

Workshops on Information Regarding the Off-Road, Truck and Bus and Drayage Truck Regulations



August/September 2010 Workshop Series
September 3, 2010

California Environmental Protection Agency



Air Resources Board

Agenda for Today

- Overview
- Revised inventory analysis
- Fine particulate mortality report
- Open comment period



Workshop Overview

- Emissions inventory revised downward
 - New technical information
 - Effects of recession
- New EPA report on fine particulate (PM_{2.5}) mortality
 - Fine particles directly linked to premature deaths
 - Provides the most robust analysis to date
- Diesel regulations still needed to protect health
 - Revisions to the regulations planned this year
 - No new regulatory proposals for today

Diesel Impact on Public Health

- Exposure to diesel exhaust can cause premature death
 - Relationship confirmed by new EPA study
- Diesel exhaust formally listed as a toxic air contaminant which increases risk of cancer
 - Confirmed by Scientific Review Panel
- Can reduce lung growth in children, cause asthma attacks and increase risk of asthma onset
 - Southern California Children's Health Study
- Localized exposure can increase health risks
- Diesel emission reductions needed to meet federal air quality standards

Amendments Under Development

- Consider impacts of the economy
- Reflect updated information
- Preserve public health protection



Fresno, California

Regulatory Timing

- Additional round of workshops
 - September/October
 - Focus on revised staff proposals
 - Emissions analysis of proposal
- Board hearing
December 2010



Emissions Inventory Revisions

Statewide Truck and Bus Rule
In-Use Off-Road Equipment Rule
Drayage Truck Rule

Summary

- Recession has significantly reduced emissions across both categories
- In-Use Off-Road and Truck/Bus inventories updated
 - Off-Road inventory now substantially lower
- Combined emissions are lower than anticipated
 - Provides margin for regulatory relief
 - South Coast (2014): 61 tons/day NO_x Eq.
 - San Joaquin Valley (2014): 40 tons/day NO_x Eq.

Outline

- Truck and Bus Inventory Revisions
- Off-Road Inventory Revisions
- Revised Margin

Statewide Truck and Bus Rule Emissions Inventory



Truck and Bus Emissions Inventory

- Revisions
 - Vehicle/Fleet Size Categories
 - Odometer
 - Out-of-State Vehicle Miles Traveled
 - Regional Allocation

Vehicle / Fleet Size Categories

- Added medium fleet categories
 - 4-20 trucks
 - 21-40 trucks
- Added motorcoach category

Vehicle / Fleet Size Categories - Medium Fleet Assumptions

Percentage of Total Population -2005

Fleet Size	T6 Instate	T7 CAIRP	T7 Single	T7 Single construction	T7 Tractor	T7 Tractor construction
1	31%	29%	26%	26%	32%	33%
2	10%	10%	9%	9%	10%	10%
3	6%	6%	6%	6%	6%	6%
4 - 20	23%	24%	29%	29%	24%	24%
21 - 40	6%	8%	9%	9%	7%	7%
41+	24%	23%	21%	22%	22%	22%

Average Age - 2005

Fleet Size	T6 Instate	T7 CAIRP	T7 Single	T7 Single construction	T7 Tractor	T7 Tractor construction
1	9.2	7.0	12.9	12.5	11.8	11.9
2	8.9	6.8	12.6	12.3	11.5	11.6
3	8.9	6.9	11.7	11.5	11.3	11.4
4 - 20	8.3	6.7	11.0	10.8	10.0	10.1
21 - 40	7.3	5.7	9.3	9.1	7.4	7.5
41+	6.0	4.5	7.7	7.5	5.9	6.0

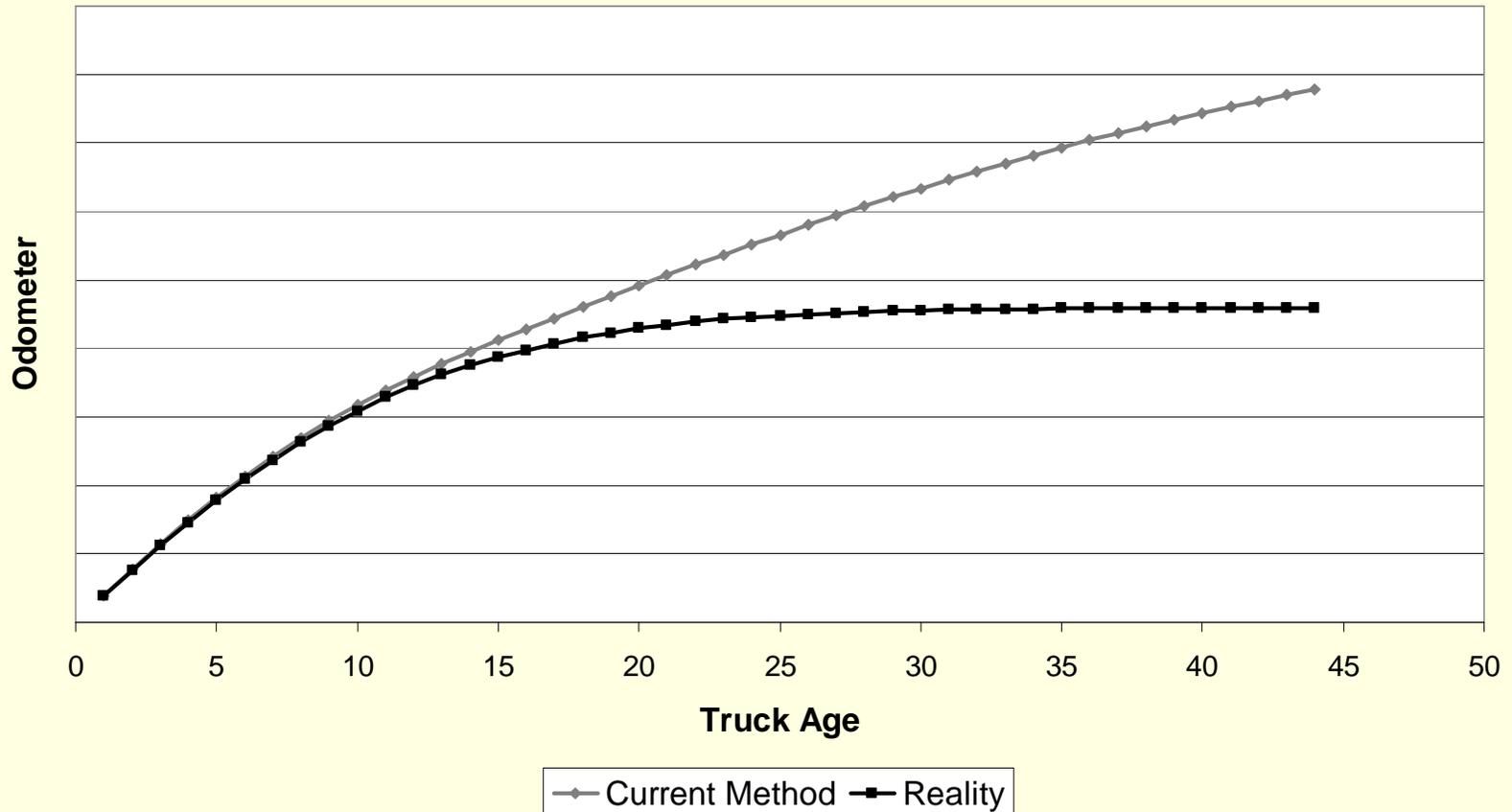
Vehicle / Fleet Size Categories - Motorcoach Assumptions

- Received new data from the California Bus Association (CBA) on motorcoaches
- Agreed upon revised growth rate, population and methodology
- Population based on reporting to Public Utilities Commission
- Mileage accrual based on CBA survey
- Inventory reflects revisions

Odometer Revision

- Current assumption
 - Odometer is sum of accrual
- Reviewed
 - Truck sales data from truckpaper.com
 - Odometer data from bond program
 - VIUS 1992 and VIUS 2002

Odometer \neq Sum of Accrual



Odometer Revision Results

- Cap MHDDT Odometer at 400,000 miles
- Cap HHDDT Odometer at 800,000 miles
- Results in small impact on emissions
 - Varies by calendar year
 - Emissions lower by a few percent
 - Emissions benefits slightly smaller because impacts baseline more than with Rule

Out-of-State VMT Revision

- Previous assumption based on 2005 data
- Received new data: 2007-2009
 - 2006 data incomplete
 - 2007-2009 data are complete
 - Data on CA registered interstate trucks appears plausible
 - Trend in data representing non-CA registered interstate trucks does not appear accurate
- Developed revised out-of-state VMT estimate
- Revised VMT more consistent with BOE Fuel statistics

IFTA Data (Million Miles/Yr)

	CA Registered IFTA Truck Miles in CA	
2005	2,189	<ul style="list-style-type: none">• CA Registered IFTA 2005-2007: 20% increase• Increase larger than BOE fuel report for all trucks (~4%)• Then 20% decrease due to recession
2007	2,660	
2008	2,213	
2009	2,134	

IFTA Data (Million Miles/Yr)

	CA Registered IFTA Truck Miles in CA	Reported Out-of-State Truck Miles in CA	<ul style="list-style-type: none"> • Out of state does not follow same trend <ul style="list-style-type: none"> • 2005 much higher than new data • 2008 higher than 2007 • Not consistent with other trends on impact of recession <p>CHOICE: Use data as is OR estimate</p>
2005	2,189	4,398	
2007	2,660	2,943	
2008	2,213	3,761	
2009	2,134	3,358	

IFTA Data (Million Miles/Yr)

	CA Registered IFTA Truck Miles in CA	Reported Out-of-State Truck Miles in CA	Modeled Out-of-State Truck Miles in CA no recession	Modeled Out-of-State Truck Miles in CA with recession
2005	2,189	4,398	3,144	3,144
2007	2,660	2,943	3,419	3,397
2008	2,213	3,761	3,601	3,115
2009	2,134	3,358	3,654	2,843

Regional Emissions

May Workshop

- Based on ARB field study and other data, corroborated with vehicle counts and transportation models
- Used regional allocation that assumed percentage of statewide emissions by air basin
- Age distribution of an inventory category was consistent across air basins

Revisions to Regional Allocation

- Field study data shows
 - Single-unit, medium heavy trucks travel mostly in air basin of registration
 - In-state tractors travel in populated areas and San Joaquin Valley
- Revision accounts for differences in populations/age distribution
 - Based on actual DMV registration
 - Among air basins for single-unit and medium heavy trucks
 - Between regions for in-state tractors

Regional Assessment

VMT Distribution Updates (Percent VMT by Region)

CY2005	Medium In-State		Heavy Single-Unit	
	New	May	New	May
South Coast	45%	42%	41%	37%
San Joaquin Valley	10%	12%	10%	18%
San Francisco Bay Area	19%	17%	18%	17%
Sacramento Valley	9%	9%	9%	9%
San Diego	7%	8%	8%	8%
Mojave Desert	1%	2%	2%	2%
Other	9%	10%	13%	10%

Regional Assessment

VMT-Weighted Average Age

CY2005	Medium In-State		Heavy Single Unit	
	New	May	New	May
South Coast	6.1	6.4	8.8	8.8
San Joaquin Valley	7.1	6.4	7.7	8.8
San Francisco Bay Area	6.5	6.4	9.3	8.8
Sacramento Valley	6.0	6.4	7.4	8.8
San Diego	6.0	6.4	8.5	8.8
Mojave Desert	6.4	6.4	9.1	8.8
Other	7.2	6.4	10.2	8.8

