles

Wall Flow Filter



Potential Cumulative Costs

- Evaluated impact with other rules
  - Transportation Refrigeration Units
  - Off-Road Regulation
- Evaluated several individual fleets
- Impacts relatively small
- Little overlap with Truck GHG regulation
- Lowered costs
  - Sweepers
  - Cranes

Impact on California's Economy is Small

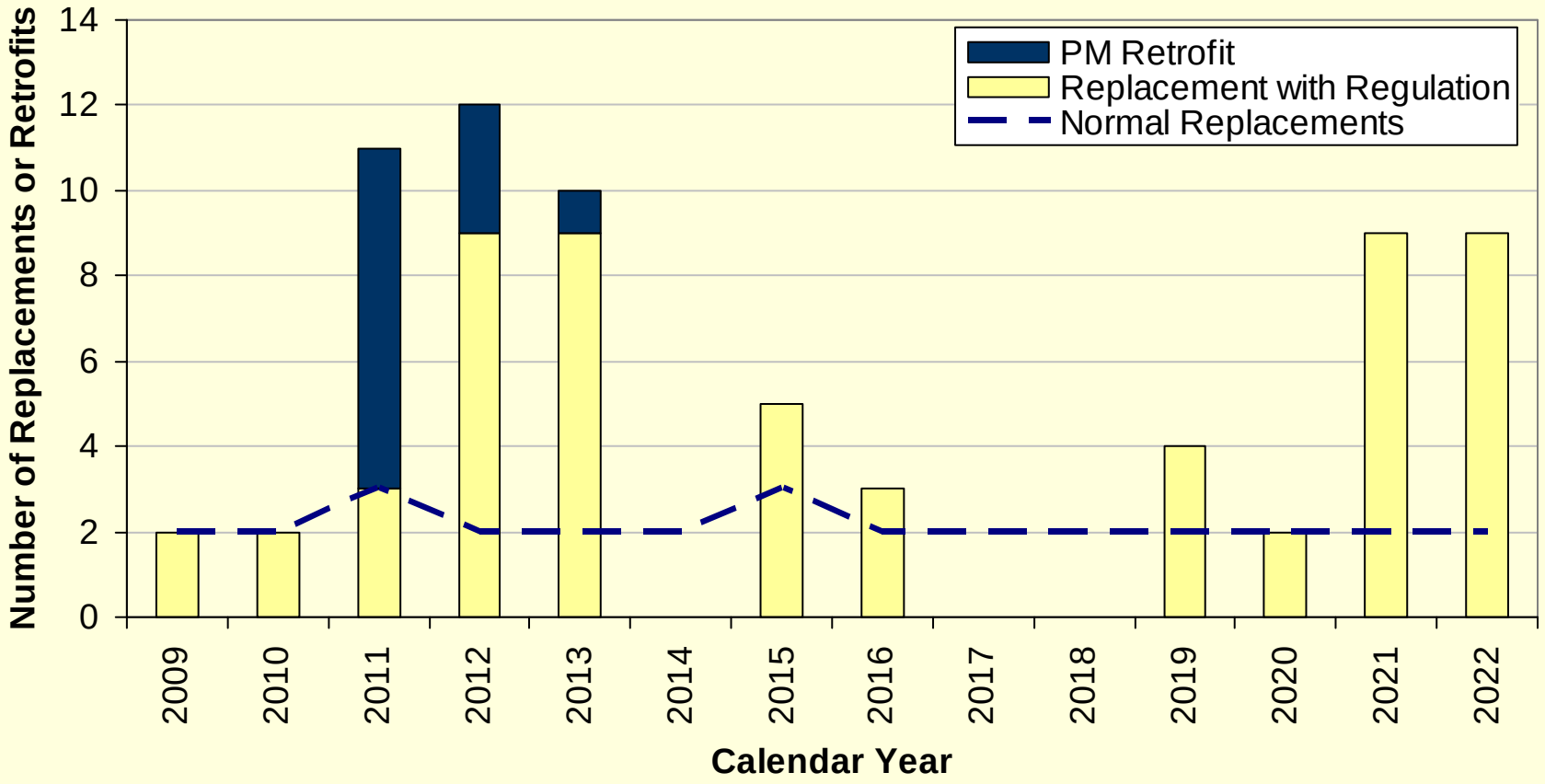
- California is a $3.1 trillion economy
  - Could reduce GDP by 0.014 percent
  - May slow job growth in some sectors, increase others
- Impact on consumers not noticeable
  - $0.01-$0.02 per pair of shoes
  - $3 to $10 for new car

