



# Cargo Handling Equipment Emissions Inventory

June 27, 2011

California Air Resources Board

1

## Outline

- ▶ Base year inventory updates since May workshop.
- ▶ Baseline projections
  - Turnover/Purchasing
  - Growth
  - Recession
- ▶ Emissions Results



2

## New Information

- ▶ CHE Regulation Reporting Requirement
  - Required for all CHE equipment
- ▶ Ports of Los Angeles / Long Beach Annual Emissions Inventories
  - Annual information from 2001 to 2009
- ▶ Rail Yard Health Risk Assessments, 2005
- ▶ Port of San Diego Emissions Inventory, 2006
- ▶ Port of Oakland Emissions Inventory, 2005



3

## Background

- ▶ 2006 Base Year Emissions Inventory
  - Base year emissions do not reflect the impact of the regulation.

**Emissions** = Population\*Activity\*HP\*LF\*Emission Factor

- ▶ Forecasting
  - Turnover/Purchasing
  - Growth and Recession
  - 2005 Rule
  - 2011 Amendments



4

## Updates to Base Year since May Workshop

- ▶ Population
  - Base year population of equipment with emission controls (ECS) and on-road engines
    - May Workshop – used assumptions from original 2005 inventory
    - June Workshop – updated population with ECS data from reporting
    - Result: Reporting indicates lower population of equipment with ECSs and on-road engines than assumed in May – lead to an increase in emissions
- ▶ Activity, Emission Factors, Load Factors
  - No changes since May workshop

5

## Projecting the Inventory

- ▶ Key Baseline Inputs
  - Turnover/Purchasing – estimates how many vehicles leave the fleet and how many are purchased each year
  - Recession & Growth – accounts for the impact of the recession on activity and projections for future growth
- ▶ Key Rule Inputs
  - Same as baseline but include the impacts of the regulation
    - Examples: retirement, purchasing of new equipment and filters, etc

6

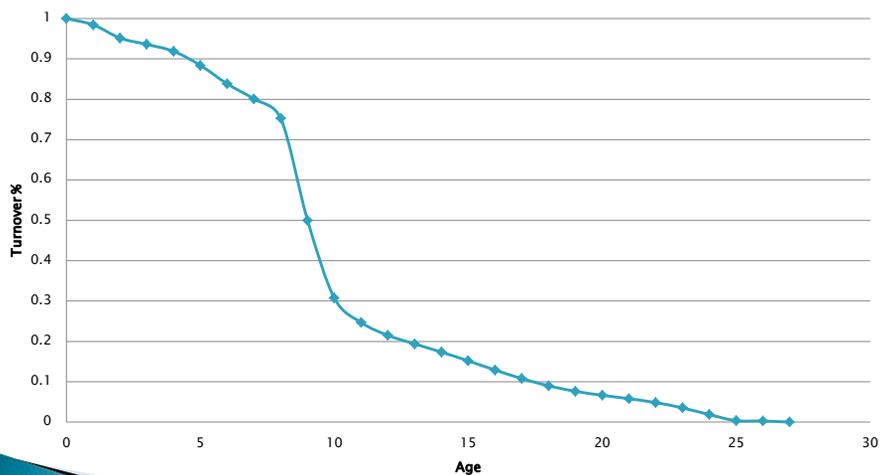
# Turnover

- ▶ Turnover – an estimate of the number of vehicles that leave a fleet over a given time.
- ▶ Turnover rates follow traditional s-curve but have been modified to reflect fleet characteristics
  - Example, some fleets only keep equipment a few years while others for much longer.
  - Turnover rates based on the average age of equipment in a fleet
  - Useful life (i.e. where 50% has been retired) is at 1.5 times the average age.
  - Maximum age is at the 98<sup>th</sup> percentile of the age distribution

7

# Turnover

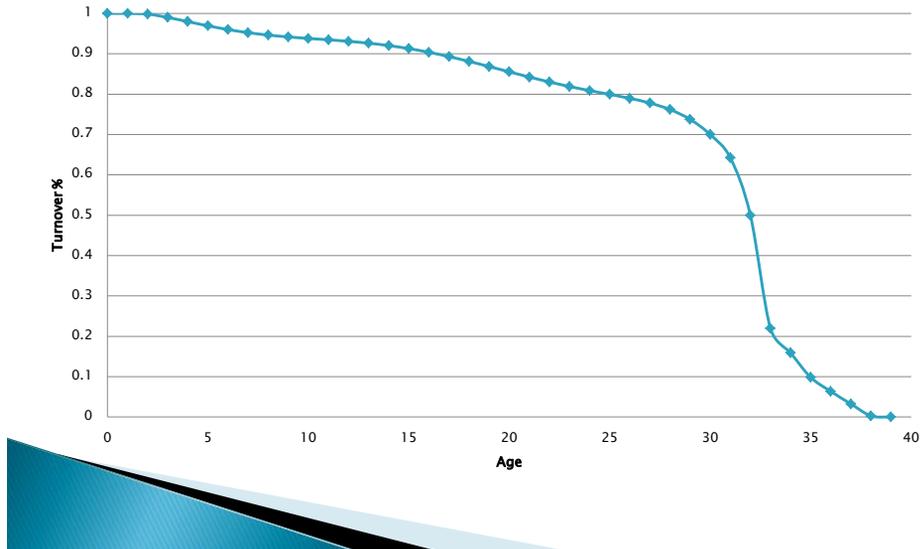
Example RTG Cranes: Useful Life = 9; Max Age = 26