Regional Assessment

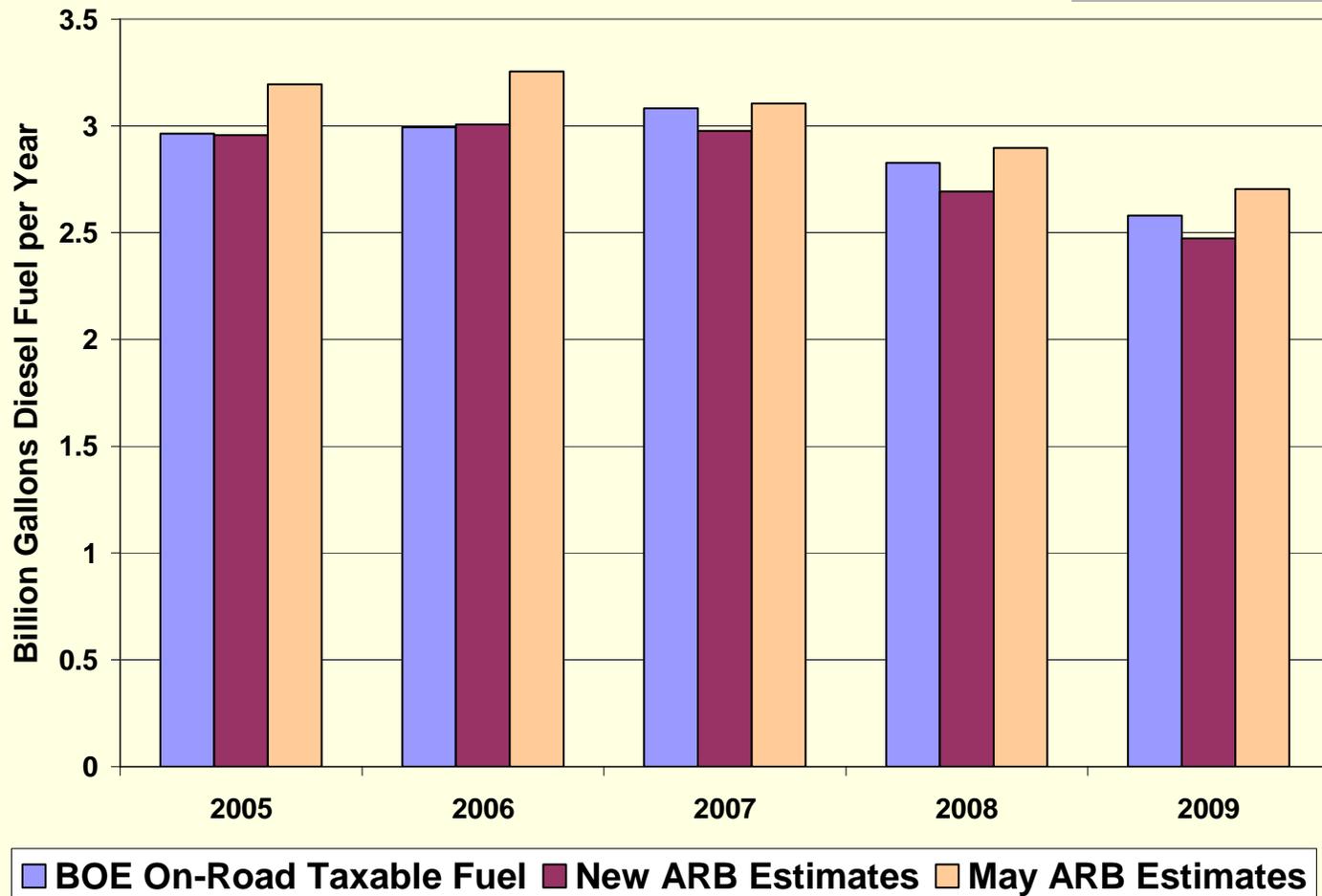
In-State Tractor Update

CY2005	Heavy Tractor VMT (Percent by Region)		Heavy Tractor VMT- Weighted Average Age	
	New	May	New	May
South Coast	26%		7.6	7.8
San Joaquin Valley	38%		7.6	7.8
San Francisco Bay Area	13%		7.6	7.8
Sacramento Valley	6%		7.6	7.8
San Diego	5%		7.6	7.8
Mojave Desert	4%		7.6	7.8
Other	7%		10.1	7.8

Inventory Update Results

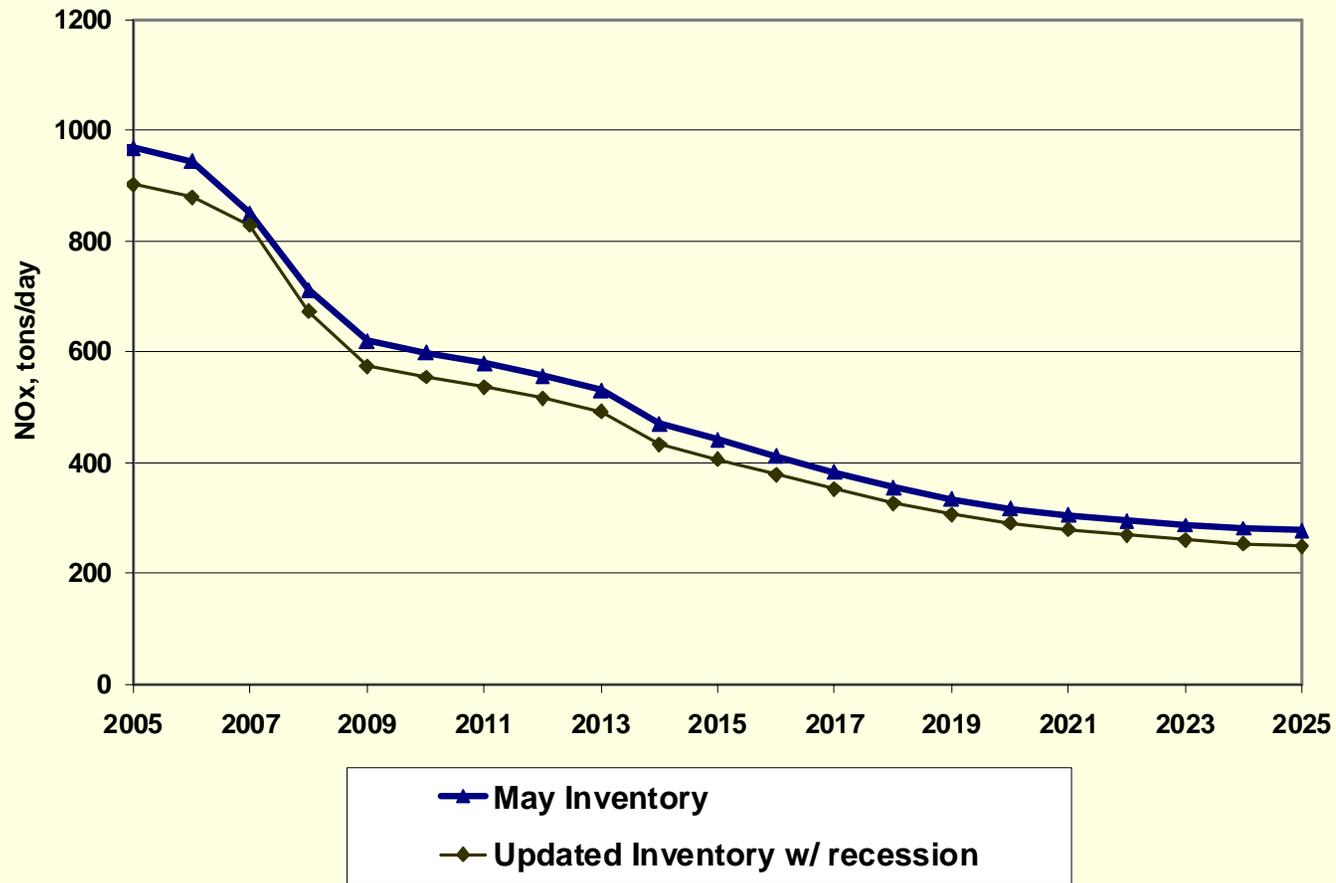
- Lower VMT estimates from out-of-state trucks lowers total VMT for all regions
- Statewide diesel fuel consumption is closer and slightly lower than reported BOE taxable diesel
 - Within 5% of BOE
- Statewide emissions lower than previously estimated
- South Coast emissions lower than previously estimated

