

# Workshops Regarding the Off-Road and the Truck and Bus Inventories and Regulatory Amendments

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## Workshops

May 6 - Sacramento

May 12 - El Monte

May 18 – Central Valley

California Environmental Protection Agency

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Air Resources Board

# Agenda

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- **Overview**
- **Emissions Inventory Presentation and Public Discussion**
- **Break**
- **Truck and Bus Regulation Presentation and Public Discussion**
- **Off-road Regulation Presentation and Public Discussion**



# Overview



# 10 Guiding Principles for Amendments to Both Regulations

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1. Continue progress toward cleaner air
2. Maintain public health benefits
3. Meet SIP commitments
4. Incentivize greenhouse gas reductions
5. Improve cost effectiveness
6. Lower peak year costs
7. Consider cumulative impact of both regulations
8. Provide most relief to fleets hardest hit by recession
9. Ensure emission reductions as economy recovers
10. Support clean technologies

# Board Directives from April

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- Revise emissions projections
- Meet SIP commitment and maintain public health benefits
- Consider on-road and off-road regulations together
- Reward fleets that have taken action to comply
- Explore ways to increase opportunities for incentive funds
- Consider ways to improve access to capital
- Design amendments to reduce peak year costs

# Emissions Inventory Development for the In-Use Off-Road and Truck & Bus Regulations

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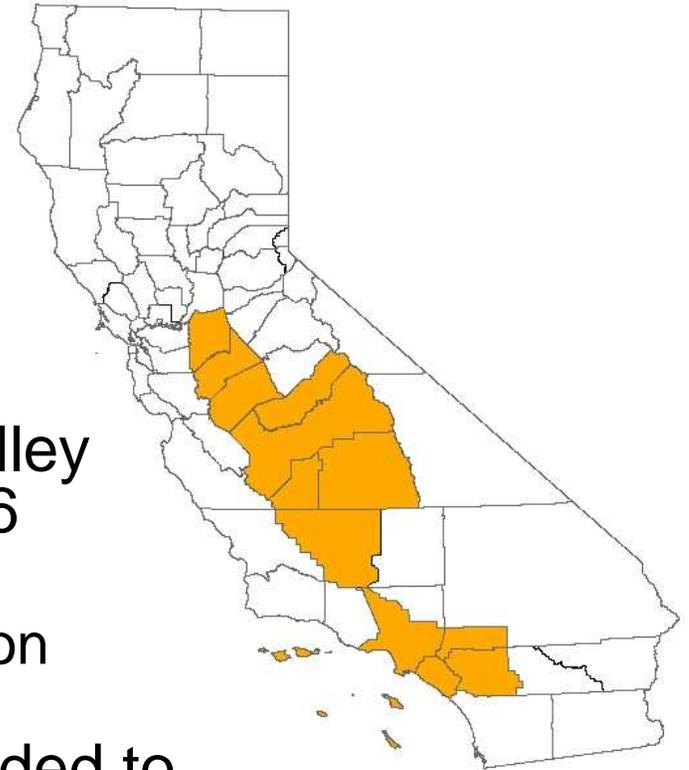
# Outline

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- State Implementation Plans
- Emission Inventory Approaches
- Rule Inventory Improvements
- South Coast Emissions Margin

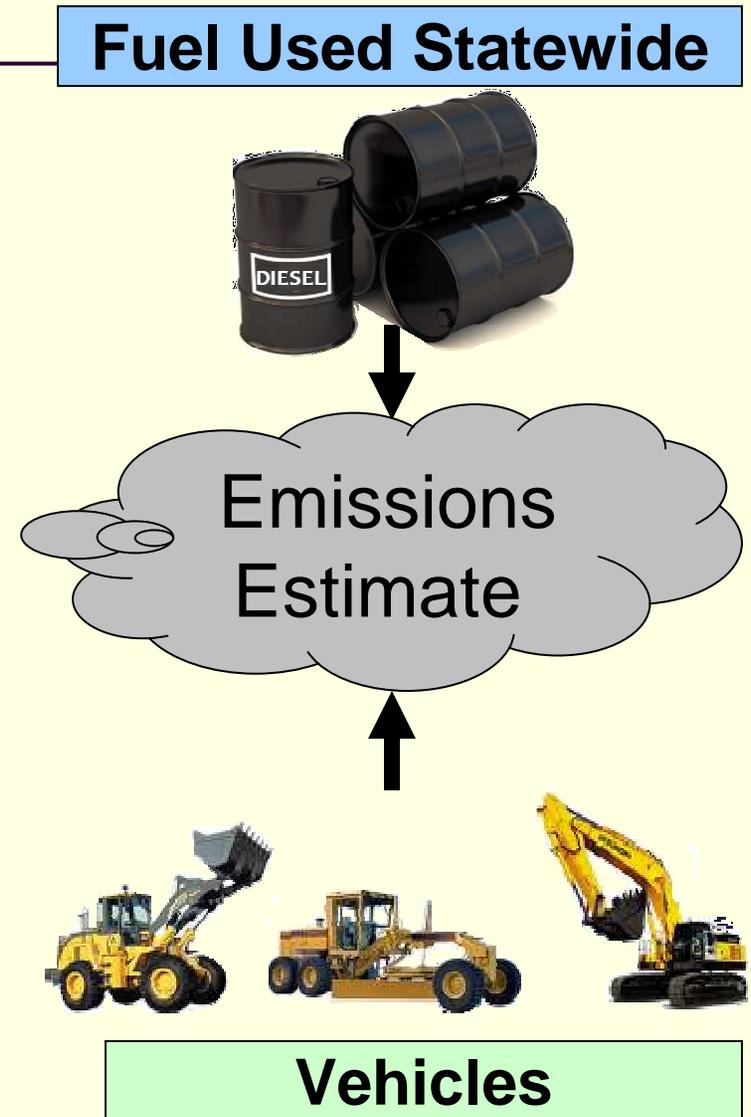
# South Coast and San Joaquin Valley SIPs

- Roadmaps for attaining air quality standards
- Attainment deadlines:
  - 2014 for PM<sub>2.5</sub>
  - 2023 for ozone
- South Coast and San Joaquin Valley need NO<sub>x</sub> down by half from 2006 levels for PM<sub>2.5</sub>
  - Heavy-duty trucks and construction vehicles are 40-50% of all NO<sub>x</sub>
- Even greater NO<sub>x</sub> reductions needed to meet 2023 ozone deadline



# Estimating Emissions

- Emissions Modeling (bottom-up)
  - Detailed inputs at equipment category level - population, activity, emission factors, etc
  - Specificity necessary for regulatory development
  - USEPA approach for SIP purposes
- Fuel-Based Method (top-down)
  - Simplified approach based on estimated fuel use
  - Not detailed enough for regulatory development

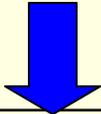
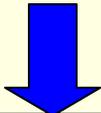
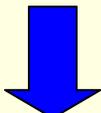


# Recent Rule Inventory Improvements

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- In-Use Off-Road Rule
  - Recession
  - Fuel Reconciliation
  - New Data
- Truck and Bus Rule
  - Construction Trucks
  - Regional Emissions Estimates

# Emissions Margin: South Coast 2014 Preliminary Estimate

Change	Impact on Emissions
Off-road Emission Method	
Recession on Off-road Sources	
Recession on Construction Trucks	
Regional South Coast Truck Emissions	
<b>OVERALL Total</b> (NOx Equivalent tons per day)	<b>21 - 42 tpd Lower Than Expected</b>

# In-Use Off-Road Equipment Emissions Inventory Approach

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# Overview

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- Review
  - Recession
  - Fuel Reconciliation
  - New Data
- Next Steps

# Impacts of the Recession

- Currently estimate 2009 activity is down 50% from 2006

<b>Data Type</b>	<b>Change Relative to Peak</b>	<b>Data Source and Age</b>
CA Construction Employment (2006-2009)	-30%	US Bureau of Labor Statistics
CA Construction GDP (2005-2008)	-30%	US Bureau of Economic Analysis
CA Construction Taxable Fuel Refunds (2006-2008)	-40%	CA Board of Equalization
CA Construction Valuation (2005-2009)	-65%	CA Dept of Finance
CA New Building Permits (2004-2009)	-80%	CA Dept of Finance
CA New Equipment Sales Financed (2005-2009)	-80%	Equipment Data Associates (UCC data)

# Fuel Reconciliation – Top-Down Approach

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- Diesel fuel sales data can help reconcile bottom-up inventories (top-down approach)
- Staff reviewed Energy Information Administration (EIA) and State Board of Equalization Data (BOE) diesel fuel data
- Equipment covered by the Off-Road Rule included in a variety of EIA fuel sectors.