Compliance Example: Actual Trucking Company

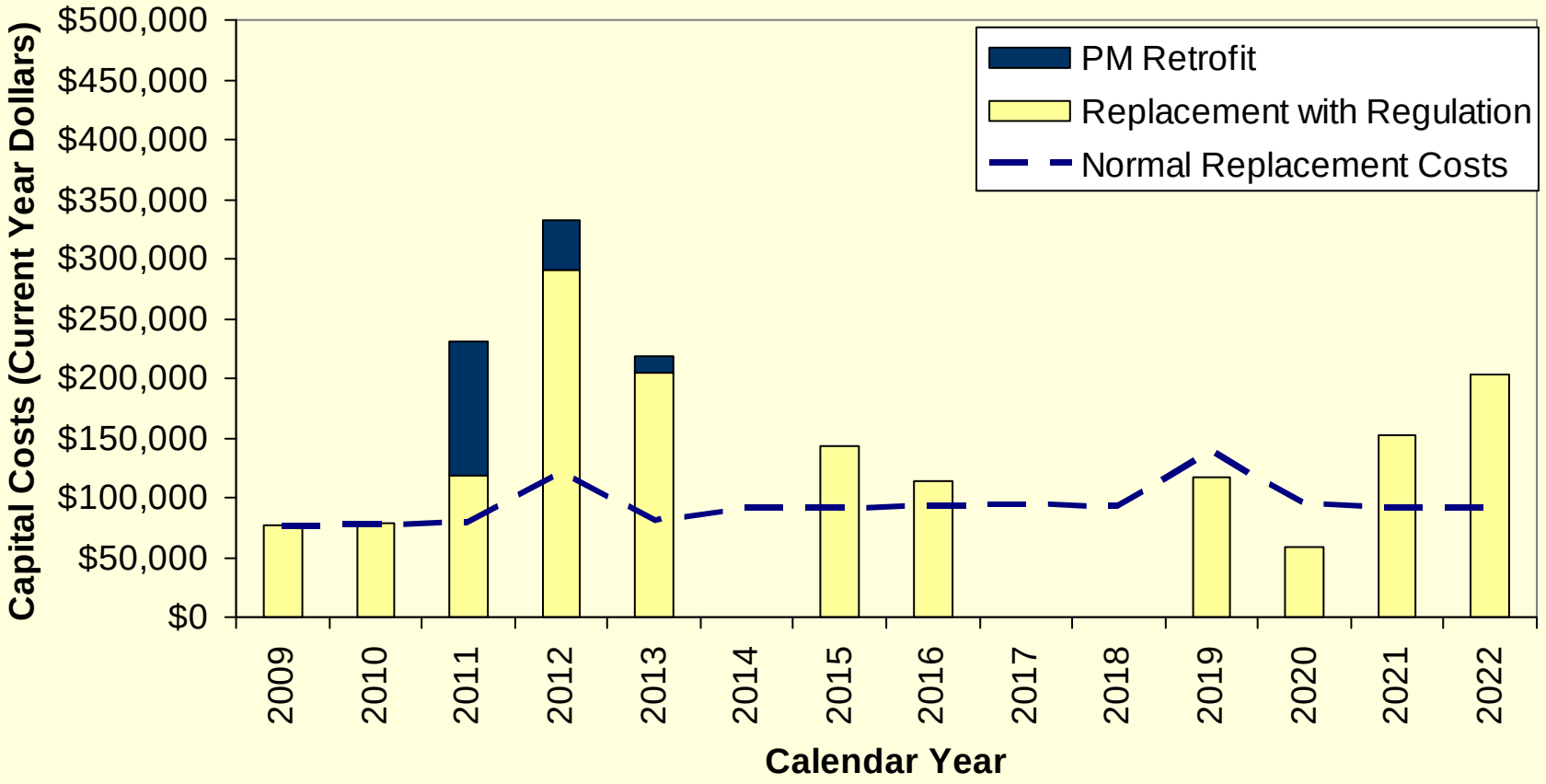
- Regional haul trucking fleet
  - Average age of vehicles 11 years
  - Normally replaces 2-3 per year
  - Normally buys 4 year old used
  - Annual revenue $3,500,000

Truck Engine Age	Number of Trucks
15	1
14	7
13	5
12	7
9	6
8	1
5	8
Total	35

What Actions Would be Needed?