Current Draft Statewide Fuel Comparison with Recession



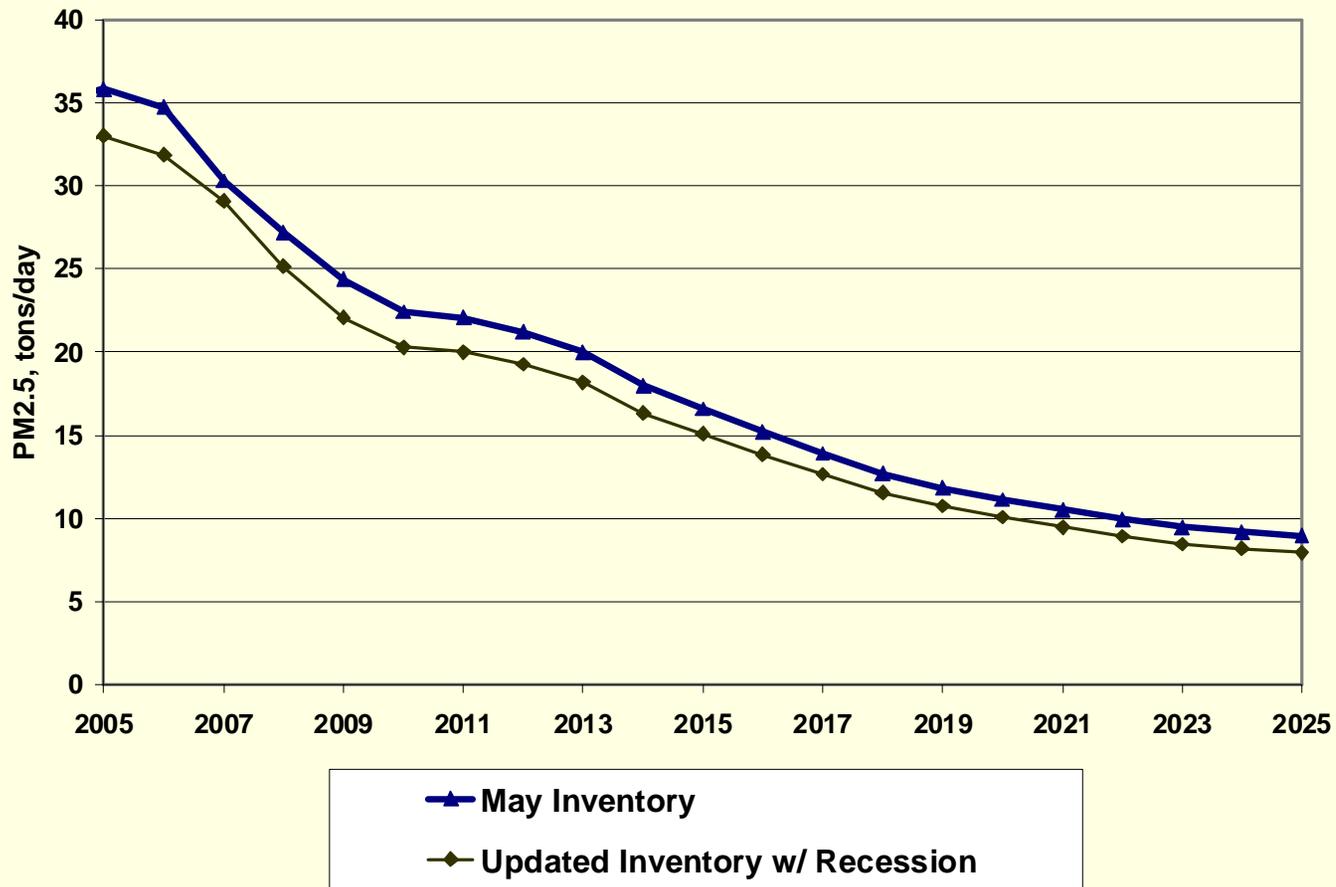
Impact of Revisions on EI

Statewide Baseline – NO_x



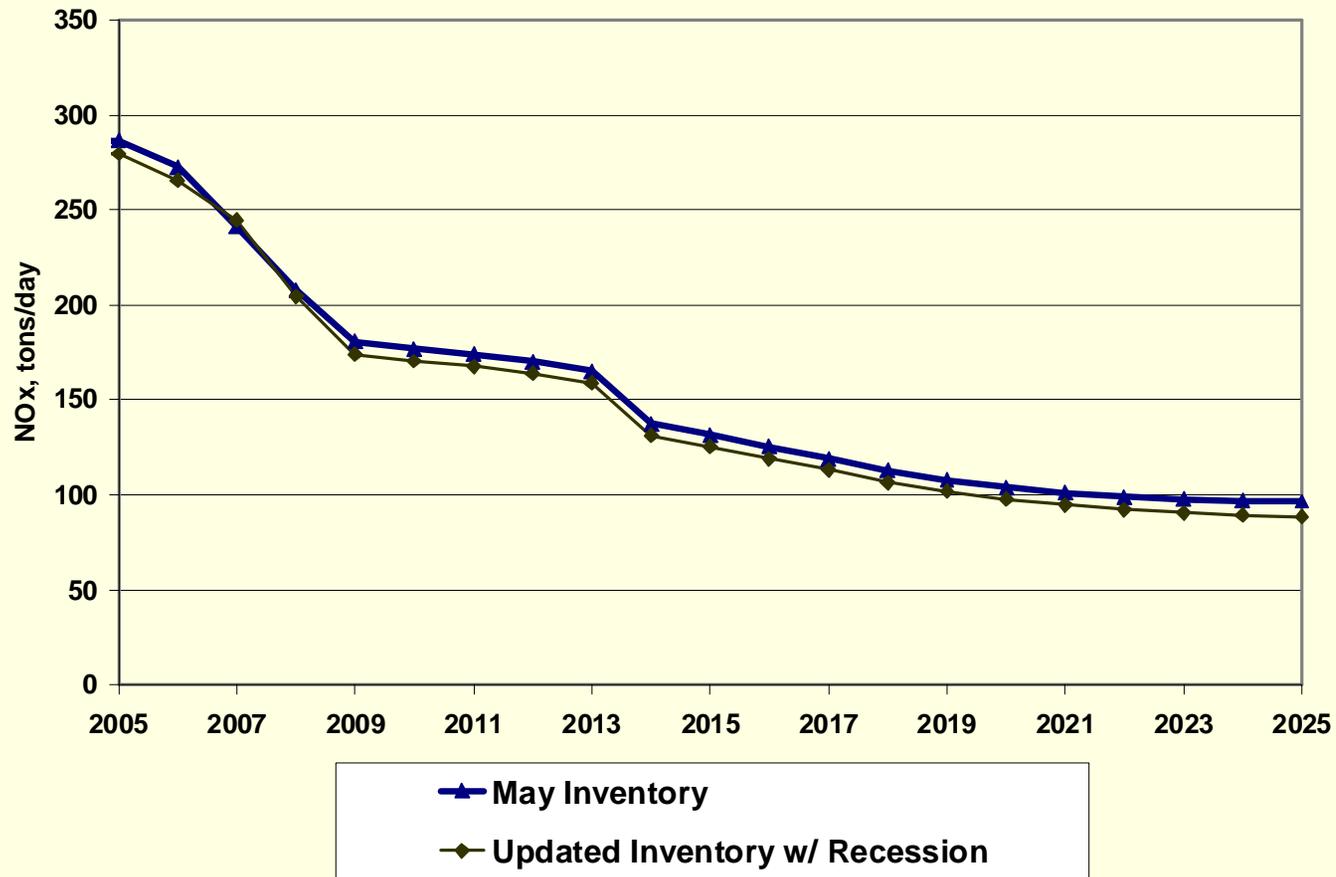
Impact of Revisions on EI

Statewide Baseline – PM2.5



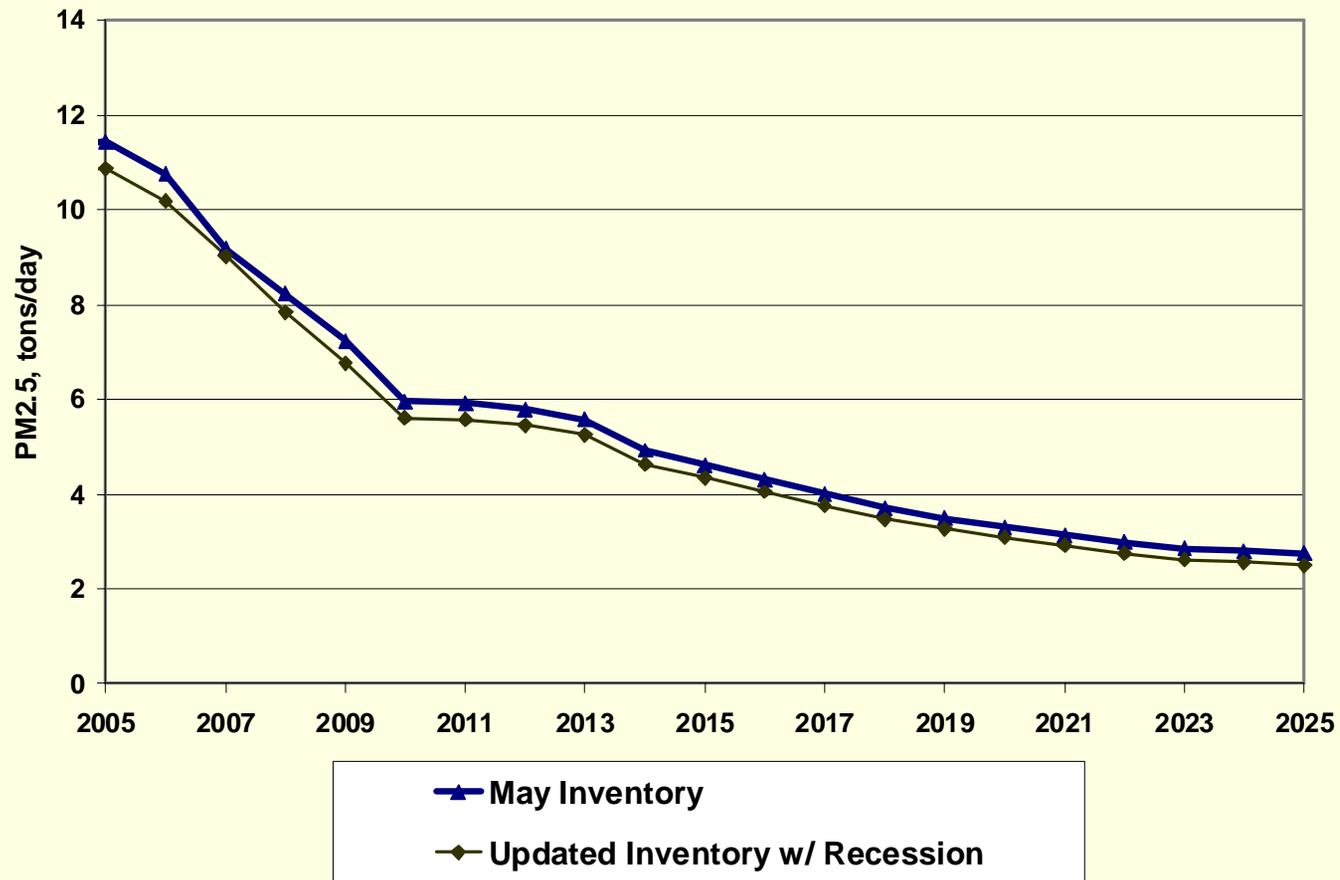
Impact of Revisions on EI

South Coast Baseline – NOx



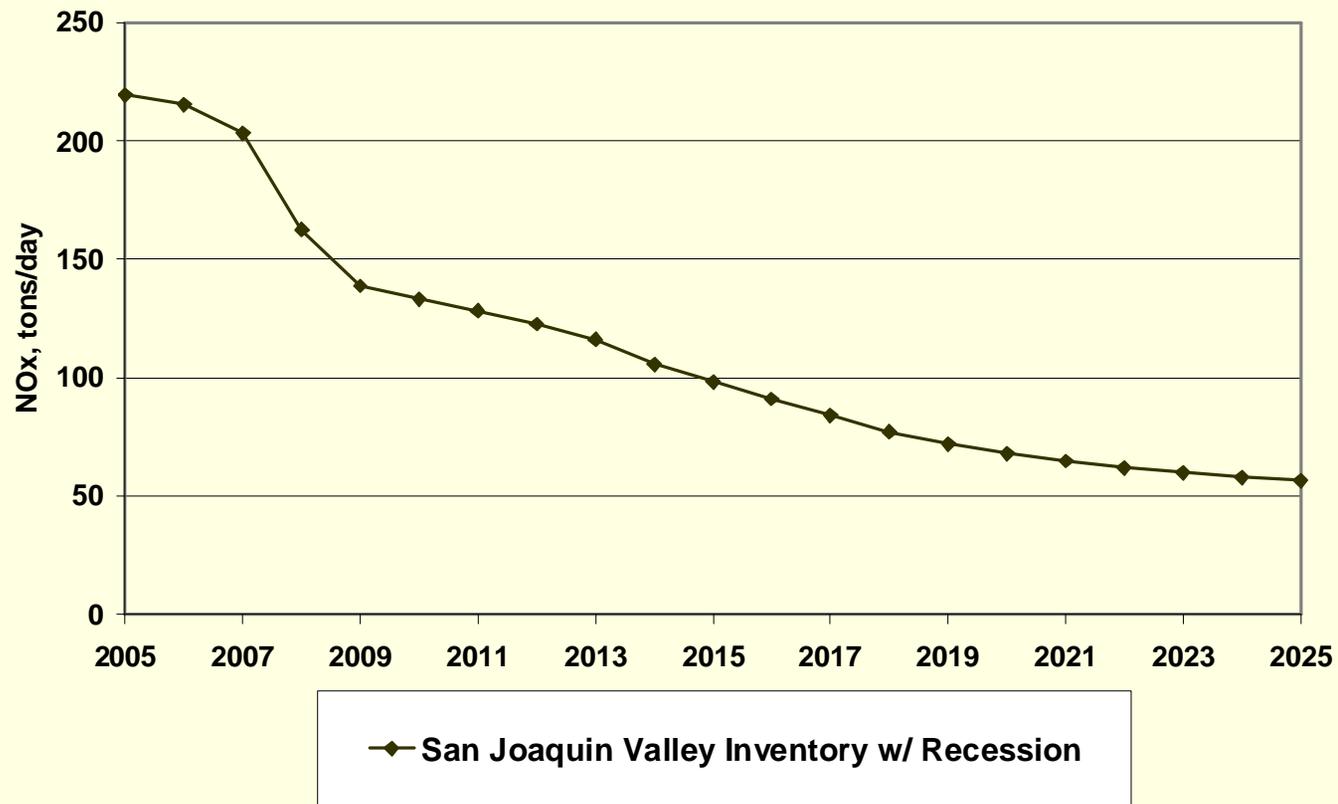
Impact of Revisions on EI

South Coast Baseline – PM2.5



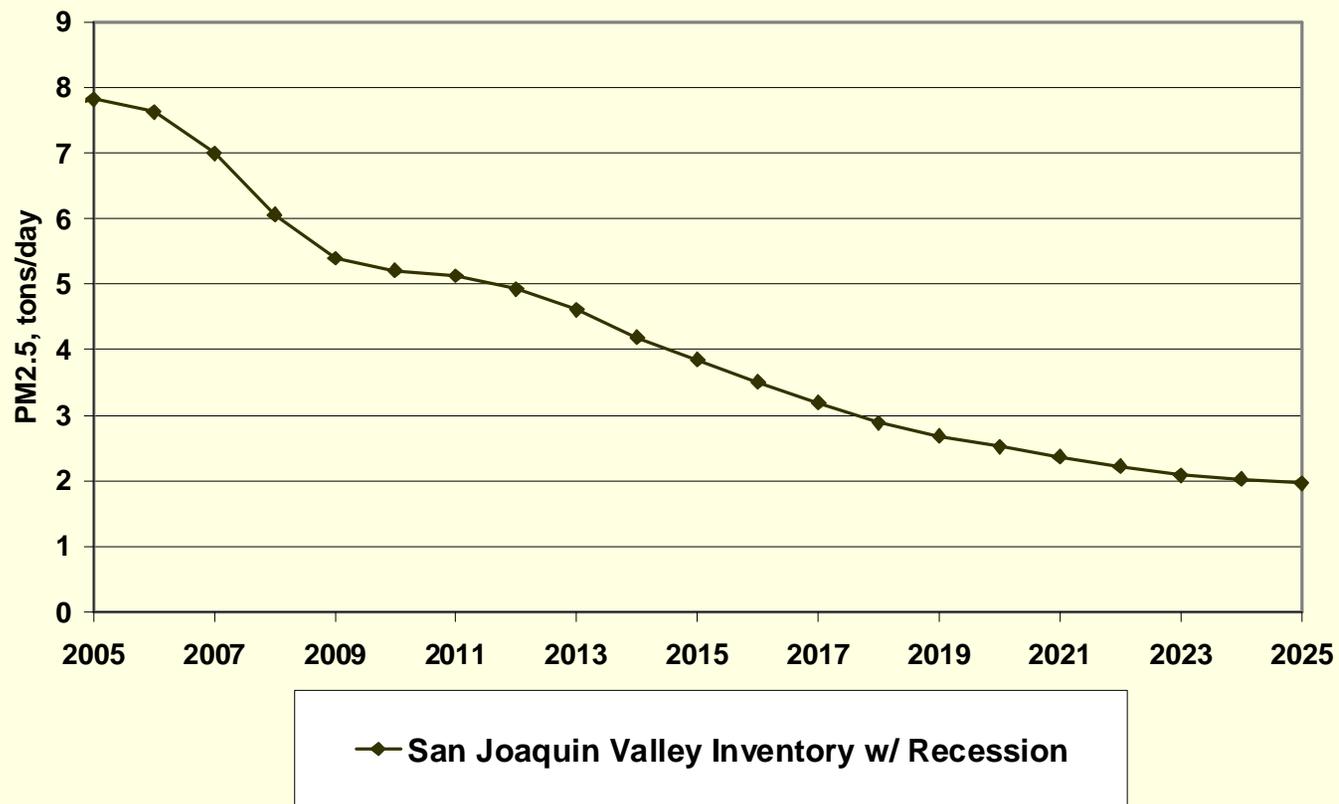
Impact of Revisions on EI

San Joaquin Valley Baseline – NOx



Impact of Revisions on EI

San Joaquin Valley Baseline – PM2.5



Emission Inventory for the In-Use Off-Road Vehicles Rule



Outline

- Update Inventory
- Emission Inventory Inputs
- New Information
 - DOORS Data
 - Engine Load
 - Recession and Forecasting
- Emissions Results
- New Margin

Update Inventory

- Why ARB is updating the inventory
 - Recession
 - Harley paper –fuel consumption too high
 - New data available

In-Use Off-Road Vehicles Emissions Inventory Approach

Estimating Emissions

- Population - (POP)
- Activity - (ACT)
- Load Factor - (LF)
- Emission Factor - (EF)

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



Population

- SIP inventory population based on California and national survey data.
- Revised inventory population based on DOORS reporting database