# EIA Fuel Sectors

<b>Equipment</b>	<b>EIA Fuel Sector</b>
Private Construction	Off-Highway
Government, Ground Support	Commercial
Industrial, Mining	Industrial
Oil Drilling	Oil Drilling

# EIA Fuel Comparison – Commercial, Off-Highway, Industrial and Oil

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- Most diesel fuel used in off-road equipment is red-dye (tax exempt)
- Some additional usage of clear diesel (taxable)
  - not fully accounted for in EIA survey
- Adjusted EIA fuel estimates for clear diesel used in off-road applications
  - Based on clear diesel refunds from BOE

# EIA Fuel Comparison – Commercial, Off-Highway, Industrial and Oil

- After adjusting for clear diesel, ARB estimates are higher than EIA
- Considerable limitations to EIA fuel data

	<b>2005</b>	<b>2006</b>	<b>2007*</b>	<b>2008*</b>
EIA	335,235	307,173	273,089	264,742
EIA+Clear Diesel	470,738	445,448	391,955	363,397
ARB	1,172,803	1,190,766	932,668*	700,492*
Ratio	2.5	2.7	2.4	1.9

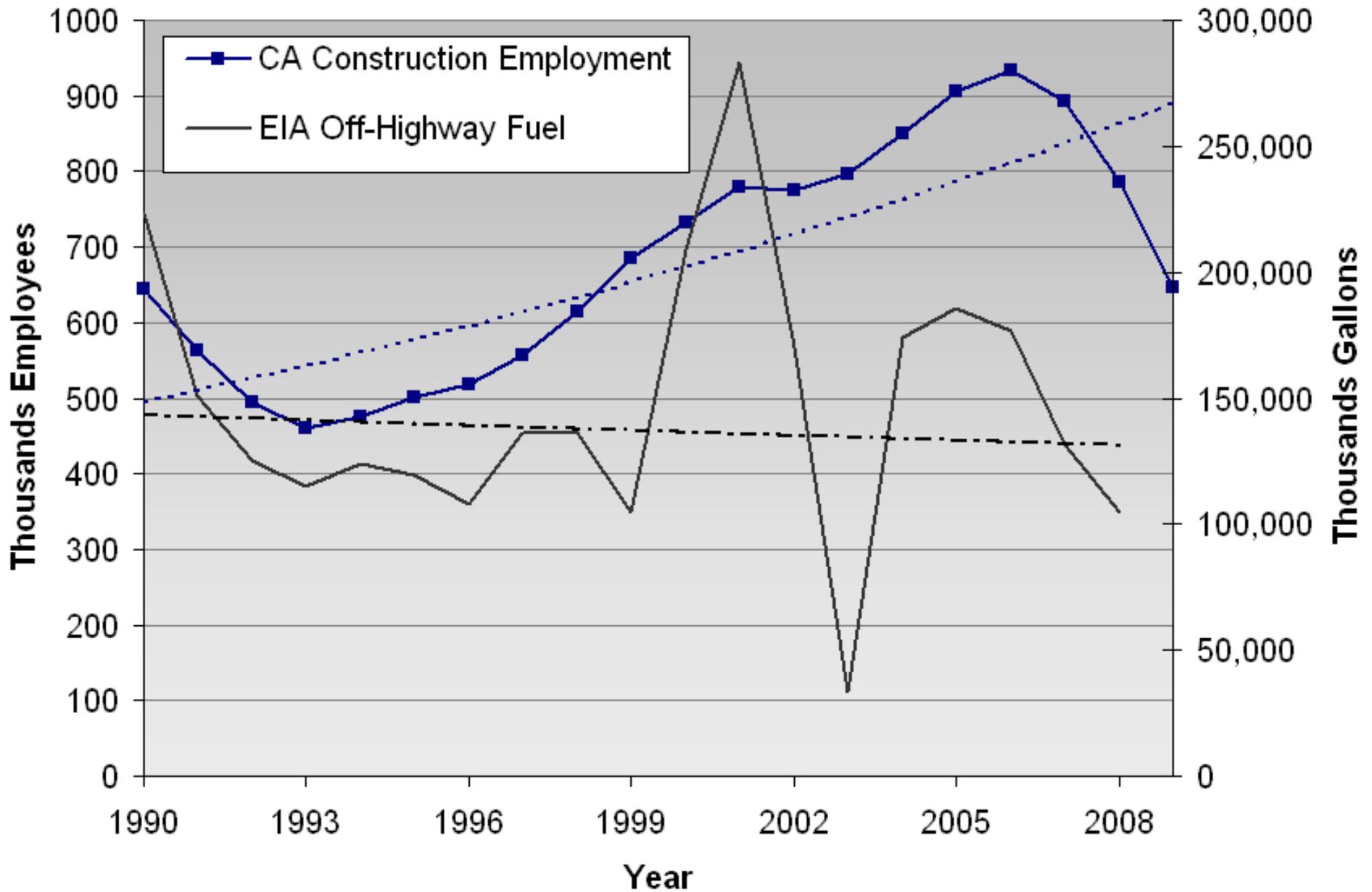
\* Recession Adjusted

# Issues with EIA Fuel Data

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- EIA staff have indicated uncertainty respondents knowing how much fuel is used by each end user
- EIA sector level data highly variable.
- EIA total off-road fuel in 2007 and 2008 much lower than California State Board of Equalization (BOE) estimates

# Issues with EIA Fuel Data



# Emission Inventory Approaches

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- Top-Down Approach
  - Issues with EIA fuel sector data
  - Not detailed enough for regulatory development
- Bottom-Up Approach
  - USEPA approach for SIP purposes
  - Specificity necessary for regulatory development
  - Review of inventory inputs to assess range of overestimation

# Bottom-Up Approach

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- Estimating Emissions (bottom-up)
  - Population - (POP)
  - Activity - (ACT)
  - Load Factor - (LF)
  - Emission Factors - (EF)

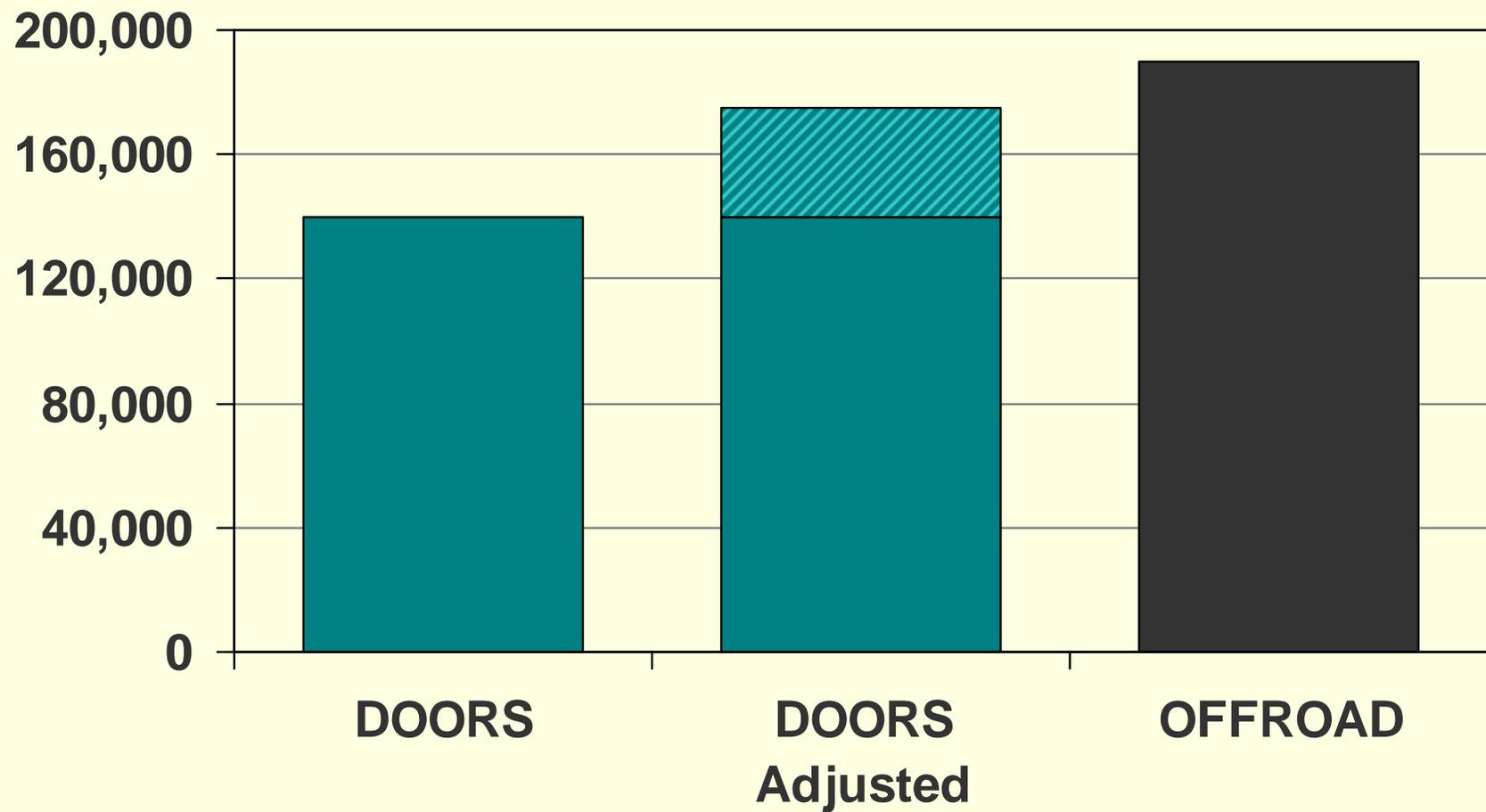
$$\text{Emissions} = \text{POP} \times \text{ACT} \times \text{LF} \times \text{EF}$$

# Population

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- SIP inventory population based on California and national survey data.
- Revised inventory population will be based on reporting to DOORS
- Additional assessment on DOORS reporting compliance
  - Contacted 1000 fleets that financed construction equipment
  - Identified fleets that hadn't reported

# Population 2009



# Activity

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- SIP inventory activity based on California and national survey data.
- Activity adjusted to account for equipment being used less as it ages
  - Based on stakeholder and industry input