8

# Turnover

Example: Forklifts: Useful Life = 32; Max Age = 39



9

# Purchasing

- ▶ Accounts for the purchasing of vehicles as a result of turnover and/or growth.
  - Model year and calendar year specific
- ▶ Purchasing based on historical age distribution - 'business as usual' (BAU)
  - Developed from 2001-2006 fleet data
  - Represents the age distribution of the fleet in the absence of the rule and the recession

10

# Growth & Recovery

## ▶ Growth

- Consistent with the recent Ocean-Going Vessel Rulemaking inventory
- Based on growth of net registered tonnage of container, bulk, general, reefer and other vessels visiting California ports

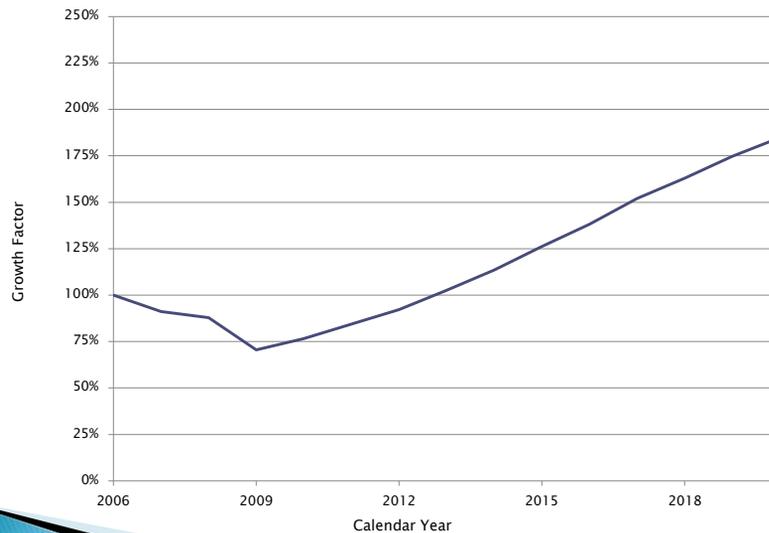
## ▶ Recession

- Incorporated the impacts of the recession on total activity
  - LA/LB container throughput dropped 25% between 2006 and 2009
  - Port of Oakland 14% drop
  - Some commodity types impacted more than others – break bulk at some locations has dropped 75%

11

# Growth and Recovery

## Example: South Coast



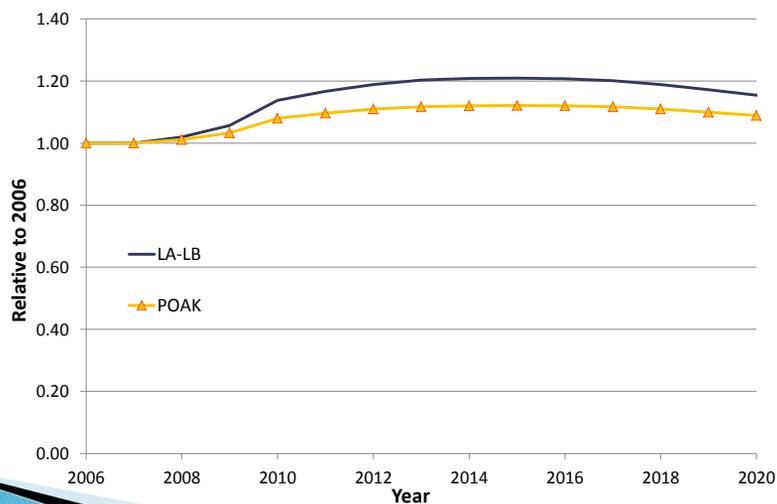
12

## Impacts of the Recession on Age

- ▶ The recession has impacted the sales of new equipment in California and nationally.
  - Sales of new equipment has dropped since 2007
  - TEU throughput used as surrogate for sales
  - Results in the fleet getting older over time as a result of depressed sales of new vehicles during the recession/recovery.