 - Fleet owners were required to report all relevant fleet information including total number of vehicles, vehicle types, horsepower and model year.
 - ~132,000 vehicles for 2009
- Additional assessment on DOORS reporting compliance

Reporting Compliance

- Survey of 1000 fleet owners was conducted in March 2010 to estimate number vehicles that have not reported to DOORS.
 - Sample derived from list of 21,800 buyers who financed equipment between 2005-2009
 - 7.3% fleets had not reported to DOORS.
 - Estimate about 25 vehicles per fleet for large fleets, 16 for medium and 6 for small.
 - Results in about a 10% non-compliance rate for population
- No estimates available for fleets in DOORS but operating out-of-state.

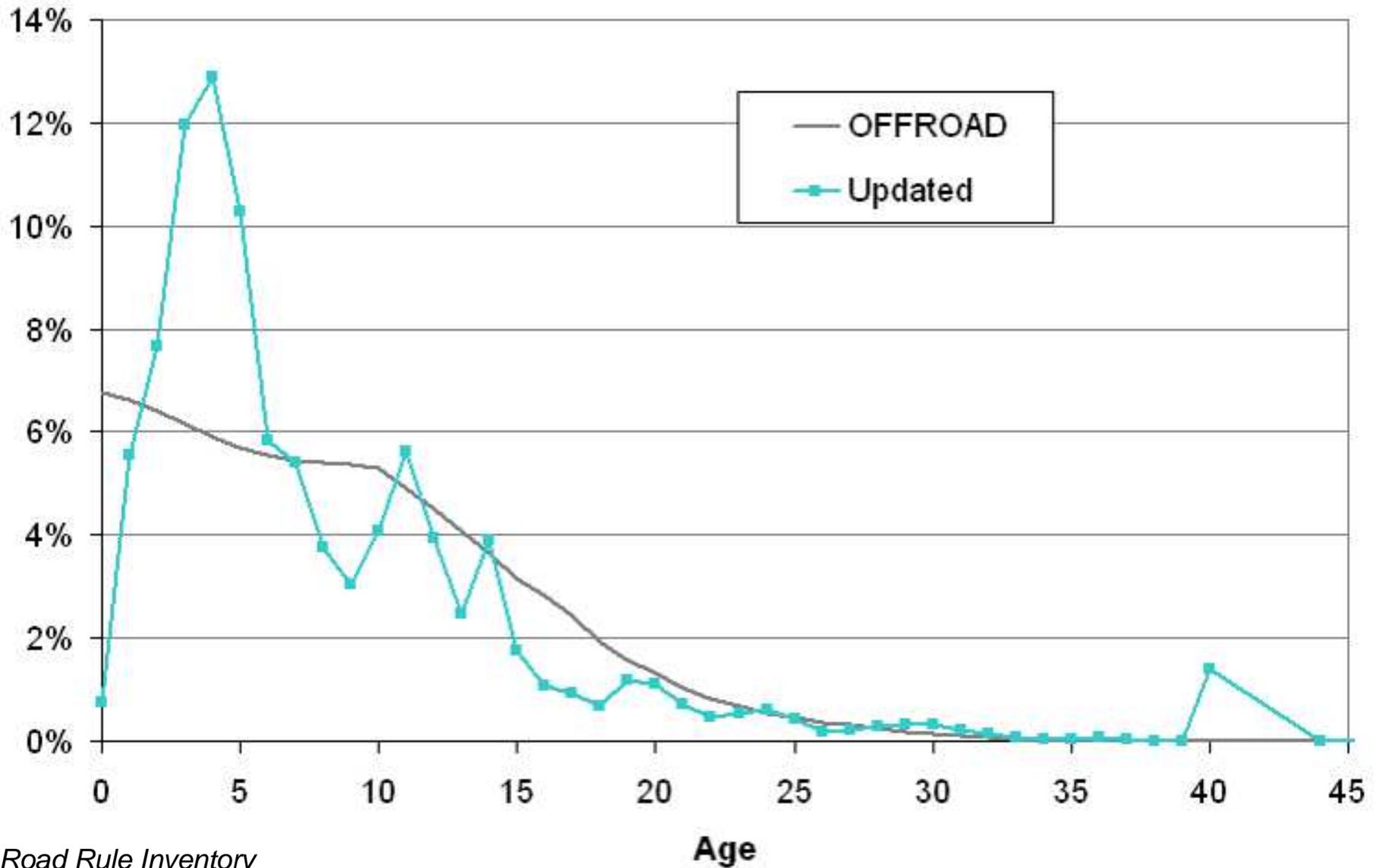
2009 Population

Sector	OFFROAD	Updated	Percent Change
Construction & Mining	172,915	116,861	-32%
Industrial	20,107	24,226	+20%
Airport GSE	1,830	3,705	+102%
Oil Drilling	1,021	822	-20%
TOTAL	195,872	145,614	-26%

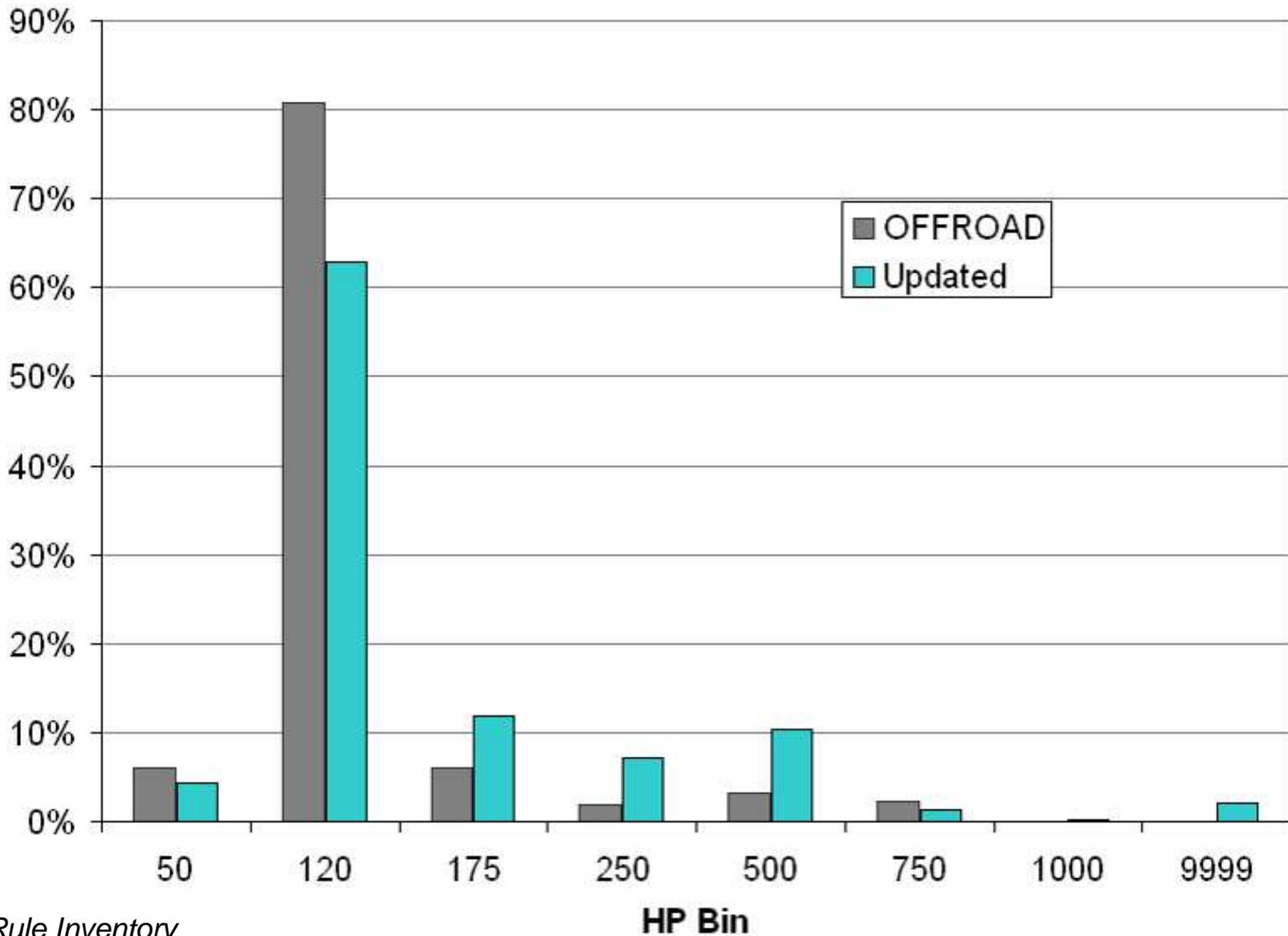
Age and Horsepower Distributions

- The age distribution from DOORS is skewed to younger vehicles than originally assumed.
- The horsepower distributions from DOORS vary.
 - For some equipment types the DOORS distribution is higher than originally assumed and for others lower.