# Activity

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- Staff reviewing activity reporting data from DOORS
  - Limited reporting data for individual pieces of equipment
  - More data is needed
- Recession adjustment accounts for changes in total activity

# Load Factor

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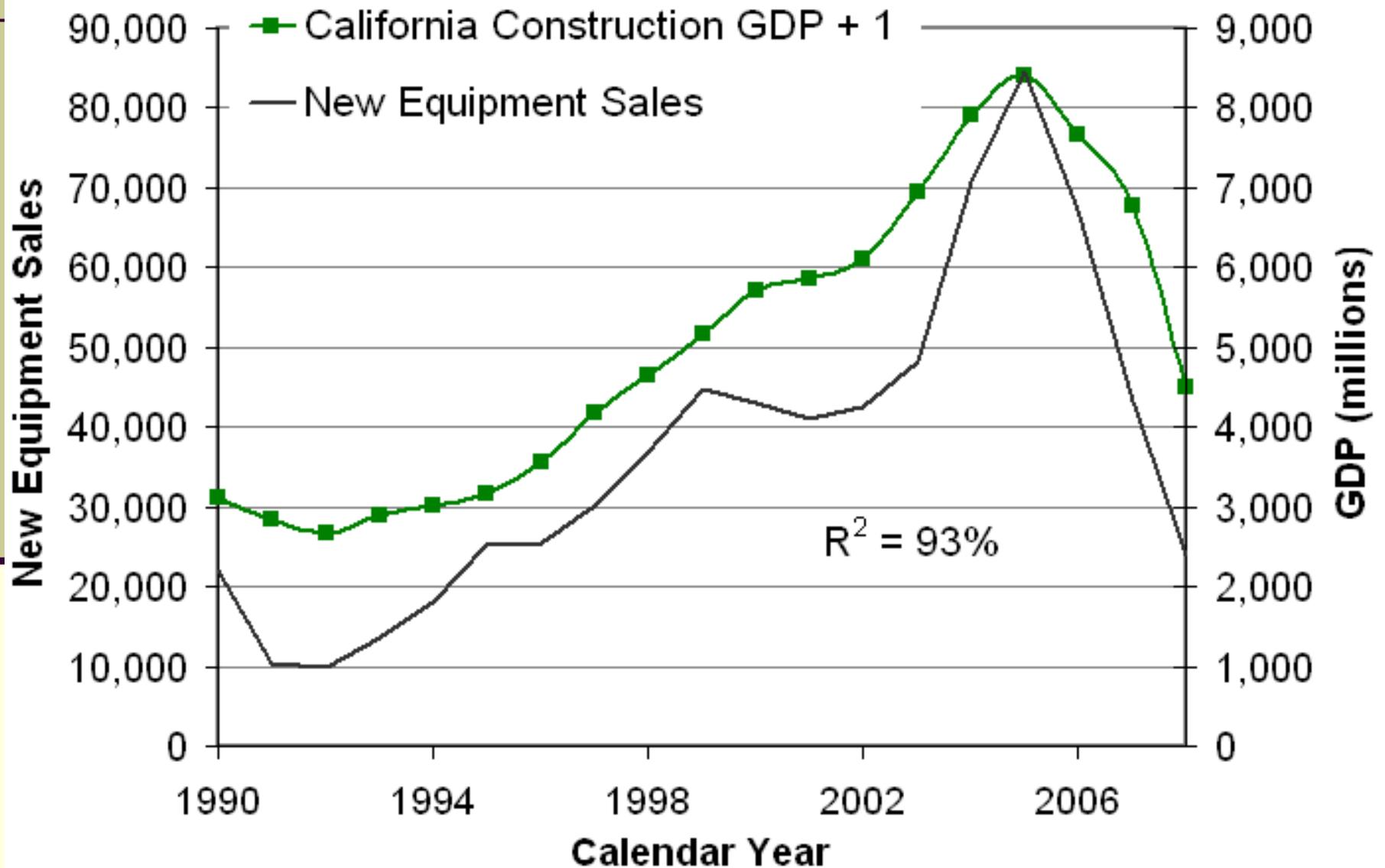
- Very little load factor data currently available
- Load varies by equipment type and usage
- Preliminary Conclusion
  - Load factors overestimated in the model by 1.3-2 times
  - Load factors for most equipment categories are 1.4 times too high
  - Still need more data

# Emission Factors

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- Literature Review
  - Much less information available for off-road equipment than on-road vehicles.
- EPA Methods
  - Transient adjustment factor
    - Increases PM emission factor
  - Updated brake specific fuel consumption
    - Lowers fuel consumption rate

# New Equipment Sales

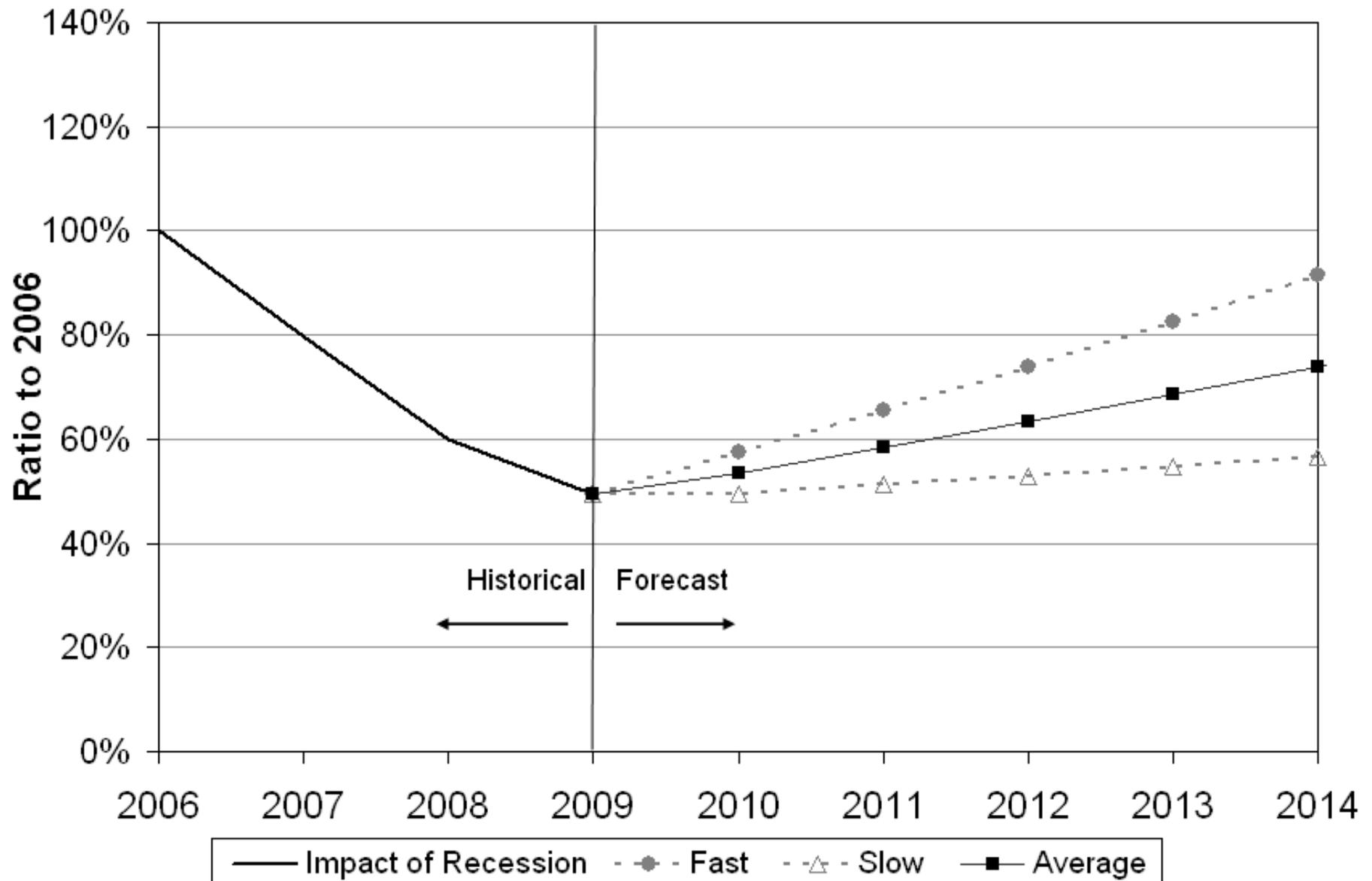


# Growth

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- SIP inventory growth for construction based on national construction employment
  - <2% growth per year
- New data
  - Incorporate recession
  - Forecasting methodologies – fast and slow recovery scenarios

# Construction Activity Growth



# Preliminary Off-Road Emissions: South Coast 2014

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- Impact of the recession and forecasting on population and activity
  - decrease emissions
- Load factor adjustment
  - decrease emissions
- PM emission factor adjustment
  - increase PM emissions
- Result: 46-67 tons/day lower emissions than previously assumed (NOX equivalents)

# Next Steps

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- June workshops to present emissions inventory results
- Work with the Associated General Contractors (AGC) to reconcile approaches
- Release documentation and inventory 45 days in advance of the September Board hearing.