13

## Impact of Recession on Average Age

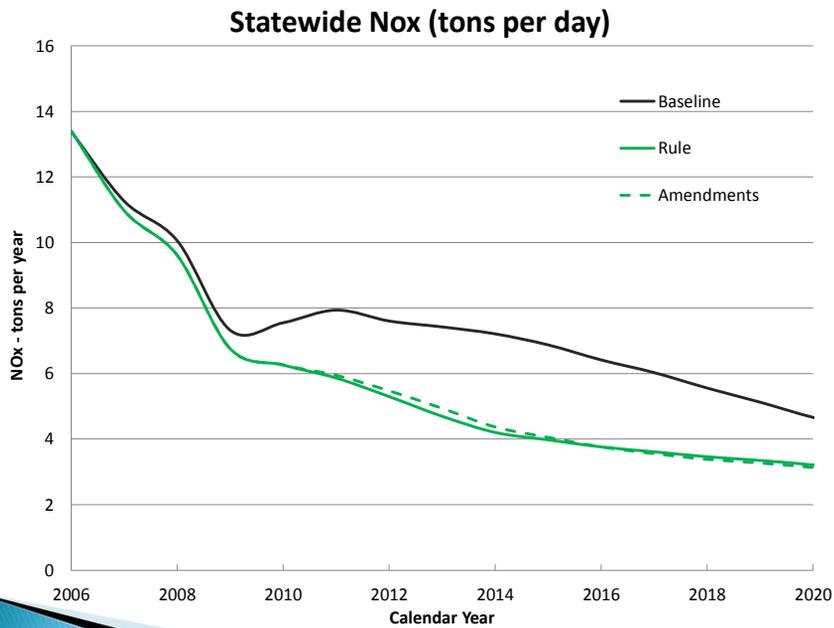


14

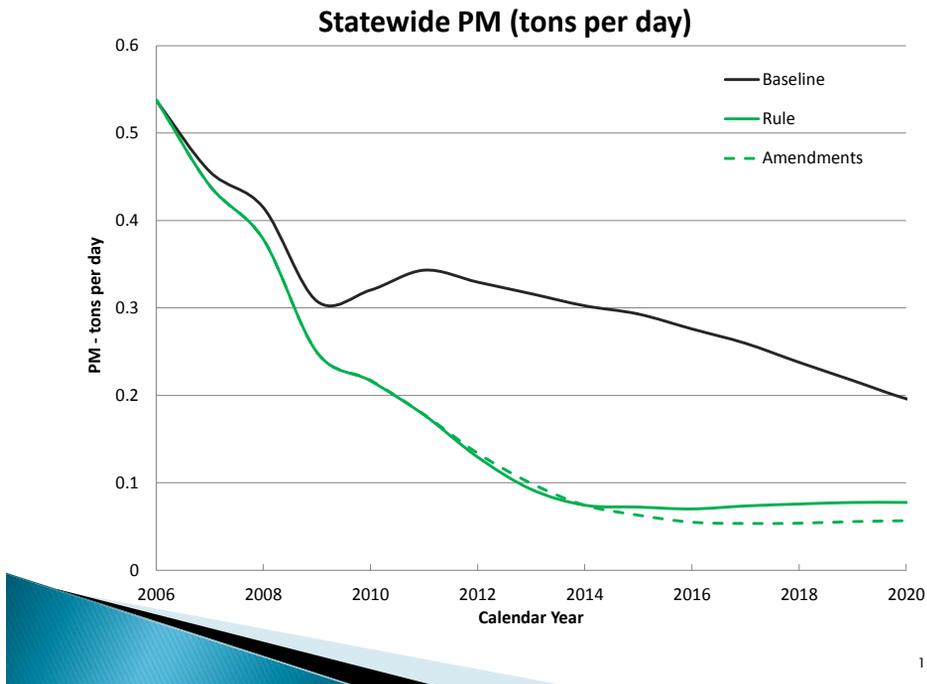
## Emissions Inventory Includes:

- ▶ New information collected since the time of the original rulemaking
- ▶ The impact of the recession and recovery
- ▶ The impacts of the original 2005 rule and the 2011 proposed amendments
- ▶ Results:
  - Updated inventory about 25% lower for NOX and 3% higher for PM in calendar year 2006 when compared to the original inventory developed in 2005
  - Very small change in emissions between the original rule and the proposed amendments in 2014.

15



16



## Conclusions

- ▶ Amendments result in:
  - Minor loss in PM benefits before 2014
  - Additional PM benefits after 2014 as a result of the Tier 4 FEL engine filter requirements.
  - 7% more PM benefits and 2% less NOX benefits statewide between 2006 and 2020