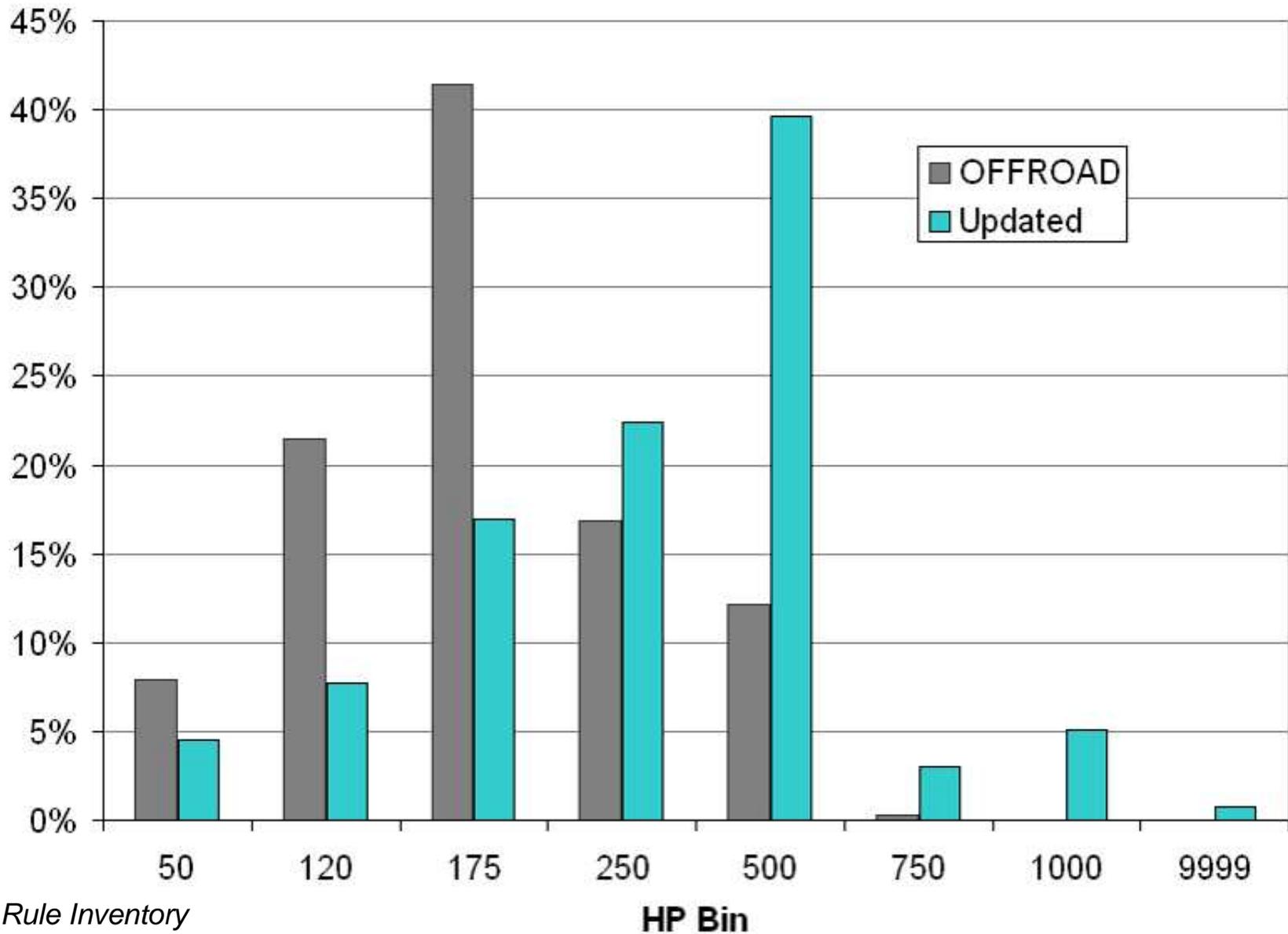
2009 Age Distribution - Excavators



Horsepower Distribution – Tractors/Loaders/Backhoes



Horsepower Distribution – Excavators



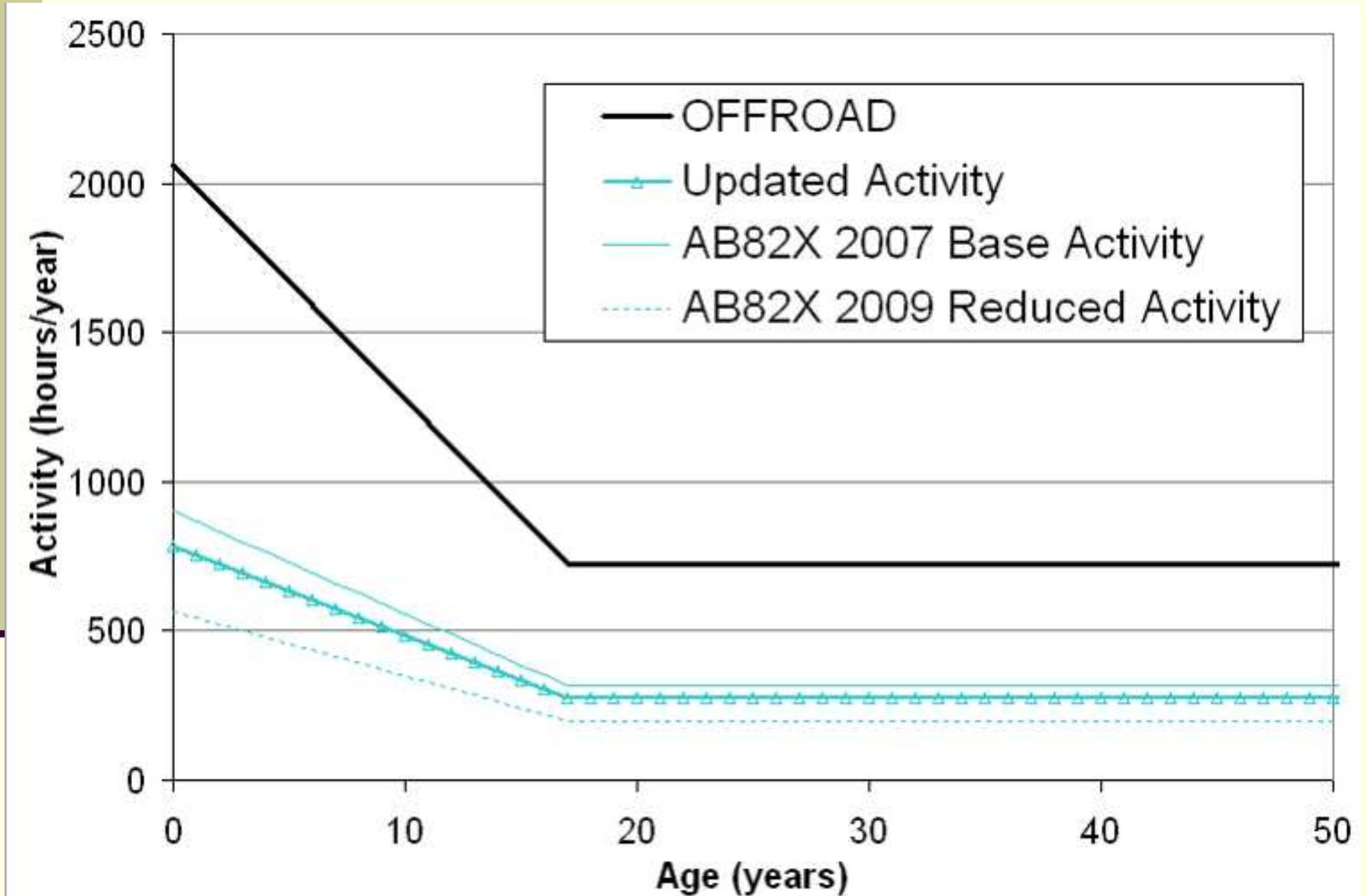
Activity

- SIP inventory activity based on national and some California specific data.
- In 2009, the California legislature approved Assembly Bill 8 2x, which required CARB to amend certain sections of the Off-Road Diesel regulation (AB 8 2x, 2009).
 - For credits fleet owners were required to provide equipment specific activity for the baseline year (2007) and activity for the same equipment in 2009
 - Both 2007 and 2009 activity significantly lower than originally assumed.

Activity

- Developed new activity profiles based on reported activity data
 - 2007 = baseline activity
 - 2009 = reduced activity
- Weighted activity – some fleets reduced population while other reduced activity
 - 34% reduced activity, 66% reduced population
- Compared results to other available data sources
 - TIAX Public Fleet Survey (2003)
 - ERG Survey <175 HP (2007)

Excavators



Average Annual Activity – Top 10 Equipment

Equipment Type	OFFROAD (hr/year)	Updated (hr/year)	% Change
Tractors/Loaders/Backhoes	942	512	-46%
Excavators	1,396	546	-61%
Scrapers	1,092	453	-59%
Rubber Tired Loaders	957	893	-7%
Crawler Tractors	1,013	409	-60%
Off-Highway Trucks	1,958	1,293	-34%
Forklifts	1,800	690	-62%
Other Construction Equipment	690	429	-38%
Rough Terrain Forklifts	1,123	237	-79%
Cranes	1,252	444	-65%

Load Factor

- Load varies by equipment type and usage
- Collected engine load data from ARB testing programs and manufacturer provided data
 - Analysis indicates that OFFROAD load factors are 25-50% too high
 - Staff concluded load factors should be reduced 33% for the updated inventory
 - Consistent with findings for other off-road equipment.