# Truck and Bus Emissions Inventory

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**California Environmental Protection Agency**

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**Air Resources Board**



# Outline

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- Review
  - Statewide Inventory
  - Recession and Forecasting
- New Information
  - Construction Trucks
  - Regional Emissions Estimates
- Next Steps



# Review

# Estimating Truck and Bus Emissions

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- Population - (POP)
- Miles Traveled per Year - (VMT)
- Emission Factors - (EF)

$$\text{Emissions} = \text{POP} \times \text{VMT} \times \text{EF}$$

# Estimating Population

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- DMV Registration Data
  - Registration type, body type, age, weight, fleet size
- Augmented with other data
  - Limited out-of-state IRP data
  - Vocational emissions estimates
    - Agriculture, drayage
  - Lutsey (2008)

# Estimating Miles Traveled

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- Vehicle Inventory and Use Survey (2002)
- Evaluate data by age, registration type, registered location, body type
- Evaluate distribution of data within each group to estimate fraction of total mileage below low mileage limits
- Use IFTA data to estimate interstate truck mileage by state of registration
  - Estimate fraction of miles in California

# Emission Factors

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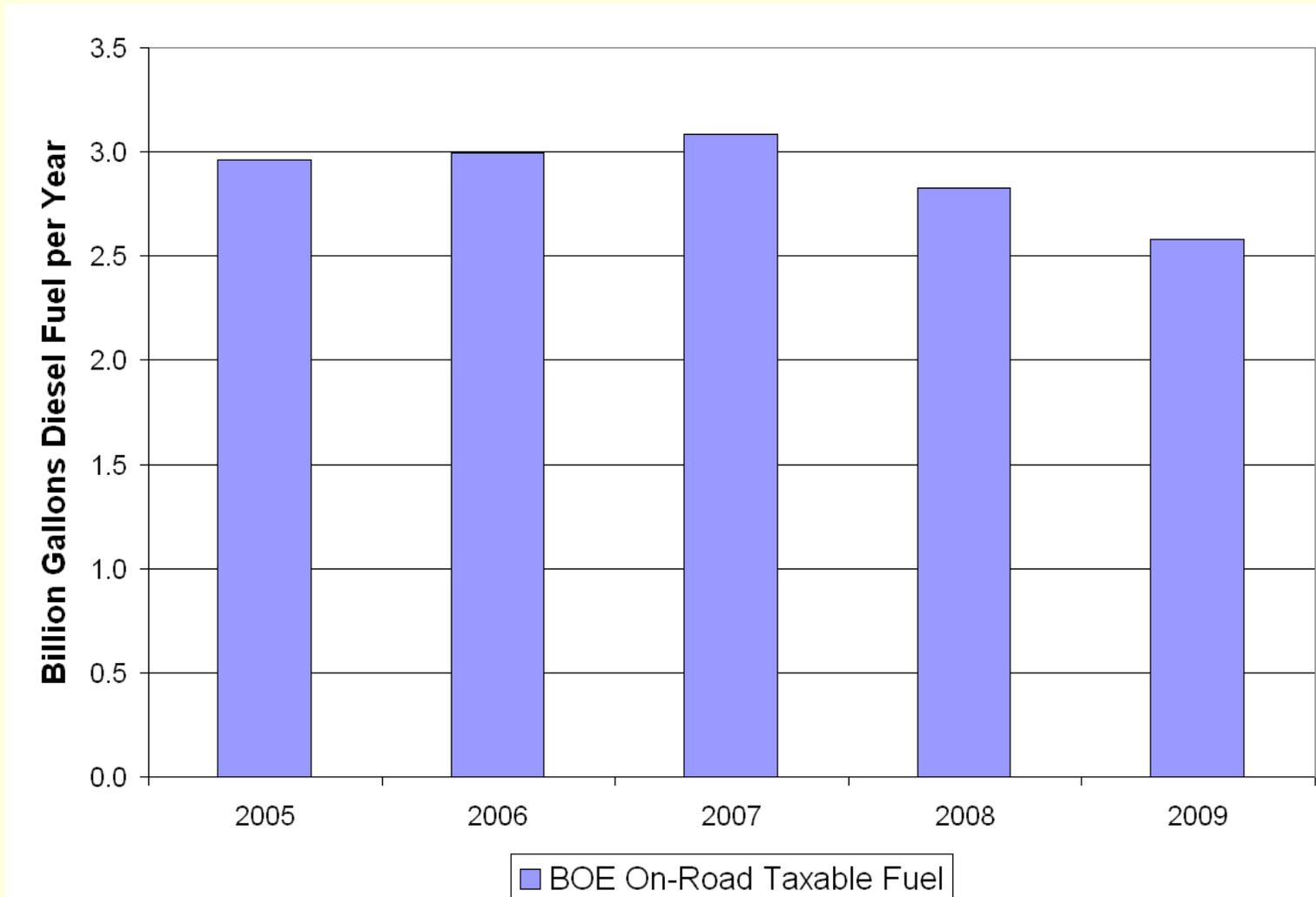
- Based on EMFAC2007
  - Reflect test data on ~100 vehicles
- Updates
  - Medium-heavy duty trucks
  - Fuel economy
- Account for differences in miles traveled for different types of vehicles

# Recession and Forecasting

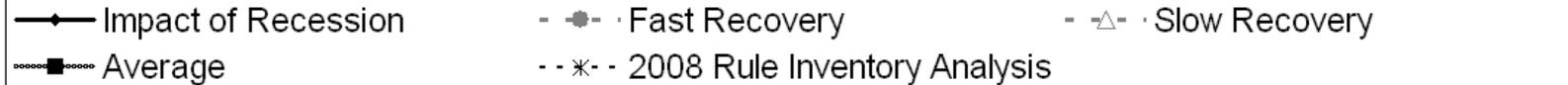
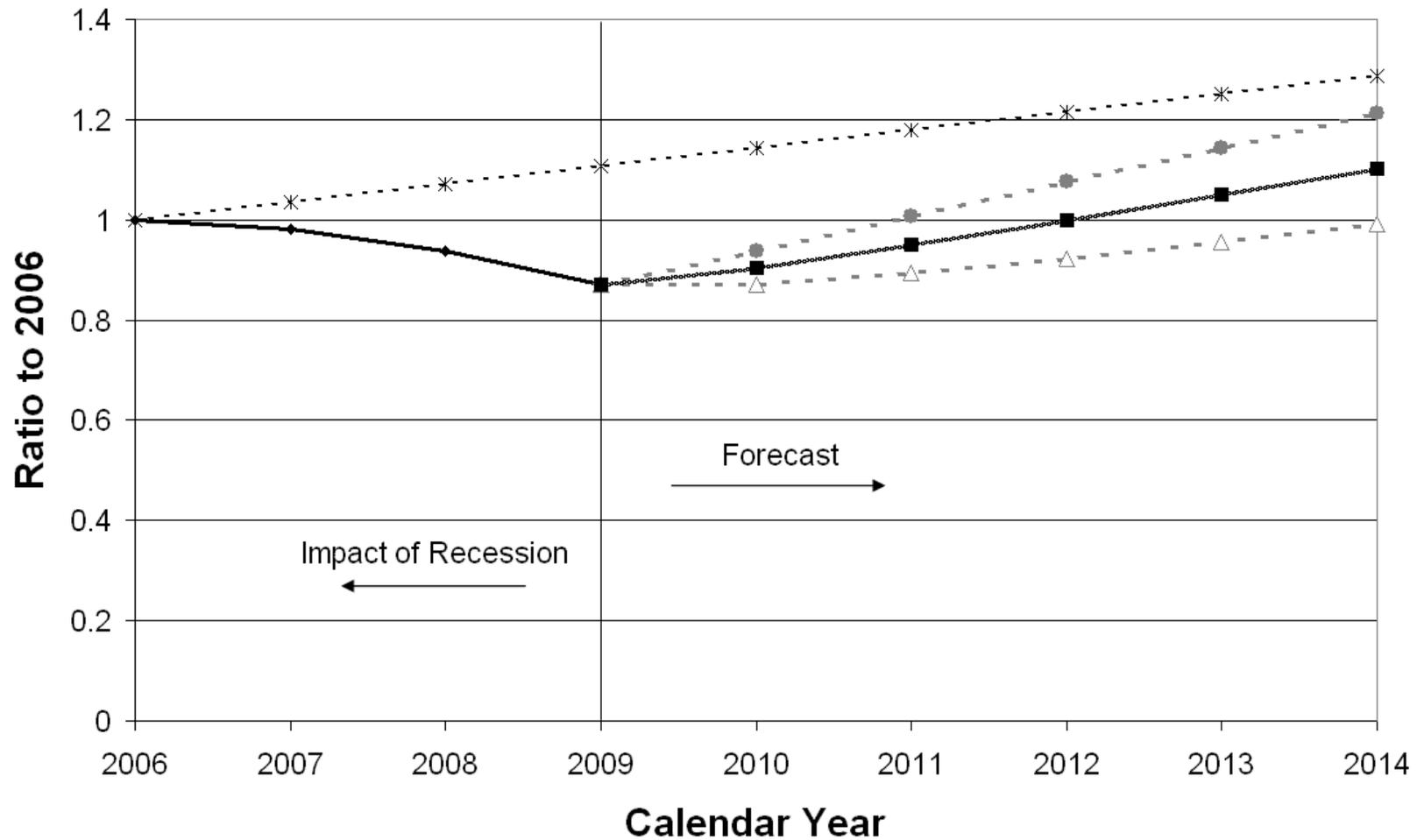
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- December 2008
  - Assumed annual average growth
  - Relationship between general economic and vehicle sales trends
- December 2009
  - Impact of recession on activity and new vehicle sales
  - Bounding scenarios for future emissions forecast