Capital Investments

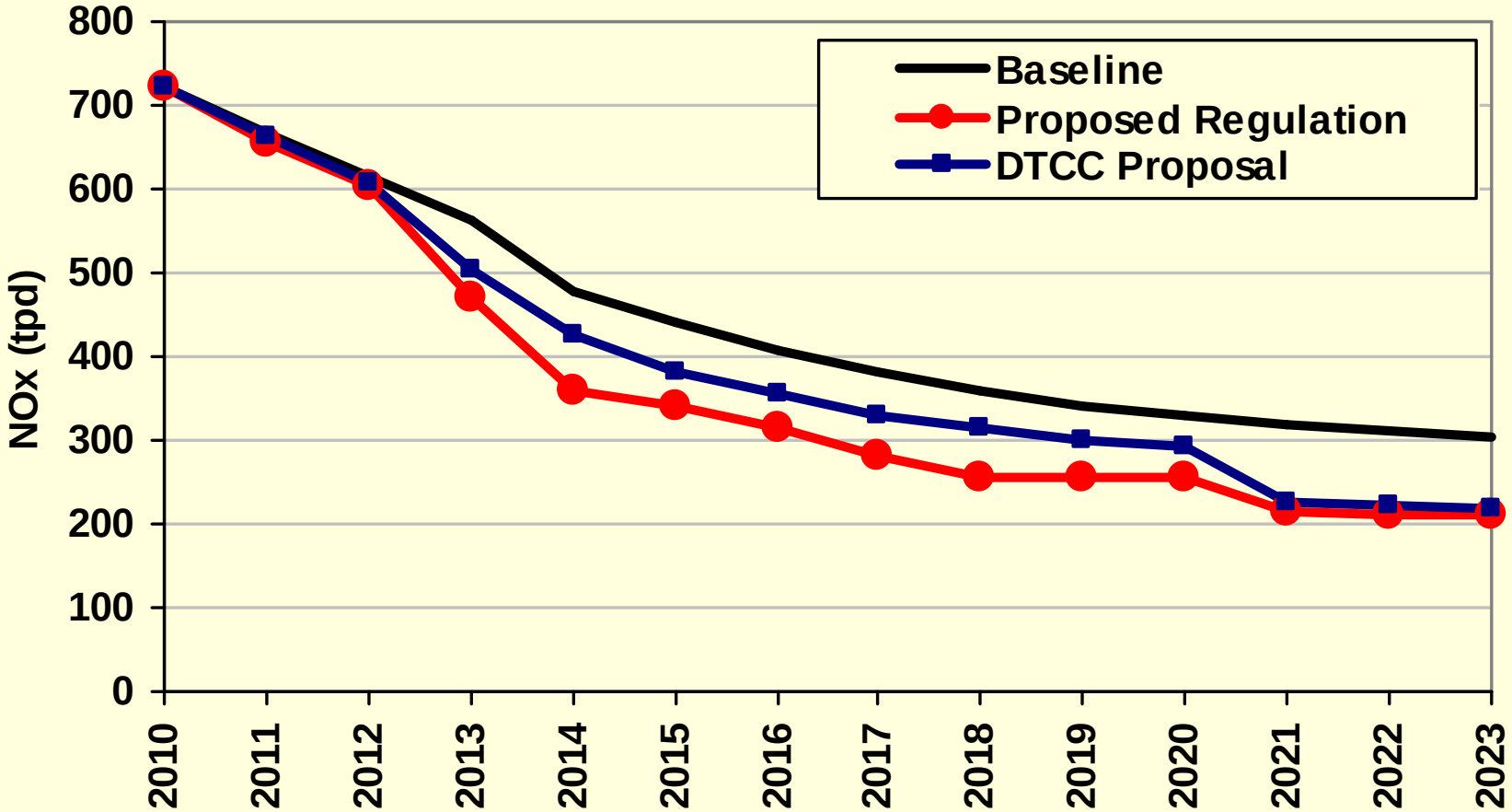


Implementation, Outreach, and Education

- Committed to work with industry
- Extensive outreach and education
- Compliance assistance
- Planning tools

Truck and Bus Regulation: Alternatives Considered

Fewer Benefits with Industry Proposal



Impact of Recession on Emissions

- Recession has resulted in fewer miles driven, lower diesel fuel sales, and reduced new truck sales
- Fewer miles driven lowers emissions
- But reduced truck sales means older higher-emitting trucks stay on the road
- Higher emission rates associated with older trucks may offset lower emissions due to less driving

Staff Recommended Modifications
Proposed 15-Day Changes

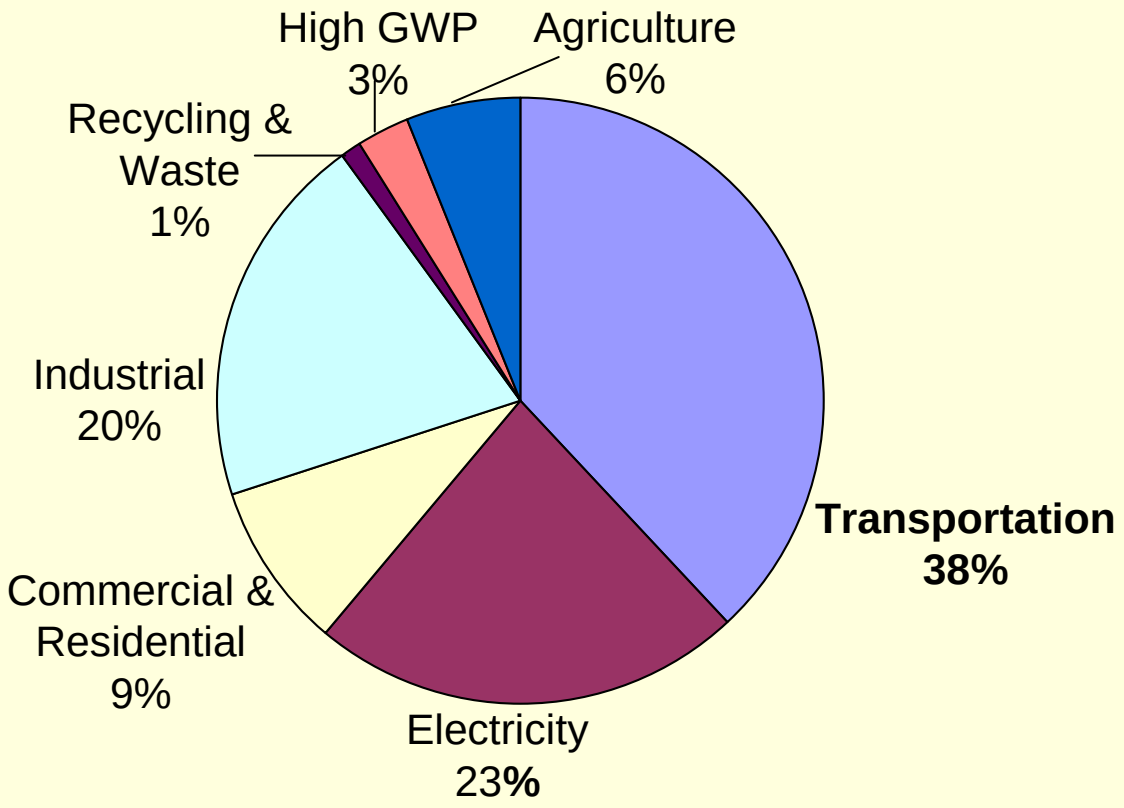
- Add retirement credit provisions
- More operating time for back-up sweepers
- Delay replacements for motor coaches
- Other clarifying and corrective changes