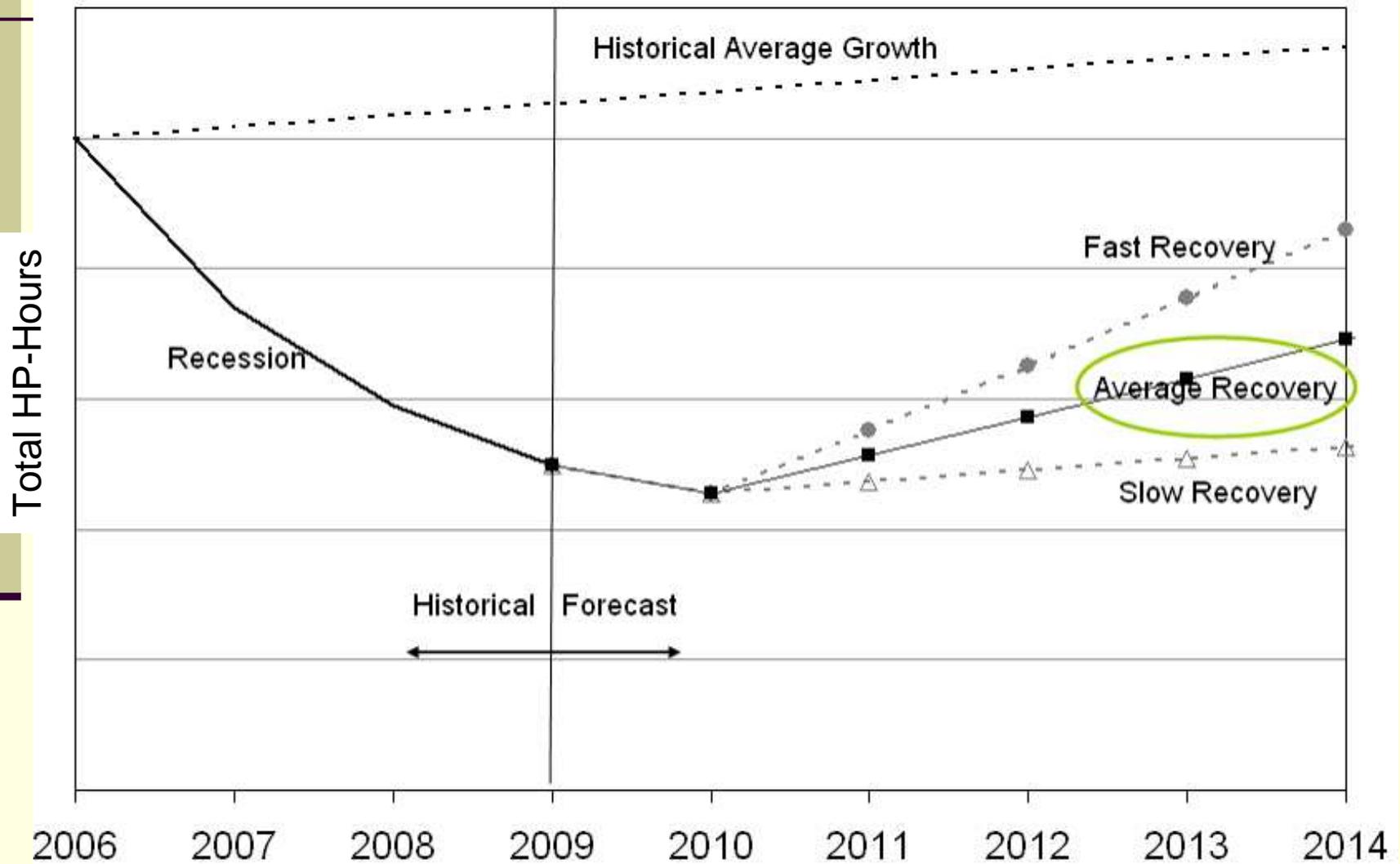
Growth – Annual Historical Rates

- Construction & Mining, and Industrial
 - SIP growth based on national 1970-2000 employment trends
 - Updated growth factor with California-specific growth in construction employment for 1970-2009
- Airport GSE
 - SIP growth based on 1991 Federal Aviation Administration flight operations data
 - Updated growth factor based on 1977-2009 US airline fuel consumption
- Oil Drilling
 - SIP growth based on 2005 ARB survey
 - Growth factor unchanged as most economic surrogates suggest no growth in the industry

Growth – Annual Historical Rates

Category	OFFROAD	Updated
Airport Ground Support	2.02%	1.78%
Construction and Mining	1.96%	1.84%
Industrial	0.63%	1.84%
Oil Drilling	0.00%	0.00%

Total Activity Forecast (2014)



Short Term Forecast (2009-2014)

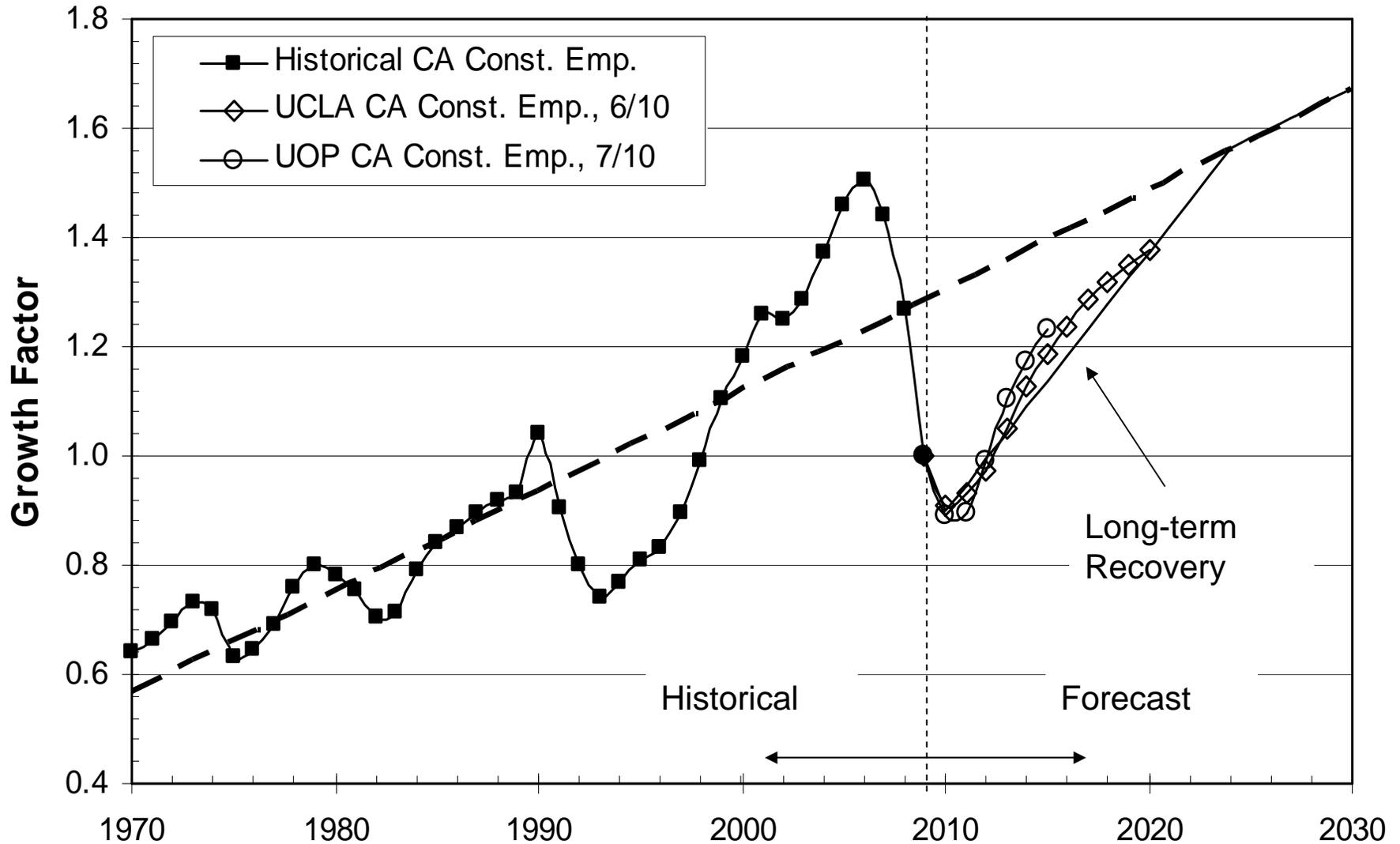
CY	Construction & Mining, Industrial¹	Airport Ground Support²
2009	1.00	1.00
2010	0.90	0.97
2011	0.95	1.01
2012	0.99	1.05
2013	1.04	1.08
2014	1.09	1.12