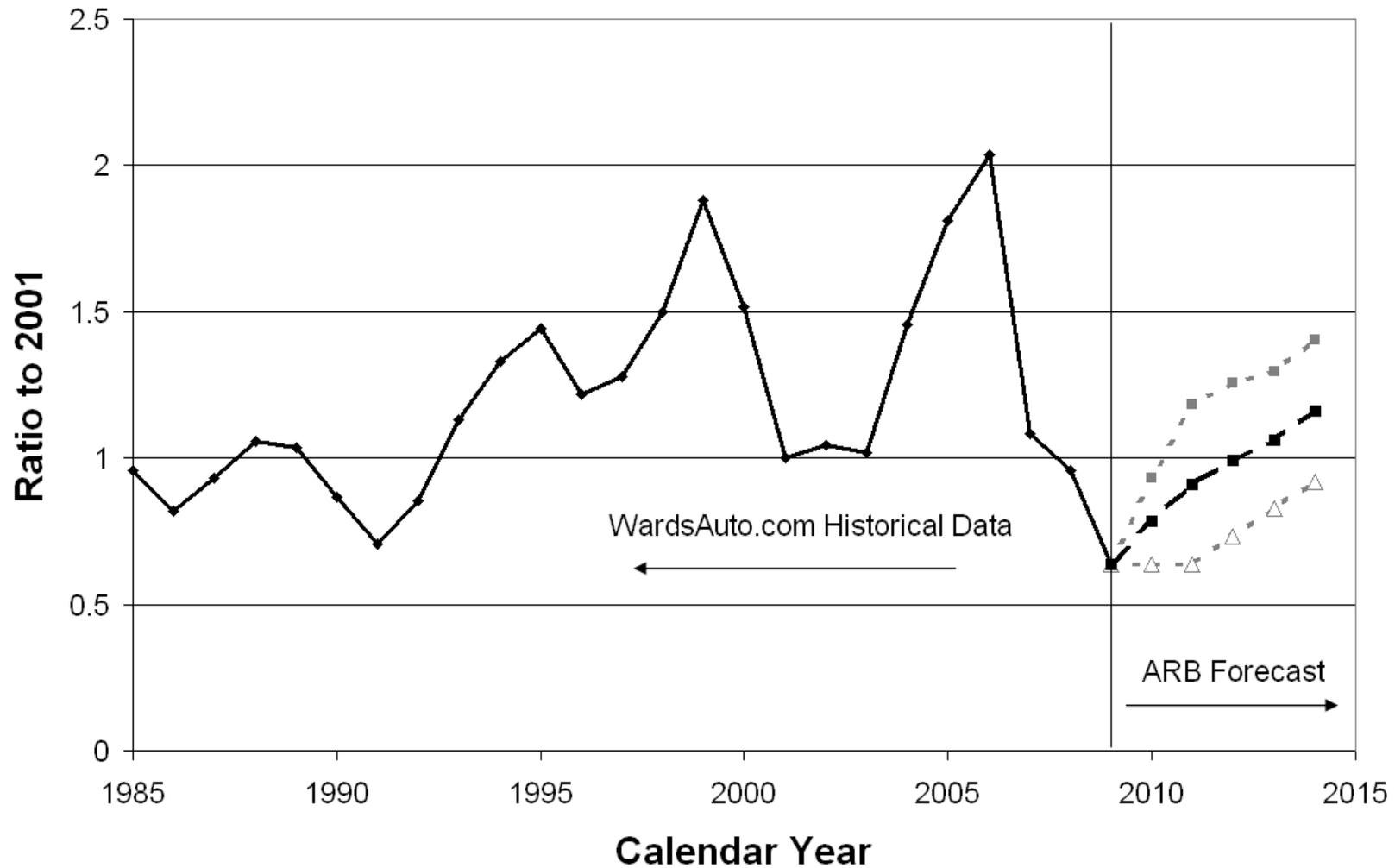
# Impact of Recession on California Diesel On-Road Diesel Usage



# Heavy-Heavy VMT Forecast



# National Heavy-Heavy Duty Truck Sales Forecast



—◆— Historical Data - -■- - Fast Recovery - -△- - Slow Recovery —■— Average



# **New Information**

# Construction Trucks

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- Recession impacted construction more than general transportation
- Separated construction trucks
  - 70,000 trucks
  - 16% of all California registered medium and heavy-heavy duty diesel trucks
- 50% reduction in construction truck emissions due to recession
- Results in additional 5% reduction in statewide truck and bus emissions in 2009

# Construction Truck Assumptions

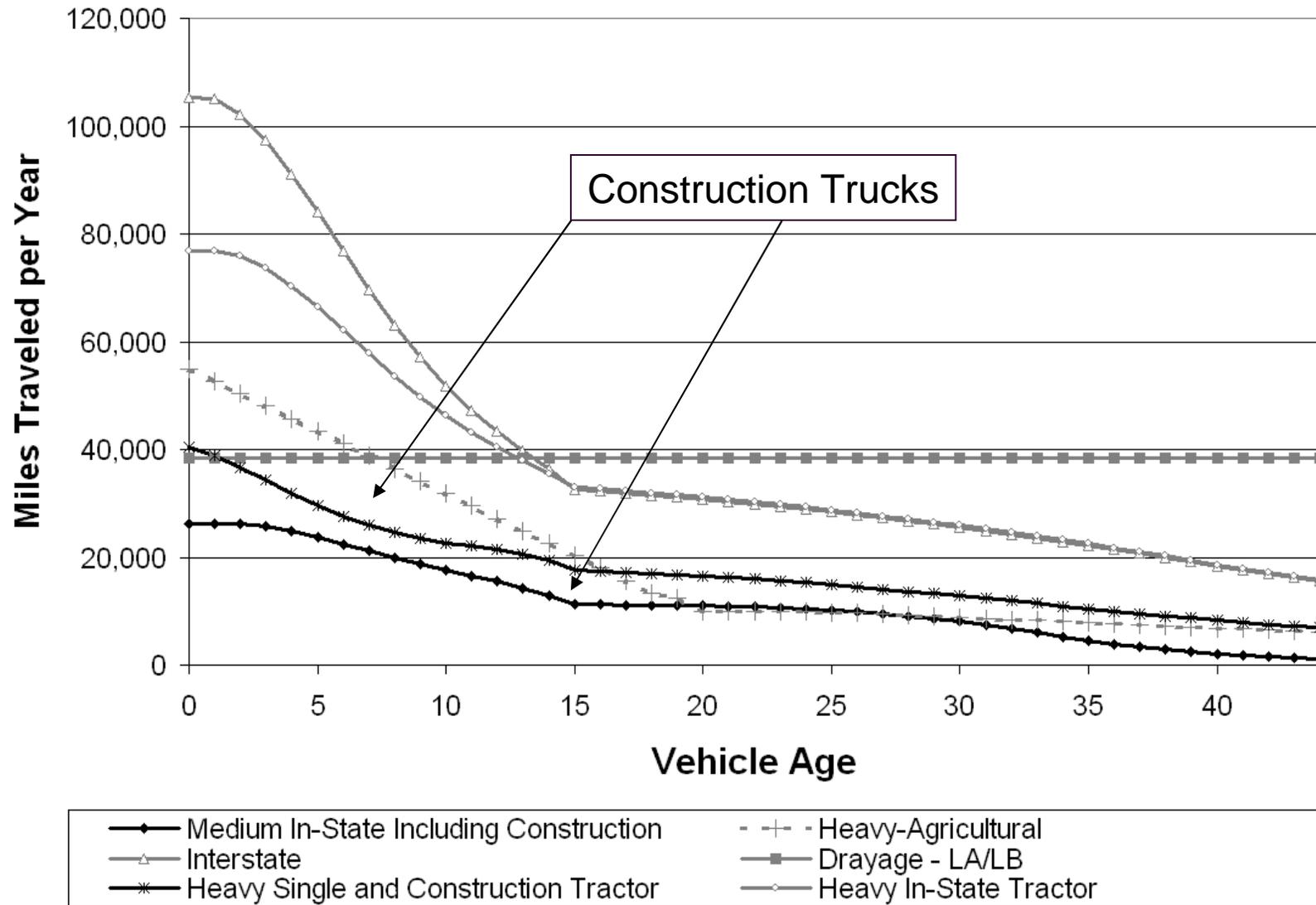
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- Age distribution same as for other in-state trucks of similar body type
  - ~10 year average age
- Construction tractor miles traveled same as single-unit trucks
  - ~ 20,000 miles/year average
- Miles traveled reduced 50% by recession in 2009
- Sales consistent with other HHDDT