Proposed Truck and Trailer Efficiency Regulation

California GHG Emissions

2002-2004 Average

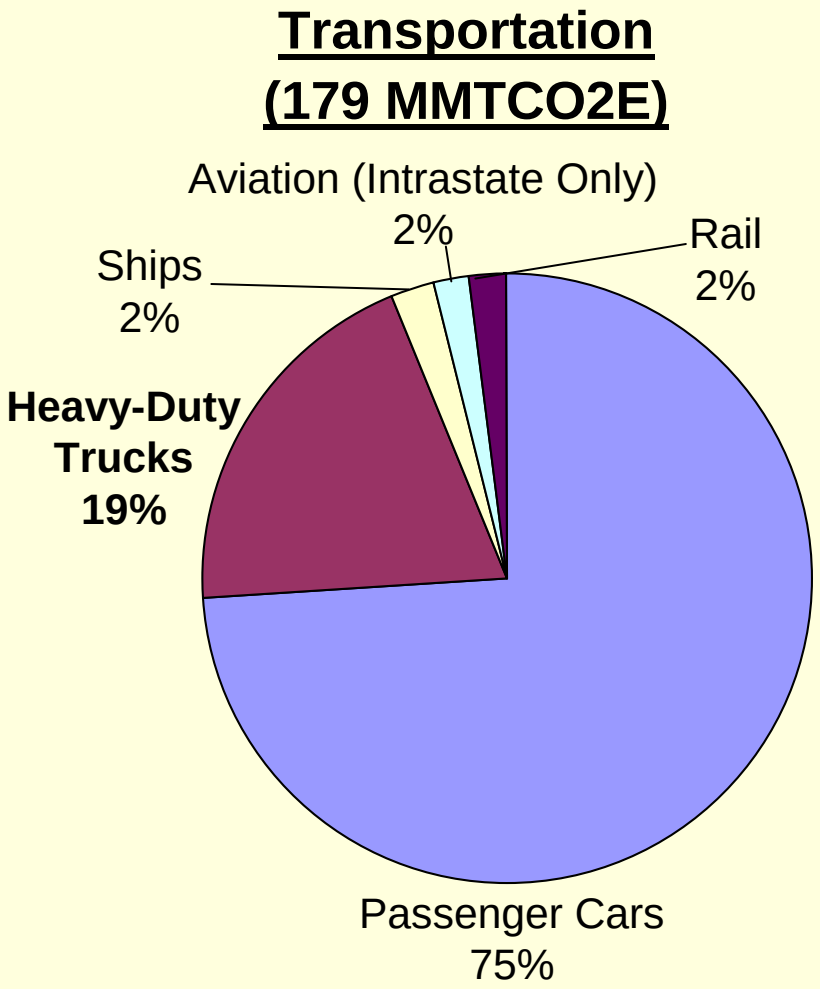
CA GHG Emissions
(469 MMTCO2E[1])



[1]MMTCO2E = million metric tons carbon dioxide equivalent emissions

California GHG Emissions

2002-2004 Average



[1]MMTCO2E = million metric tons carbon dioxide equivalent emissions

Goals of Proposed Regulation

- Reduce GHG emissions from long haul tractors by reducing
  - Tractor and trailer aerodynamic drag
  - Tire rolling resistance
- Tractor aerodynamics
  - Streamlined hood, sleeper cab roof fairings, gap fairings, fuel tank fairings, aerodynamic bumper, and mirrors
- Trailer aerodynamics
  - 53-foot or longer box-type trailers
  - Side skirts, front gap fairings, rear trailer fairings
- Low rolling resistance tires

Goals of Proposed Regulation (continued)

- U.S. EPA SmartWay Program
  - Voluntary partnership
  - Test protocols and guidelines
  - Certifies fuel efficient tractors, trailers, and technologies
- Staff proposal establishes a California mandatory program based on SmartWay Program

Impacted Tractors and Trailers

	Calendar Year 2010		
	CA	Out-of-State	Total
Tractors	37,000	399,000	436,000
Trailers	93,000	997,000	1,089,000

Available Technology (New)

New SmartWay Certified Tractors

- Fully aerodynamic tractor with low rolling resistance tires
- Manufacturers:
  - Freightliner, International, Kenworth, Mack, Peterbilt, Volvo
- Fuel efficiency improvement 3% - 4.5% - resulting in annual fuel cost savings of $1,800
- Average incremental cost: $2,100

Available Technology (New)

NEW SmartWay Certified Trailers

- Purchased directly from trailer manufacturer/dealer:
  - Great Dane, Hyundai Translead, Manac, Stoughton Trailers, Strick Corp., Trailmobile Canada, Utility Trailer Manufacturing, Wabash National Corp.
- Fuel efficiency improvement of 6.5% minimum - resulting in annual fuel cost savings of $1,300 to $3,300
- Trailer incremental cost: $2,900
- Refrigerated-van certification coming soon

Available Technology (In-Use Retrofit)

SmartWay Verified Aerodynamic Technologies

- Side skirts
  - 4% or greater fuel efficiency improvement
  - Fleets have experienced positive results
  - Average cost: $1,900

Available Technology (In-Use Retrofit)

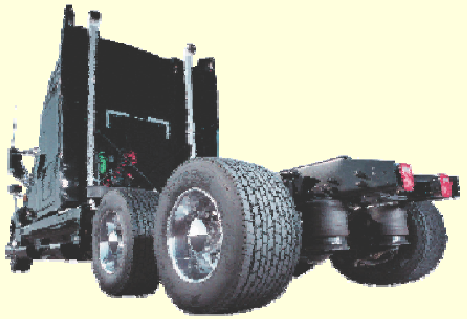
SmartWay Verified Aerodynamic Technologies (continued)

- Front gap fairings
  - 1% or greater fuel efficiency improvement
  - Average cost: $870
- Rear trailer fairings
  - 1% or greater fuel efficiency improvement
  - Average cost: $2,800

Available Technology (New and In-Use Retrofit)

SmartWay Verified Low Rolling Resistance Tires

- Dual or single wide tires
  - 3% or greater fuel efficiency improvement (tractor-trailer combination)
  - Incremental cost: $0 to $50 per tire ($0 to $900 per tractor-trailer)



Emerging Technologies

- Manufacturers continuously developing & improving product functionality & durability
  - Retractable skirts
  - Flexible skirts
  - Double channel skirts
  - Flow control devices

Retractable Skirts

Flow Control Devices

Double Channel Skirts

Flexible Skirts

Scope of Regulation

- Tractors that pull box-type trailers that are 53-foot or longer
  - Greater than 26,000 pounds (Class 7 and 8)
  - Operate in California
- 53-foot or longer box-type trailers
  - Dry van and Refrigerated van
- California and out-of-state registered
- Primary responsible parties: Owners
- Other responsible parties: drivers, motor carriers/ CA-based brokers, and CA-based shippers

Proposed Requirements

Tractors

- 2011+ model year (MY) sleeper cab tractors
  - SmartWay certified
  - January 1, 2010
- 2011+ MY day cab tractors
  - SmartWay verified low rolling resistance tires
  - January 1, 2010
- All pre-2011 MY tractors
  - SmartWay verified low rolling resistance tires
  - January 1, 2012