1. Based on California construction employment

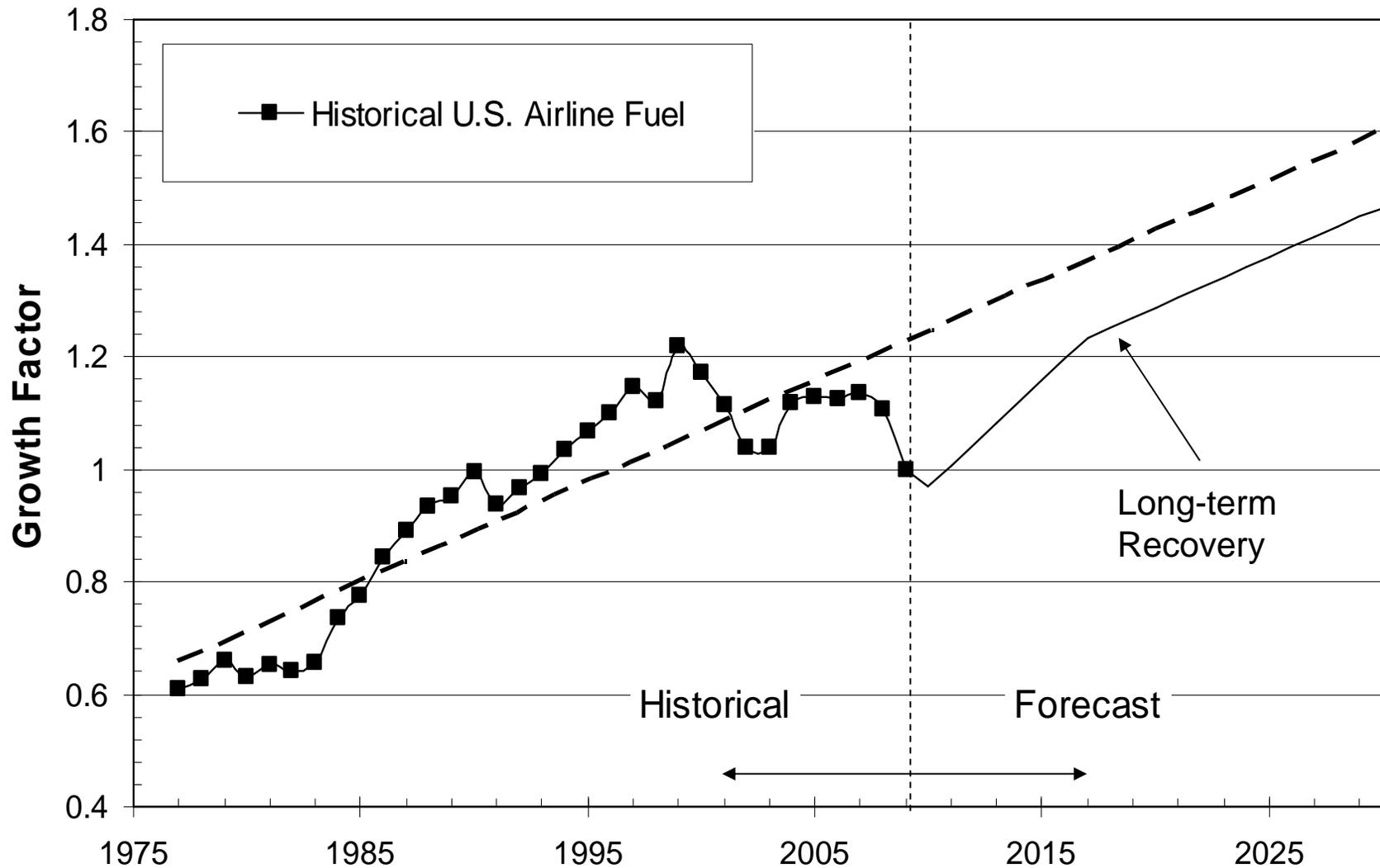
2. Based on U.S. Airline fuel

All fractions relative to 2009

Construction & Mining, Industrial



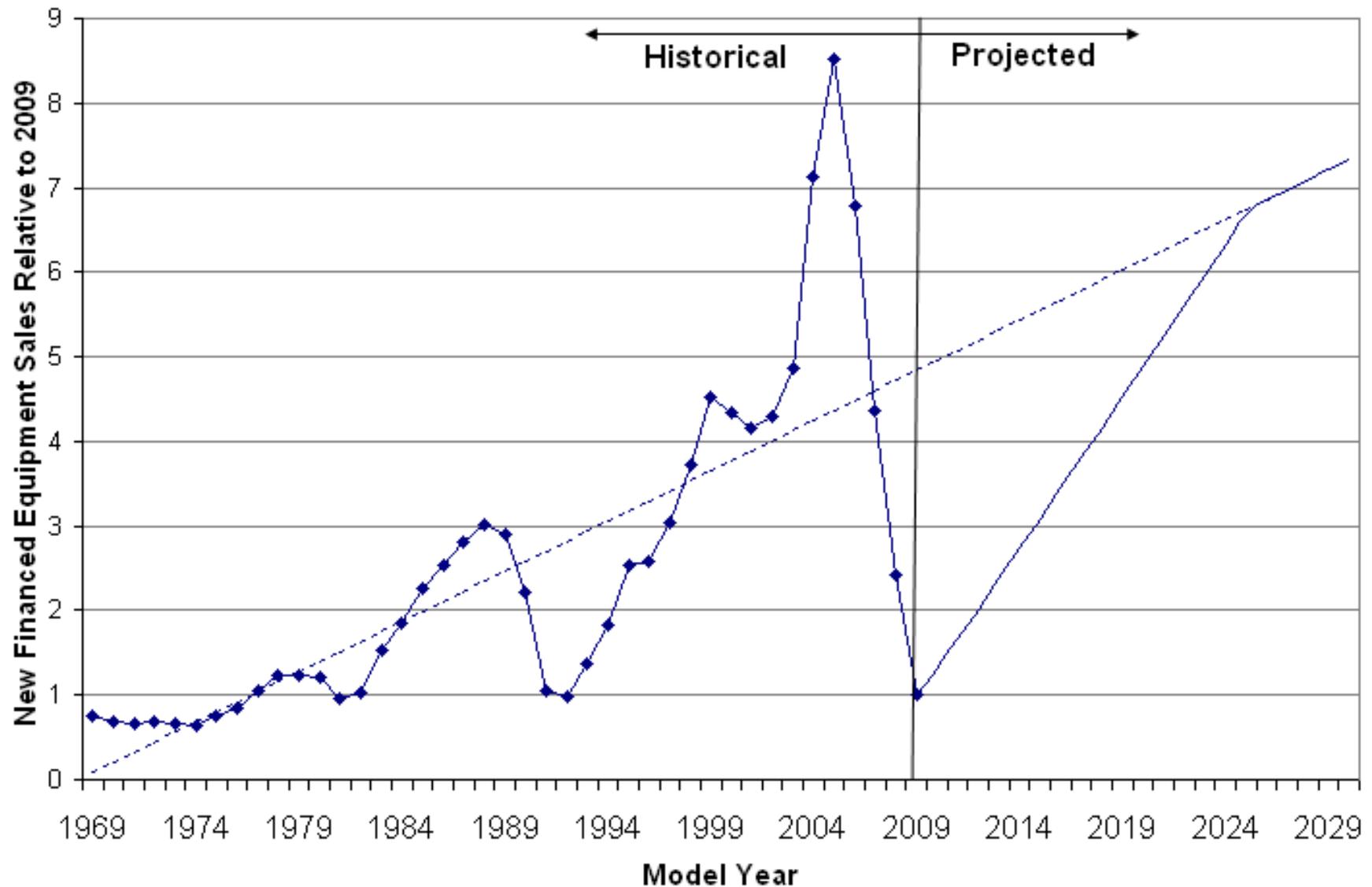
Ground Support Equipment



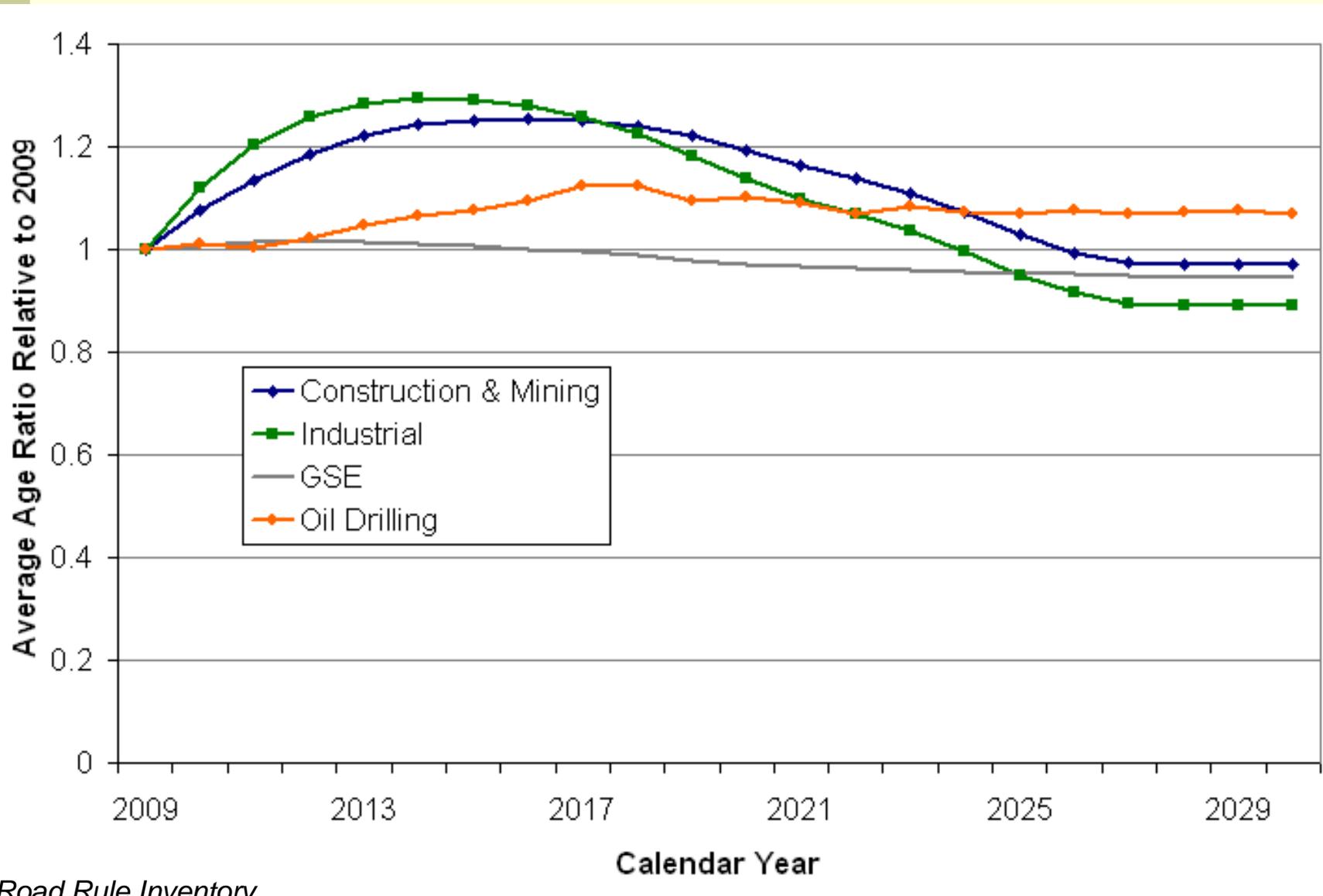
Impact of Recession and Forecasting on Age Distribution

- Staff incorporated the impacts of the economy on sales of new off-road diesel equipment. The strength of new equipment sales will impact the age distribution of the fleet into the future.
 - Depressed sales will lead to the fleet, as a whole, getting older over time
- The recovery scenario has a direct impact on the relative change in the fleet age over time.
 - Note: Activity renormalized to prevent changes in total activity as a result of changes in the age distribution.

Construction Equipment Sales



Impact of Sales on Age – Average Recovery Scenario



Other Inputs

- Brake Specific Fuel Consumption (BSFC)
 - OFFROAD fuel consumption rates are 0.401 lb/hp-hr
 - Staff adopted BSFC values from USEPA's NONROAD model (0.367 lb/hp-hr)
 - USEPA values very similar to engine data and industry comments
- Base Emission Factors – unchanged
- Deterioration Rates – unchanged
 - Capping deterioration at 12,000 hours

Spatial Allocation

- Construction equipment allocation methodology based on human population growth (same allocation used for trucks).
- Updated allocation of industrial equipment with newer employment data.
- GSE and Oil drilling equipment allocation remains unchanged.

Spatial Allocation - Construction

Air Basin	OFFROAD	2014 Updated
SC	36%	37%
SF	15%	16%
SJV	10%	17%
MD	2%	3%
SV	9%	9%
SD	9%	9%
Others	19%	10%

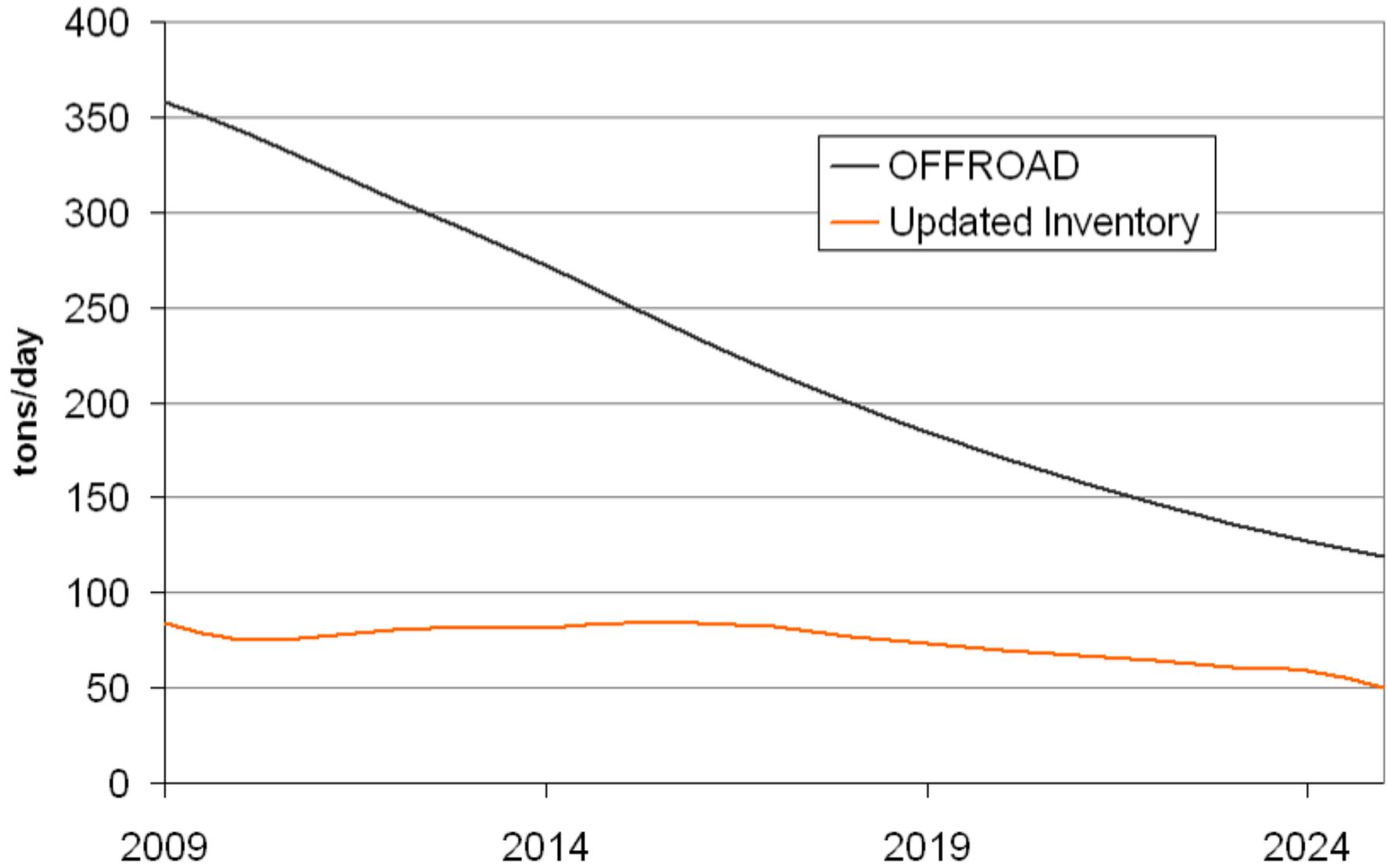
Spatial Allocation - Industrial

Air Basin	OFFROAD	2014 Updated
SC	56%	47%
SF	24%	24%
SJV	5%	9%
MD	1%	2%
SV	3%	4%
SD	6%	7%
Others	6%	8%