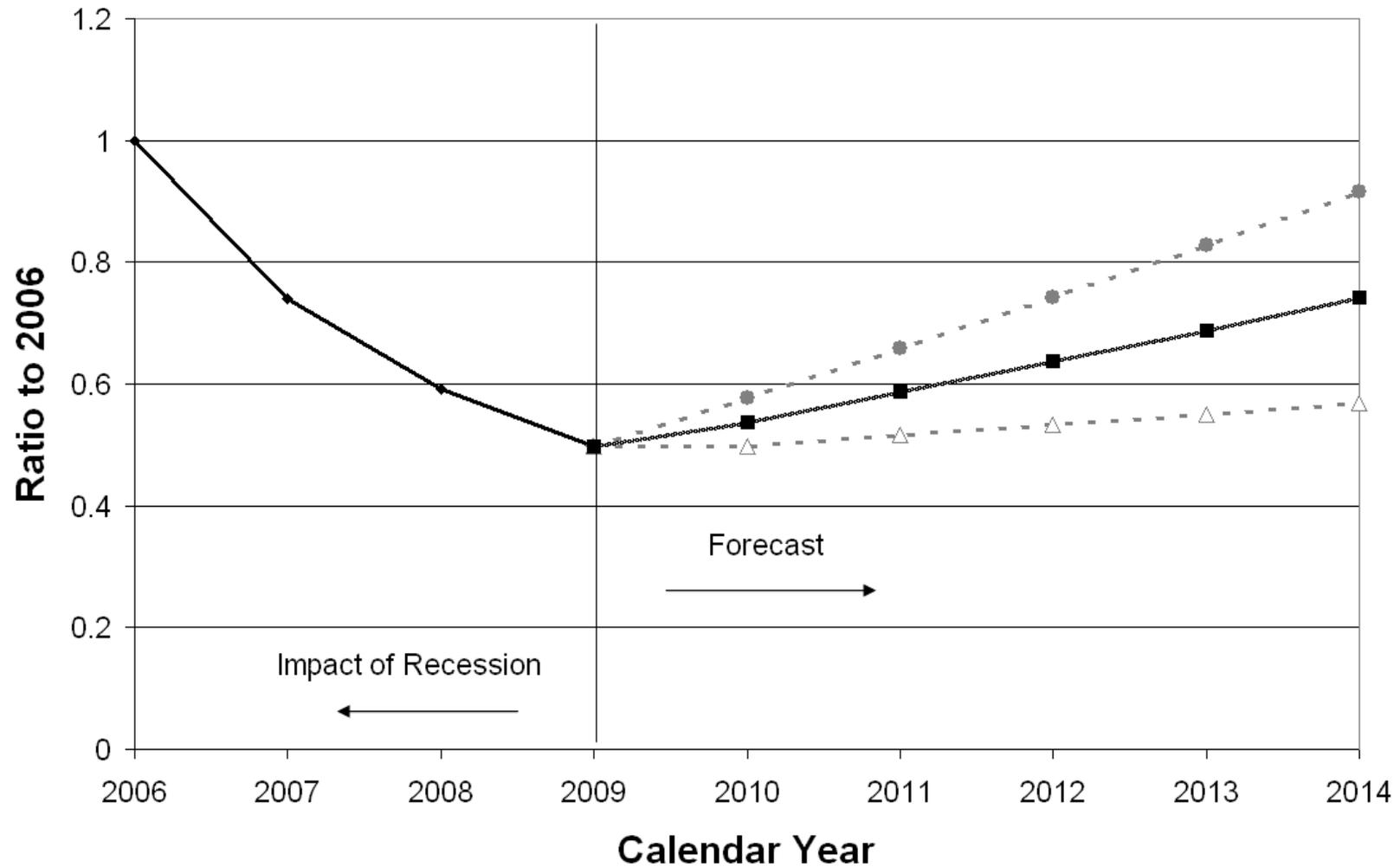
# 2005 Population by Category

Type		Population	Type	Population	
Agriculture	Medium	9,785	Utility	Medium	2,611
	Heavy	12,454		Heavy	1,278
Construction	Medium	39,040	Other California Registered	Medium CA-IRP	1,573
	Heavy Tractor	11,218		Medium In-State	147,371
	Heavy Single	15,561		Heavy CA-IRP	48,740
	Heavy IRP	3,343		Heavy In-State Tractor	44,071
Drayage	Heavy-Oakland	2,815		Heavy In-State Single	23,028
	Heavy-LA/LB	15,884		Out-of-State Registered	Medium
	Heavy-Other	1,445	Heavy Neighboring States		37,100
Solid Waste Collection	11,632	Heavy Non-Neighboring States	397,969		
Public	Medium	19,641	Buses	School	16,469
	Heavy	12,513		Other*	8,546
<b>All Trucks and Buses</b>				<b>890,939</b>	

# Mileage Accrual by Category



# Construction Truck VMT Forecast



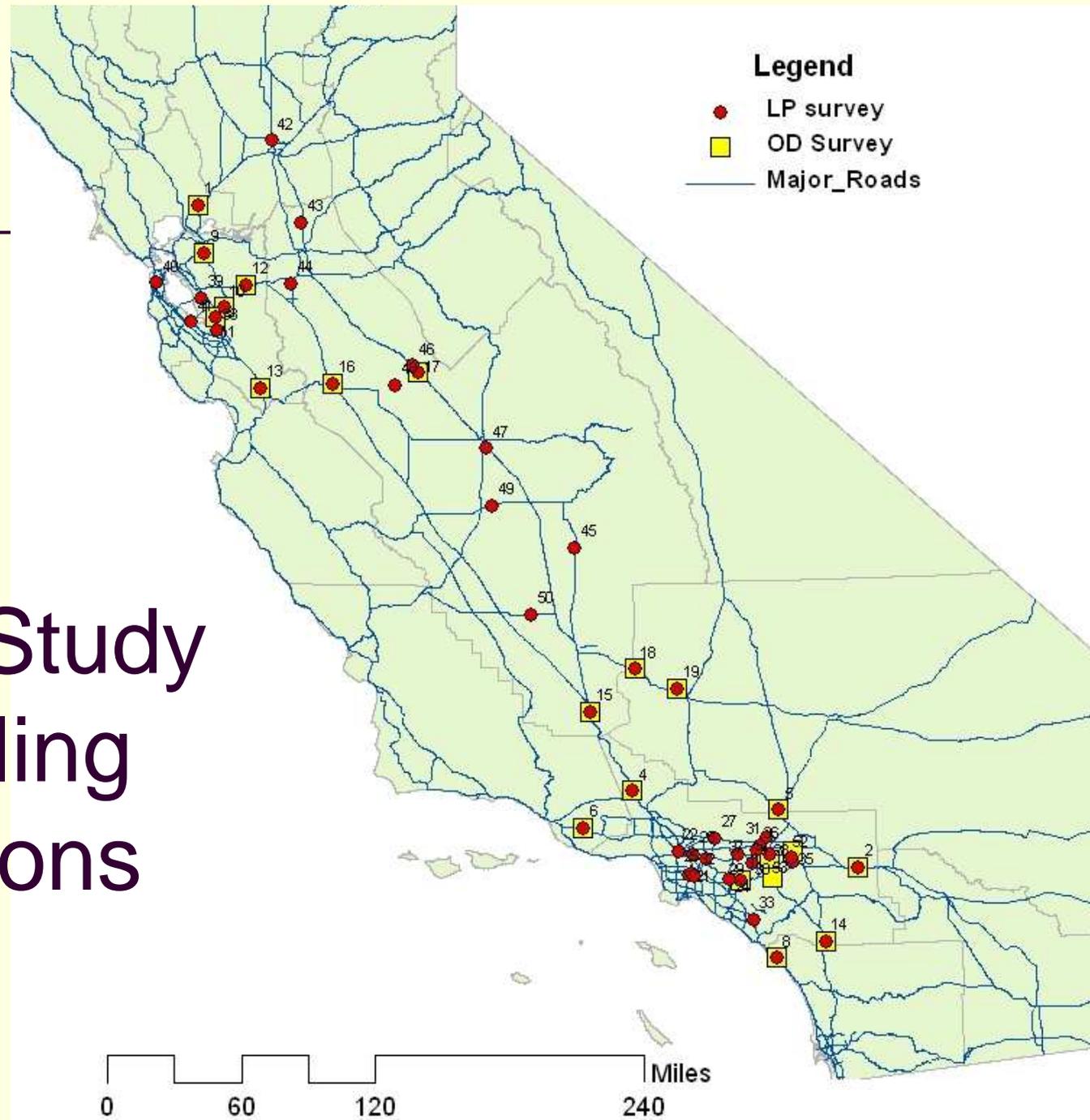
—◆— Impact of Recession - ●- Fast Recovery - △- Slow Recovery .....■..... Average

# Regional Emissions Estimates

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- New approach
- Based on 2007-2009 ARB Field Study
- 50 locations
  - O/D data
  - License plate info
  - All by body type and registration type
- Augmented with special study data for vocational fleets, registration data, and previous studies

# Field Study Sampling Locations



# Draft Regional Allocation by Truck Category - 2005

	Medium In-State	Agriculture	Interstate	Heavy Single-Unit	Construction	Heavy Tractor
South Coast	42%	2%	20%	37%	43%	26%
San Joaquin Valley	12%	45%	29%	18%	19%	38%
San Francisco Bay Area	17%	6%	8%	17%	9%	13%
Sacramento Valley	9%	19%	10%	9%	10%	6%
San Diego	8%	2%	4%	8%	6%	5%
Mojave Desert	2%	1%	15%	2%	4%	4%
Other	10%	24%	15%	10%	10%	7%

# Evaluating Draft Estimates: Heavy-Heavy Trucks

		1000 Vehicle Miles Traveled per Day					
		South Coast	San Joaquin Valley	Sacramento Valley	San Francisco	San Diego	Mojave Desert
2008	EMFAC2007	7,253	11,257	3,509	2,841	1,476	4,883
	Truck Models	11,734	11,703				
	New Estimate <sup>^</sup>	11,030	11,673	3,526	4,501	1,996	4,137
2007	EMFAC2007	6,714	10,933	3,310	2,704	1,403	4,571
	HPMS	12,632	8,828	3,835	4,911	2,456	5,314
	New Estimate <sup>^</sup>	10,392	11,180	3,387	4,267	1,864	3,941