Proposed Requirements
Trailers

- 2011+ MY 53-foot or longer box-type
  - SmartWay certified *or*
  - Retrofitted with SmartWay Technologies:
    - Low rolling resistance tires
      - Minimum of 1.5% fuel efficiency improvement
    - Aerodynamic devices
      - Minimum of 5% fuel efficiency improvement for a dry van, and
      - Minimum of 4% fuel efficiency improvement for a refrigerated van

Proposed Requirements
Trailers
(continued)

- Pre-2011 MY 53-foot or longer box-type
  - Same requirements as 2011+ MY trailers
  - Delayed compliance until January 1, 2013
  - Three Optional Plans
    - Small Fleet Compliance Plan
    - Large Fleet Compliance Plan
    - Reefer Van Compliance Plan

Proposed Requirements

Optional Compliance Schedule
- 2010 and Older MY Trailers -

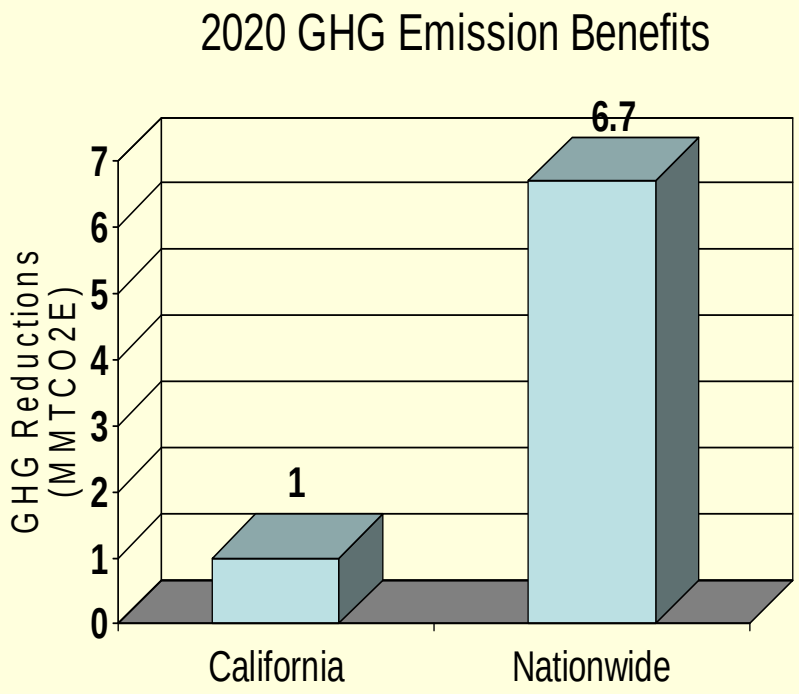
- Small fleet – 20 or less trailers
  - Phase-in: 2013 - 2016
- Large Fleet – 21 or more trailers
  - Phase-in: 2010 - 2015
  - Early compliance credit
- Refrigerated van – 2003-2008 MY
  - Phase-in: 2017 - 2019

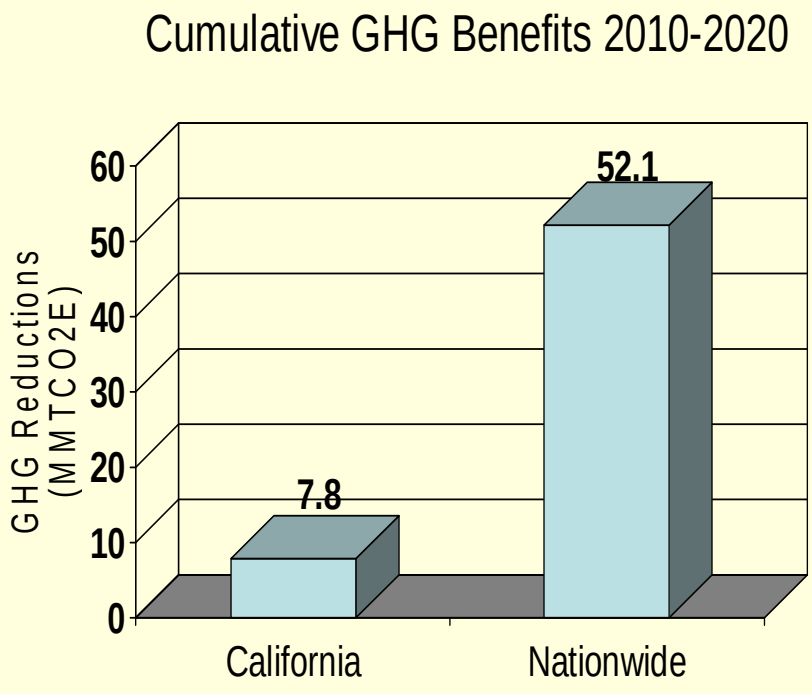
Proposed Requirements

Exemptions

- Short haul tractors and trailers
  - 100 mile radius or less than 50,000 miles per year
- Drayage tractors and trailers
  - Operate 100 mile radius of port or intermodal rail yard
- Container chassis
- Drop frame vans
- Curtain side vans
- Authorized emergency vehicles
- Military tactical vehicles

GHG Emission Benefits (MMTCO2E)





Additional Benefits

- NOx reductions in California
  - 2014 = 4.3 tons per day
  - 2020 = 1.4 tons per day
- Contribute towards SIP commitments
- Cumulative fuel savings (2010-2020)
  - California = 750 million gallons diesel fuel
  - Nationwide = 5 billion gallons diesel fuel

Costs and Benefits

	Tractor-Trailer Combination	
	New SmartWay Certified	**In-Use Retrofitted**
Fuel Savings (%)	10%	8%
Tractor incremental cost	$2,100	$250
Trailer incremental cost	$2,900	$2,900
Fuel savings (gallons/year)	1293	1034
Annual Savings @ $3.14/gallon	$4,060	$3,250
Payback period in years		
(Trailer : Tractor = 1:1)	**1.2**	**1.0**
(Trailer : Tractor = 2.5:1)	**2.3**	**2.3**

Assume: baseline fuel economy of 5.8 miles per gallon, and an average long haul annual mileage accrual rate of 100,000 miles.