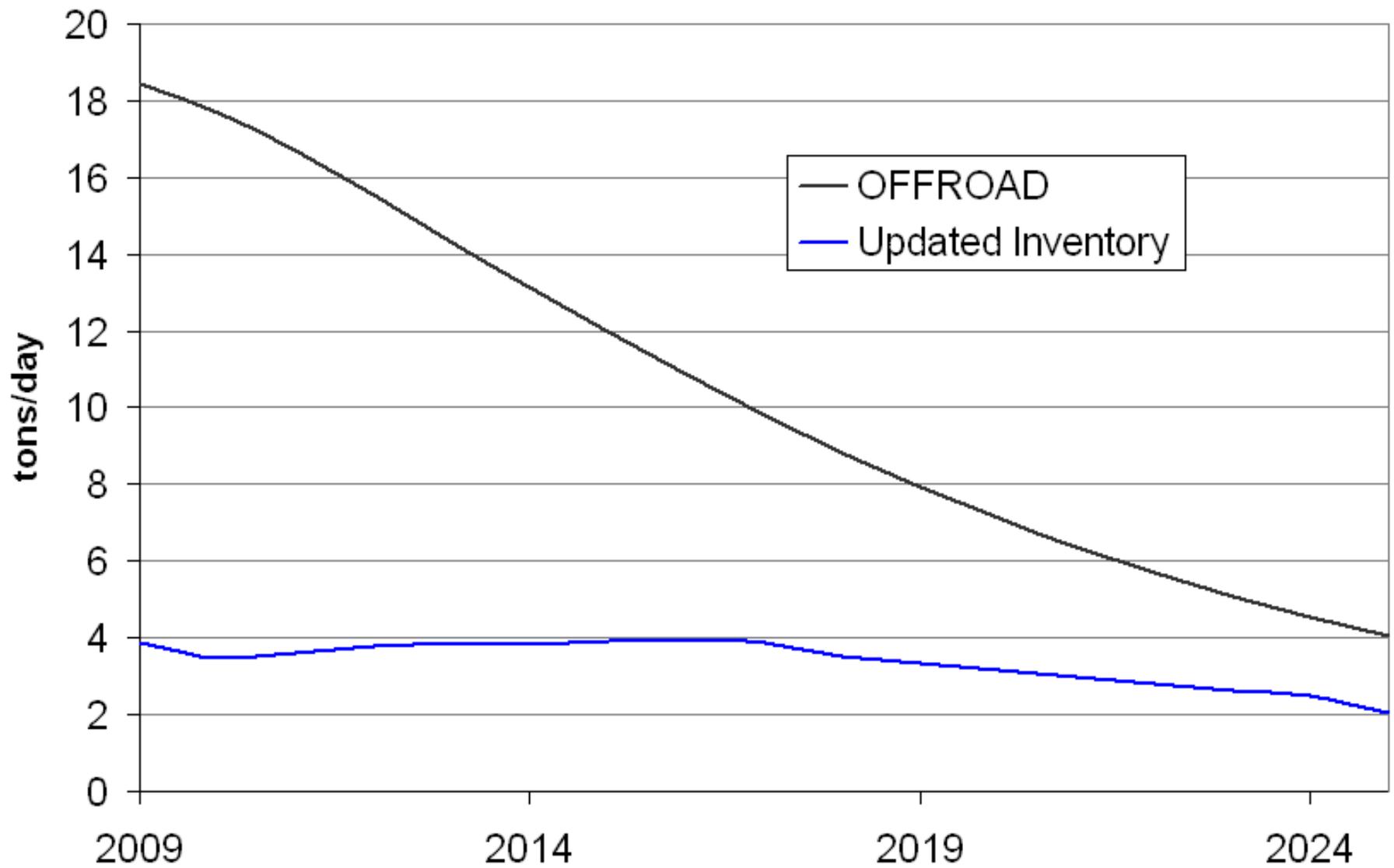
Overall Changes

- Population – lower
- Activity – lower
- Load Factor – lower
- Age – generally younger
- Growth – lower, especially in the early years due to the recession
- **Overall inventory is significantly lower than originally estimated.**

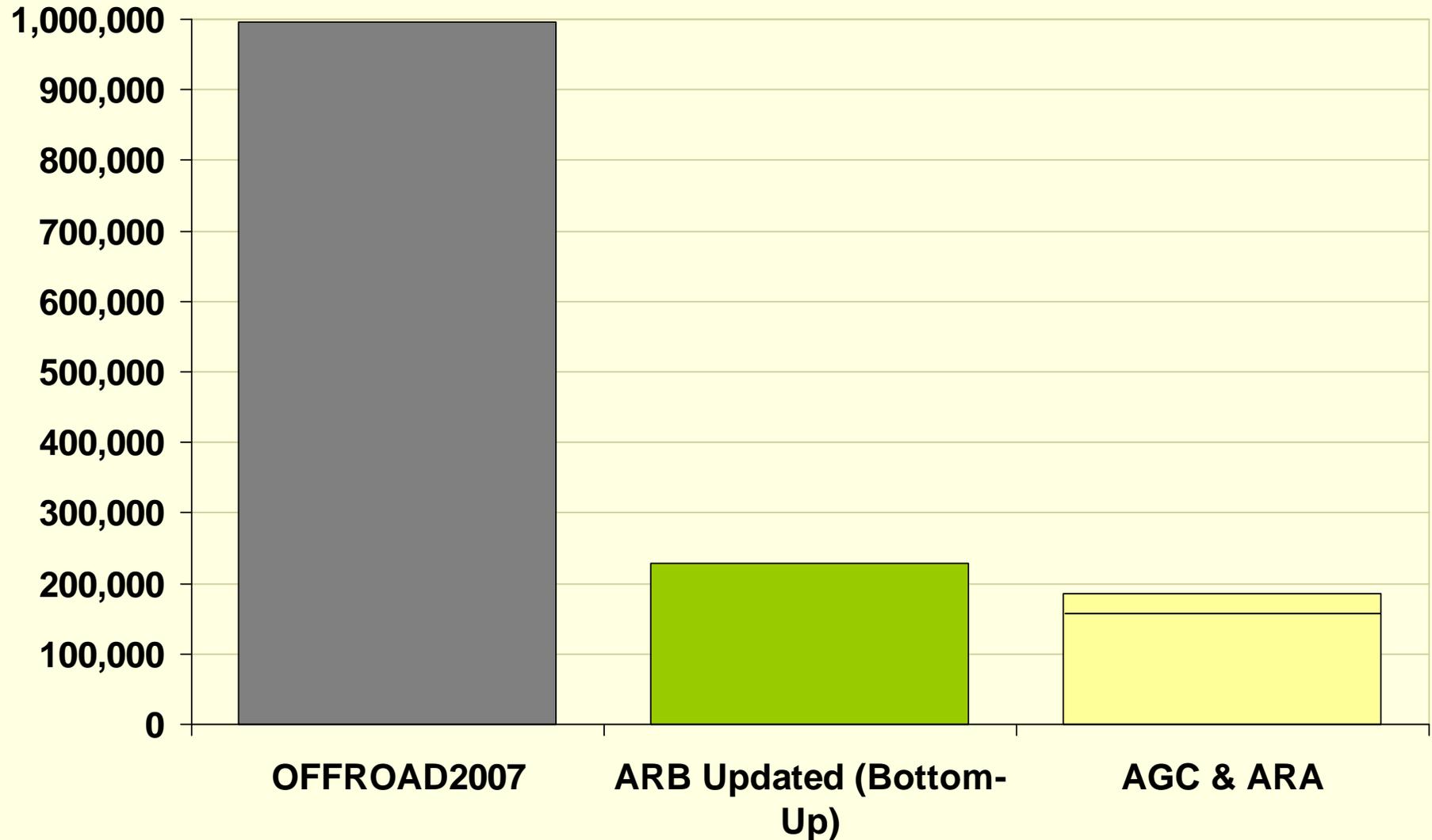
Statewide Baseline Emissions - NOX



Statewide Baseline Emissions – PM2.5



2009 Statewide Fuel Consumption (thousand gallons)



Next Steps

- Incorporate 'low use' vehicles
 - 7% DOORS vehicles designated as low use (<100 hours/year)
 - Assume 10% low use with threshold of <150 hours/year

Estimated Margin

- Assuming currently adopted rule
- Does not reflect proposed regulatory amendments
- Presented in NOx Equivalent emissions
 - Assuming average economic recovery



Revised Combined Truck and Construction Margin

- South Coast
 - Previous estimate: 21-42 tons/day NOx Eq.
 - Current estimate: 61 tons/day NOx Eq.
 - Reduced truck shortfall due to revised regional allocation and out-of-state VMT
 - Reduced construction emissions due to methodology and impact of recession
- San Joaquin Valley
 - Current estimate: 40 tons/day NOx eq.

South Coast – Average Recovery Scenario (2014)

South Coast		2014 Remaining Emissions (TPD)	
		SIP	Updated
Off-Road	NOx	85.6	26.2
	PM2.5	2.3	0.9
Trucks	NOx	55.1	81.5
	PM2.5	2.3	0.9
NOx Eq (pm*10)		186.7	125.7
New Margin			61
Old Margin			21-42

San Joaquin Valley – Average Recovery Scenario (2014)

SJV		2014 Remaining Emissions (TPD)	
		SIP	Updated
Off-Road	NOx	29.1	12.7
	PM2.5	0.7	0.4
Trucks	NOx	88.6	75.2
	PM2.5	1.9	1.1
NOx Eq (pm*9)		141	101
Margin			40

Next Steps

- Finalize rule scenario inventories
- Complete documentation and models for release

PM2.5 Mortality Estimate Report

Please see additional handout

Open Comment Period

Statewide Truck and Bus Rule
In-Use Off-Road Equipment Rule
Drayage Truck Rule

Workshop Summary

- Emissions inventory reflects latest information
- Fine particulate matter causes premature deaths
- Regulations are still needed to protect public health

10 Guiding Principles for Amendments to Both Regulations

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