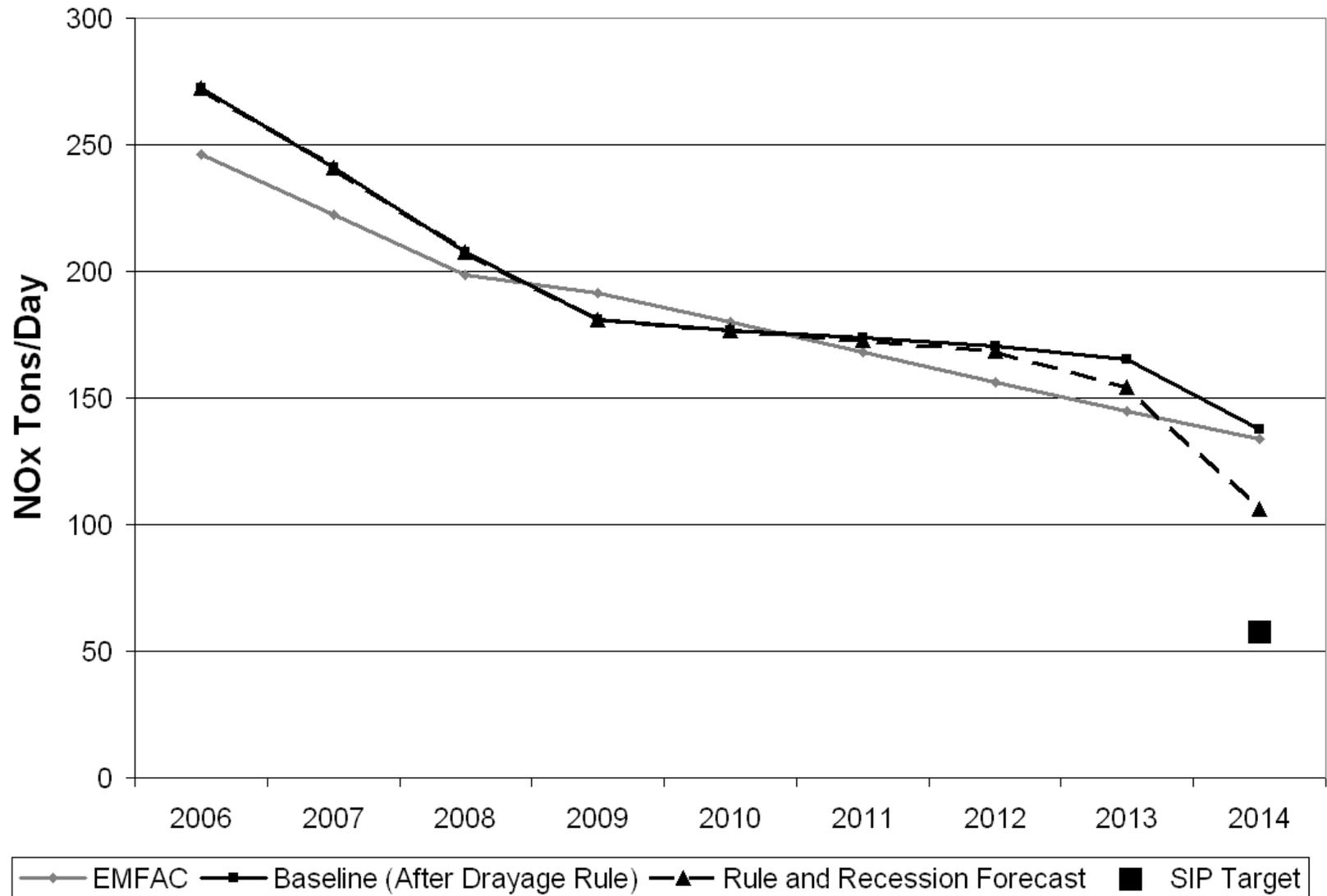
<sup>^</sup> New estimates are not recession adjusted

# Regional Allocation Results

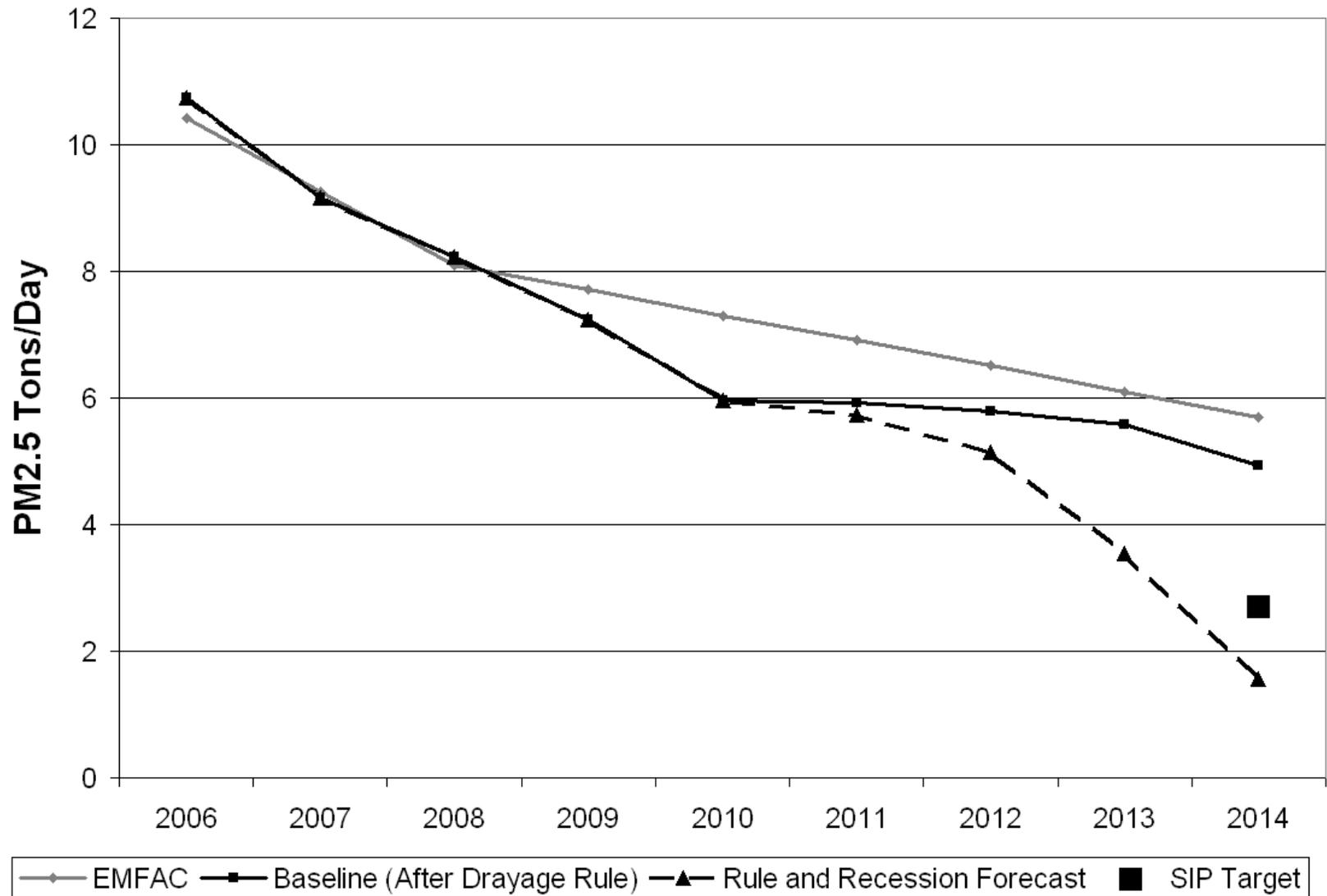
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- More truck miles traveled in South Coast
  - Added truck miles traveled by older vehicles
- Less truck miles traveled in Mojave Desert
  - Subtracted truck miles traveled by older vehicles
- Same truck miles traveled in San Joaquin Valley
  - Significant portion of younger through traffic

# 2014 South Coast NOx – Trucks and Buses



# 2014 South Coast PM2.5 – Trucks and Buses



# Emissions: South Coast 2014 Draft Estimate

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- Construction Trucks
  - Reduces miles traveled because construction tractors drive less than average
  - Activity reduced 50% due to recession
  - Revised future forecast
- Spatial Allocation
  - More truck miles traveled by older vehicles
- Result: 25 tons/day more emissions than previously assumed (NO<sub>x</sub> Equivalent)

# Next Steps

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- Continue inventory updates
  - Improved age distributions in rural areas
  - New regulatory scenarios
- Report in June workshops
- Integrate agricultural truck reporting data
- Model development for upcoming EMFAC release

# Break

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# Regulatory Amendments

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# Plan to Bring Amendments to Board

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- Update inventory
- Create detailed alternatives and evaluate cost/emissions impact
- Follow 10 principles
- Gather input at workshops
- Craft package that fits within final estimate of SIP margin and maintains health benefits

# Proposed Timeline for Amendments

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- May 2010 Workshops
  - Emission inventory, data sources, and methodologies
- June 2010 Workshops
  - Draft proposed amendments for both regulations
  - Draft inventories for rule assessments
- August 2010
  - Final inventories released
  - Publish staff reports and proposed amendments
- September 2010
  - Board Hearing to consider staff proposal

# Truck and Bus Regulation Update



# Outline

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- Background and Status
- January 2010 Workshops
- Board Member Direction
- Compliance Deadline Extensions
- Longer Term Amendments and Concepts
- Grant and Loan Programs
- Economic Impact Data
- Contact Information
- Public Comment Period