Economic Impacts

- Initial capital cost to businesses significant
  - But so are the fuel savings
- Costs and savings to businesses 2010-2020
  - Costs ≅ $8.5 billion
  - Savings ≅ $17.1 billion
- Net savings (2010-2020) ≅ $8.6 billion

Proposed 15-Day Changes

- Remove 100-mile operating range exemption for tire requirement
- Remove reporting requirements for refrigerated van compliance provision
- Exempt solid waste trailers
- Other minor modifications

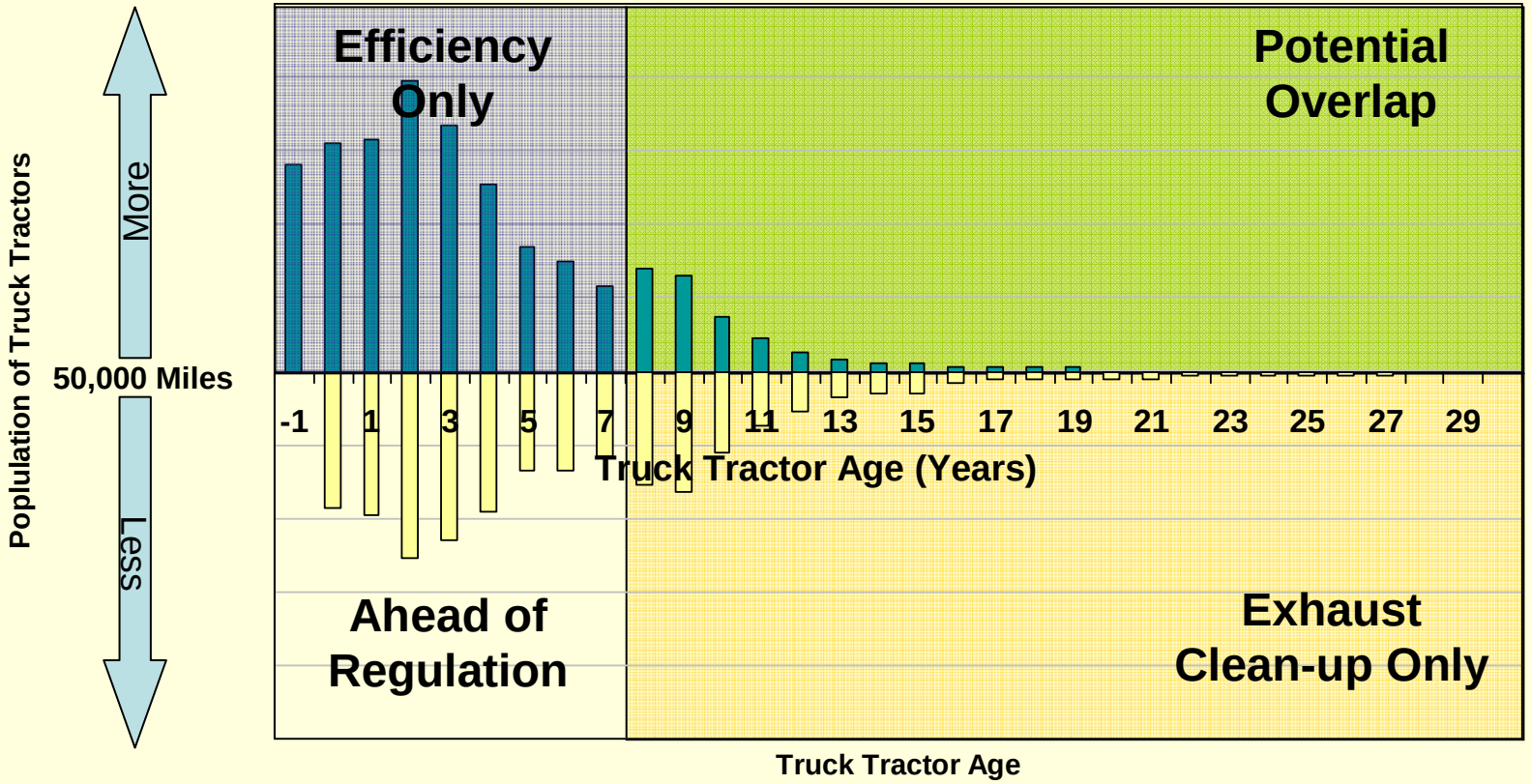
Integration of Proposed Regulations

Each Regulation Targets Different Fleets

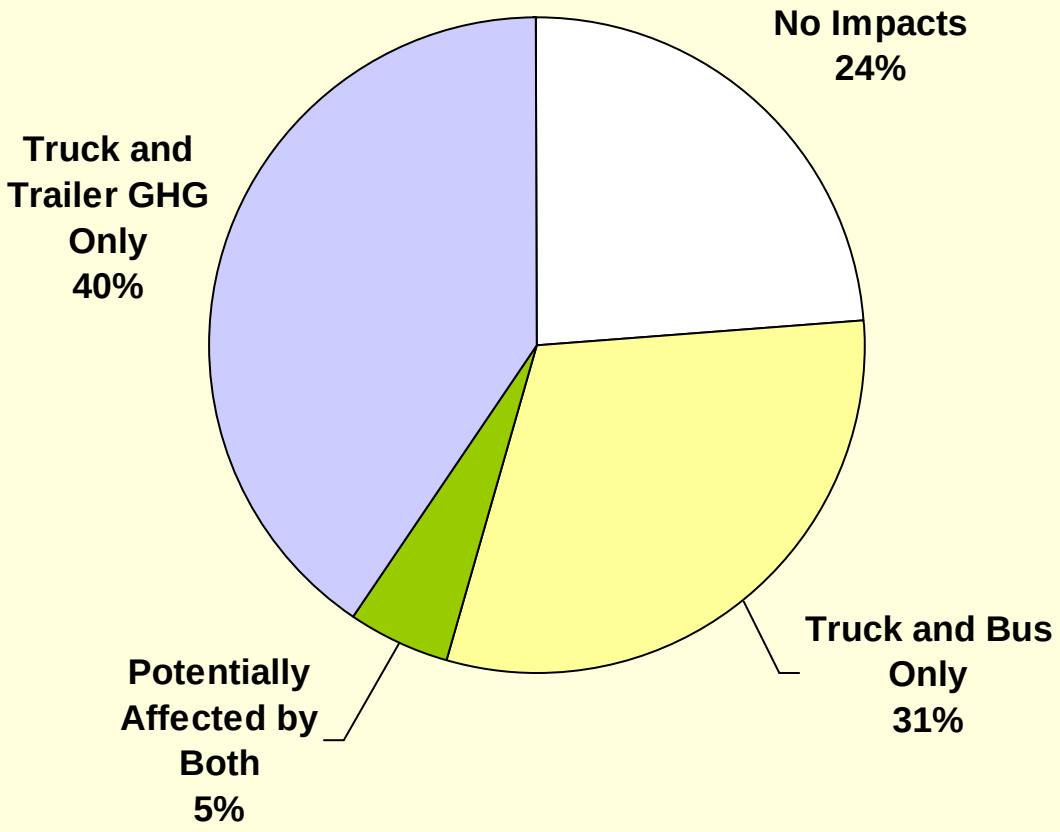
- Truck and Trailer GHG Regulation
  - Newer long haul fleets
- Truck and Bus Regulation
  - Older in-state fleets
- Different compliance timelines
- Incentives available for both

Potential Overlap is Minimal

In-State and Out-of-State Tractors



Few Trucks Have Overlapping Costs



Enforcement to Ensure Equity

- Expand existing inspection efforts
  - Weigh stations, random roadside, and fleet
- Web based database for vehicle records
- Crosscheck other programs
- Record audits
- Additional resources requested

Availability of Incentive Funds

Incentive Funding Will Play An Important Role

- Economic challenges
- Obtaining traditional credit difficult
- Substantial grants available
- Couple with loan guarantees
- Funding provides critical role

Incentives Portfolio

- Carl Moyer Program
  - About $140 million per year
  - Funds available for grants and vouchers
- Proposition 1B
  - $1 billion over several years
  - Funds available for grants and loan guarantees
- Assembly Bill (AB) 118
  - $350+ million for low interest loans
- Lower Emission School Bus Program
  - About $200 million for replacements and retrofits

Selected 2009 Changes to Carl Moyer Guidelines

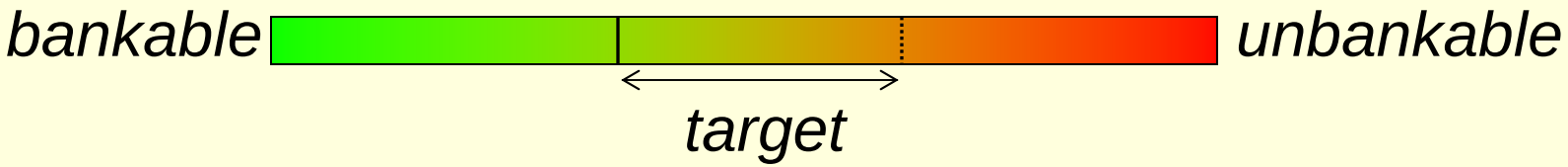
- Facilitate funding for small fleets
- Add three years of model year eligibility
- Add additional flexibility for minimum project life