# Truck and Bus Regulation Background

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- Approved in 2008
- Filter requirements to reduce PM emission
  - Phased in beginning January 1, 2011
  - Requires filters on all trucks by 2014
- Requirements to reduce NOx emissions
  - Phased in beginning January 1, 2013
  - Requires cleanest available engines by 2023
- Three compliance options
  - Best available control technology (BACT) schedule
  - Percentage of fleet requirements
  - Fleet average
- Special provisions, credits

# Truck and Bus Regulation Status

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- December 2009 update on economy
  - Board directive for short term relief
- Held 3 public workshops in January 2010
- Delayed planned amendments
  - Further economic and SIP analysis
  - Consider together with off-road regulation
  - Inventory refinements

# January 2010 Workshops Discussion

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- Defer PM filter requirements
  - Until 2013 (2 years) for fleets of 20 or fewer vehicles
  - Until 2012 (1 year) for fleets of 21 to 40 vehicles
- Reduce number of PM filters required for larger fleets

# January 2010 Workshops (cont.)

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- Allow agricultural fleets to utilize small fleet provisions
- Allow drayage trucks to be included in compliance demonstration
- Amend school bus provision
  - Add option to be exempt until 2013
  - Remove reporting requirements and rely on record keeping

# January 2010 Workshops (cont.)

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- Report only low-use vehicles if fleet meets BACT
- “NE” label for NOx-exempt areas allowed
- Allow for emergency use exemption



# January 2010 Workshops - Credits

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- For fleets of 20 or fewer vehicles:
  - Double PM credit if PM retrofit before 2011
  - Exempt from NOx if PM retrofit before 2012
- Retirement credit:
  - Change baseline to October 1, 2006
  - Allow non-operated vehicles to count as retired
- Credits would expire January 1, 2014

# April Board Directives: Truck and Bus

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- Consider more relaxed mileage provisions
- Reduce possibility that 2 actions required on same vehicle
- Credit for fleets that have already taken action to comply

# Changes to Deadlines

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- Delay early reporting for claiming retirement credits and early PM credits
  - Agricultural vehicles and two-engine street sweepers still required to report by March 31, 2010
- Extend January 1, 2011 compliance and reporting date several months
  - Subsequent reporting deadlines to be in January
- Advisory 415 (March 2010)  
<http://www.arb.ca.gov/msprog/onrdiesel/documents/advisory415.pdf>

# Longer-Term Amendments to Consider

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- Additional flexibility in 2014
- One year delay would use up SIP margin
- Potential Regulatory Amendments
  - Increase mileage thresholds
  - More gradual PM filter rate and/or vehicle upgrade rate
  - Allow credits to extend past 2014

# Concepts to Explore

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- Evaluate certain types of fleets or vehicles
  - Logging
  - Construction
    - Cumulative costs
  - Small fleets (50% of all trucks)
  - High cost vehicles
  - Smaller trucks
- Impact of proposed changes on funding

# On-Road Grant and Loan Programs

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- Grant and loan funding is available now
- Expanded Voucher Incentive Program
  - Open to small fleets registered in CA
  - Up to \$45,000 for truck replacements
  - Up to \$10,000 for retrofits
  - Quick turn-around: approval in five days
- New Hybrid Voucher Incentive Program
- Goods Movement Funding (Proposition 1B)
  - Spring 2010 bond sales → \$200 million for new projects
- Loan Guarantees (PLACE)
- Low Emission School Bus Program
- Future changes to grant and loan programs will be coordinated with regulatory changes

# Economic Impact on Businesses

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- Coordinate with industry groups
- Collect fleet data and financial information
  - 2006 to present
  - Trucks and Buses: engine model year, vehicle type, annual miles
  - Off-road Vehicles: model year, horsepower, annual hours of operation
- Evaluate costs to individual businesses
- Assess benefits of credits

# For More Information...

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Truck and Bus Regulation information:

[www.arb.ca.gov/dieseltruck](http://www.arb.ca.gov/dieseltruck)

Listserv (onrdiesel):

[http://www.arb.ca.gov/listserv/listserv\\_ind.php?listname=onrdiesel](http://www.arb.ca.gov/listserv/listserv_ind.php?listname=onrdiesel)

**DIESEL HOTLINE:**

(866) 6-DIESEL (866-634-3735)

Email: [8666diesel@arb.ca.gov](mailto:8666diesel@arb.ca.gov)

# Public Comment Period

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# Off-road Regulation Update

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# Outline

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- Off-road Regulation Background
- Current Relief Provisions
- Stakeholder Suggestions
- Board Member Direction
- Concepts Being Considered
- Question and Comment Period



# Off-road Regulation Overview

Compliance requirements and deadlines vary by fleet size

<b>Fleet Size Category</b>	<b>Description</b>	<b>Dates and Requirements</b>
Small	2,500 hp and under	2015-2025 PM only (no vehicle or engine turnover)
Medium	2,501 to 5,000 hp	2013-2020 PM and NOx
Large	Over 5,000 hp State and federal government fleets	2010-2020 PM and NOx

# Off-road Regulation: Current Requirements

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In each year, two ways to meet the NOx and PM requirements

- Fleet average targets for NOx and PM

or

- **NOx:** Turn over certain percentage of fleet horsepower per year
- **PM:** Install exhaust retrofits on certain percentage of fleet horsepower per year

# Relief Granted so Far (AB 8 2X)

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- Credit for fleets with reduced horsepower or reduced activity
  - Compares current fleet to 2006-2007 levels
- Delay a portion of 2011-2012 requirements until 2013



- Approximately 55% of large fleets have claimed one or both of these credits
- On average, they provide a 2-4 year delay
- Required additional documentation and reporting

# AGC Petitioned ARB to Delay Regulation

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- AGC petitioned ARB in January, 2010, for full 2-year delay
- ARB issued enforcement delay in February, 2010
  - Delay 2010 turnover and retrofit requirements (reporting/labeling still in effect)
  - Time to consider potential need for further amendments
  - Recognized lack of U.S. EPA Authorization to enforce
- Executive Officer held special hearing on March 11

# Off-road EO Hearing Summary

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- Economist Lynn Reaser, Point Loma Nazarene University
  - Construction sector down 30 - 70+ percent from peak
  - Slow recovery projected through 2015
- Harley/Millstein Study
- Individual fleets:
  - Recession - Loss in revenues, employment
  - AB 8 2X relief helpful but not adequate
- Changes requested:
  - 2 to 5 year delay; delay until Tier IVs available
  - Expand on AB8 2X credits
  - Slow down, spread out BACT requirements
  - Recognize actions already taken

# Off-Road Carl Moyer Guidelines Revisions

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- Increased eligibility for off-road equipment replacement program
  - Tier 1 and 2 now eligible
- Continue flexibility for retrofits
- Revisions increase options for incentive funding

# Summary of Stakeholder Suggestions

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- Delays
  - 1 to 5 years, or until Tier 4s available
- Reduced Requirements
  - Lower annual turnover and retrofit requirements (spread out the requirements over a longer period)
- Additional Credits
  - Expand on credits that provide relief for fleets with reduced activity and horsepower
  - Extend double credit periods for exhaust retrofits

# Stakeholder Suggestions (cont.)

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- Allow fleets to rely on turnover, instead of retrofitting
- Increase low-use threshold
- Combine the NOx and PM fleet averages into one (maybe based on age)
- Target relief to cleaner areas of the state
- “Whatever it is, make it less complicated.”



# Board Direction

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- Ensure fleets that were proactive are rewarded
- Continue early incentives where possible
- Do not simply postpone a front-loaded compliance date
- Consider cumulative cost of on-road and off-road regulations on individual fleets
- Carefully consider stakeholder suggestions

# Reg Change Concepts Being Considered

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- Some delay of the first compliance date
- More flexibility to use turnover, repowering for compliance in lieu of retrofitting
- Reduction in annual turnover/retrofit requirements, especially before 2015 (e.g., 2013 requirement)
- Relaxing of fleet average targets



# Regulation Change Concepts Being Considered (cont'd)

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- Simplify the fleet average structure
- Maintain existing credits for early actions and provide new opportunities
- Increase low-use threshold
- Incentivize vehicles with reduced fuel usage (such as diesel-electric hybrids)
- Try to increase eligibility for incentive funding
- Bubble option (allow flexibility among regs)

# Additional Changes / Clarifications

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- Promote alternative fuels (including electric)
  - Do not count electric vehicles in fleet horsepower
- Clarify lifetime exemption for vehicles with early retrofits
- Clarify responsibility for idling requirements for rental vehicles
- Clarify annual compliance certification process
- Adding vehicles
  - Possibly simplify based on model year



# Questions Moving Forward

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- What parts of the regulation are the most challenging for fleets?
- What parts are the most confusing?
- What parts are least cost effective?
- What parts fit in with normal business cycles, what parts do not?

Please take the time to complete the survey.



# For More Information...

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Off-Road Regulation information:

[www.arb.ca.gov/ordiesel](http://www.arb.ca.gov/ordiesel)

Listserv (ordiesel):

[www.arb.ca.gov/listserv/listserv\\_ind.php?listname=ordiesel](http://www.arb.ca.gov/listserv/listserv_ind.php?listname=ordiesel)

DIESEL HOTLINE:

(866) 6-DIESEL (866-634-3735)

Email: [8666diesel@arb.ca.gov](mailto:8666diesel@arb.ca.gov)

DOORS Reporting Questions:

(877) 59-DOORS (877-593-6677)

Email: [doors@arb.ca.gov](mailto:doors@arb.ca.gov)

# Public Comment Period

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