- Add “Two Vehicles to One” option
- Grantees: use BACT Compliance Schedule during contract

Carl Moyer Program: Vouchers

- New grant option beginning in 2009
- Provides approx. $30,000 - $35,000 per truck
- Simplified requirements
  - Quick turn around (1 week)
  - Voucher good at participating truck dealers
  - Available statewide
- Can be combined with loan guarantee

AB118 Loan Guarantee Program

- Priority for small fleets and those with “financial hardship”
- Target “nearly bankable” small businesses



- Loans available by Spring 2009
- Loans for used trucks, new trucks, SmartWay products and exhaust retrofits

Proposition 1B Funding

- $1 billion over several years
  - First installment of $250 million in 2007-2008
  - Second installment of $250 million in 2008-2009
- Replacement funds available for 2003 and older trucks
- Available for large and small fleets
- Grants competitive: cost-effectiveness & reductions
- Loan guarantee program for small fleets in development
- Guideline revisions scheduled for February 2009
  - Add funding options for Class 7 trucks (over 31,000 GVWR)
  - Fund small fleets 2 years before compliance deadline

Funding Options for Small Fleets

(1-3 trucks)

- Fleet Modernization Grants (old truck 1993 or older)
  - Up to $50,000 for 2007-2009 replacement truck
  - Up to $75,000 for 2010+ replacement truck
  - Exhaust retrofits (up to 100% of cost)
- Voucher Program (old truck 1993 or older)
  - Approx. $30,000 - $35,000 for replacement truck
  - Focus on quick turn-around (one week)
- Truck Replacement Grants (old truck 2003 or older)
  - Up to $35,000 for 2007-2009 used replacement truck
  - Up to $45,000 for 2007-2009 new replacement truck
  - Up to $50,000 for 2010+ replacement truck
  - Funding also available for retrofits and repowers
- Loan Guarantees
  - Lower interest rates and qualification criteria
  - Loans for new & used trucks and SmartWay products

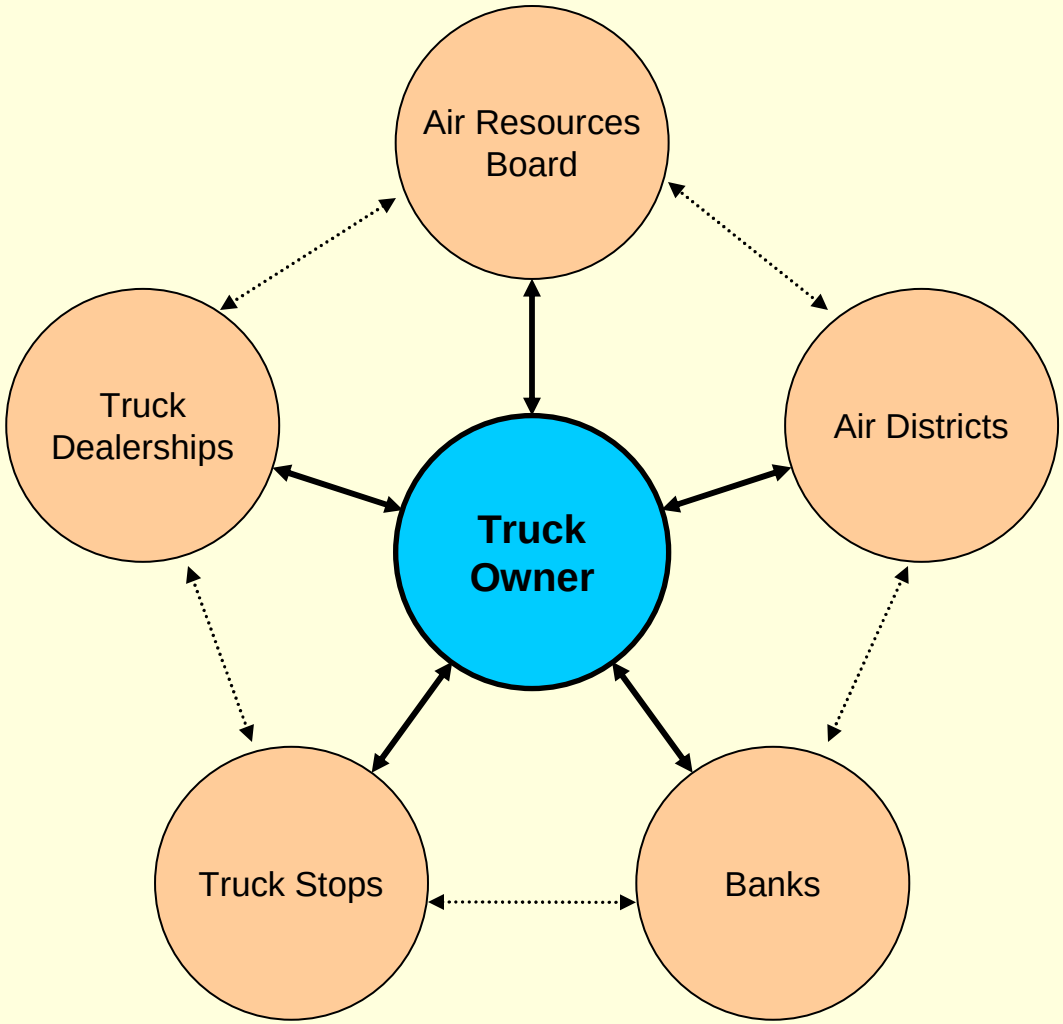
Funding Options for Large Fleets
(4 or more trucks)

- Truck Replacement Grants (old truck 2003 or older)
  - Up to $35,000 for 2007-2009 used replacement truck
  - Up to $45,000 for 2007-2009 new replacement truck
  - Up to $50,000 for 2010+ replacement truck
  - Funding also available for retrofits and repowers
- Loan Guarantees
  - Potential funding for fleets in “financial hardship”
- Retrofits
  - Limited funding for Level 3 exhaust retrofits
  - Future funding opportunities for NOx retrofits that bring used trucks into compliance

Funding Options for Other Fleets

- Agricultural Vehicles
  - Limited use vehicles: through 2013
  - Low use & specialty vehicles: through 2019
- School Buses
  - $200 million Lower Emission School Bus Program
    - At least 3,500 exhaust retrofits
    - Funding could retrofit every eligible public school bus
  - Additional local and state funds

Program Provides Multiple Access Points



Incentives Portfolio Summary

Fleet Type	Programs	For What	Source(s)
Small fleet (1-3 trucks)	Grants; Vouchers; Loan guarantee	Replacement of 1993 or older truck with 2007 or newer truck;	Carl Moyer AB 118
		Replacement of 1993 or older truck with 2010 or newer truck	
		Exhaust retrofit	
Fleets moving goods in a trade corridor	Grants	Replacement of 2003 or older truck with 2007 or newer truck; Exhaust retrofit;	Proposition 1B
1-10 trucks (financial hardship)	Loan guarantee	2007 or newer truck; Exhaust retrofit; GHG Efficiency	AB 118

Tying it all Together

- Many funding options, significant aid
- Coordinated programs: grant programs as down-payment, loans can complement
- Integrated outreach to best assist affected fleets
- Coordinated approach can get new truck ~ $800 per month

Recap and Closing

Importance of Proposed Truck and Bus Regulation

- Largest component of SIP reductions
  - Cannot attain PM and ozone standards
- Billions in transportation funding at risk
- Thousands of lives at stake
- Benefits outweigh costs
- State's obligations cannot be delayed
  - Industry alternatives do not meet SIP targets

Importance of Proposed Truck GHG Regulation

- Key early action measure in Scoping Plan
- Investment pays for itself
- Environmental benefits

Needed Technology is Available Now

- Numerous retrofits verified
- New trucks already have filters
- 2010 engines on track
- Low-rolling resistance tires common
- Smartway tractors available
- Trailer retrofits now in use

Minimizes Economic Impacts

- No actions required until 2010
- Significant flexibility provided
- Small fleets have additional time
- Newer trucks ahead of exhaust requirements
- Little overlap from both regulations

Incentives Will Play an Important Role

- Over $1 billion is available
- Will target those most in need…small fleets
- Numerous ARB programs being coordinated
- Private lenders will be key partners

Recommendation

- Adopt staff proposal with 15-day changes
- Direct staff to:
  - Evaluate and report on localized impacts from agricultural provisions by end of 2009
  - Monitor potential impacts on pupil transportation