Addressing Air Quality and Climate Change Goals in the San Joaquin Valley

California Dairy and Livestock Greenhouse Gas Reduction Working Group

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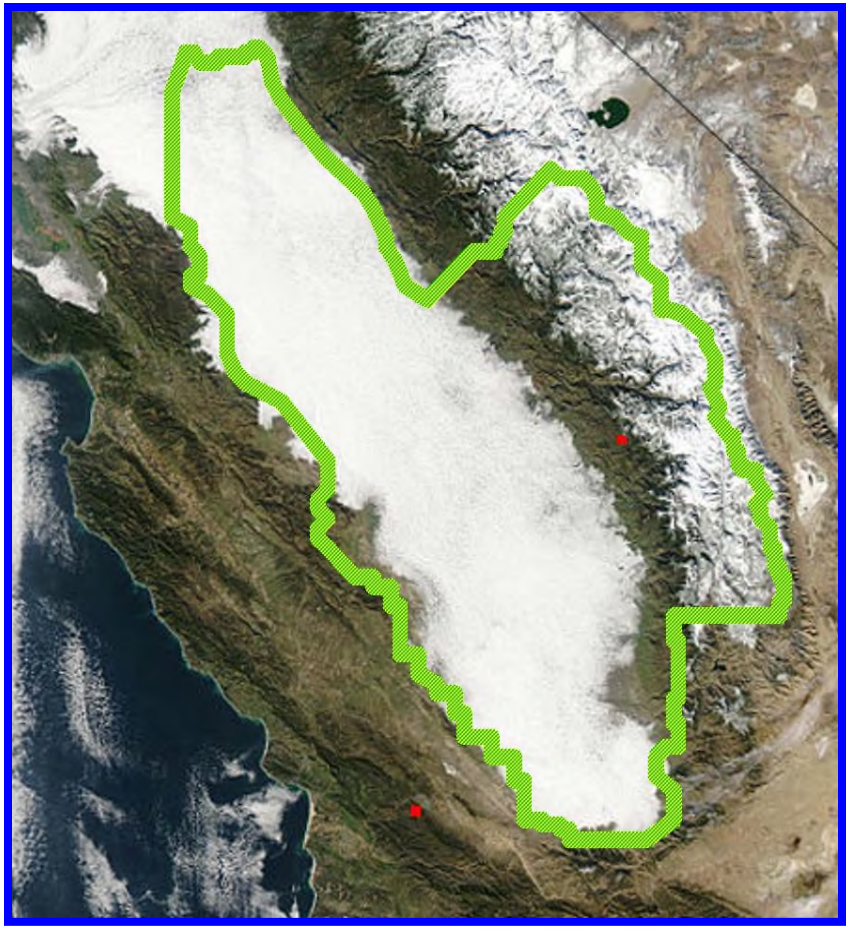
Air Quality Challenges in the San Joaquin Valley

- Surrounding mountains and meteorology create ideal conditions for trapping air pollution
- Economic challenges – SJV has 20 of CA's 30 most disadvantaged communities (CalEnviroScreen)
- Interstate-5 and Hwy 99 (major transportation corridors)
- Extreme nonattainment for 8-hr Ozone Standard (summer)
- Serious nonattainment for PM2.5 Standards (winter)
- NOx the most critical pollutant in the SJV for both ozone and PM2.5
- ~ 85% of NOx from mobile sources
- > 80% reduction in stationary source NOx emissions since 1980



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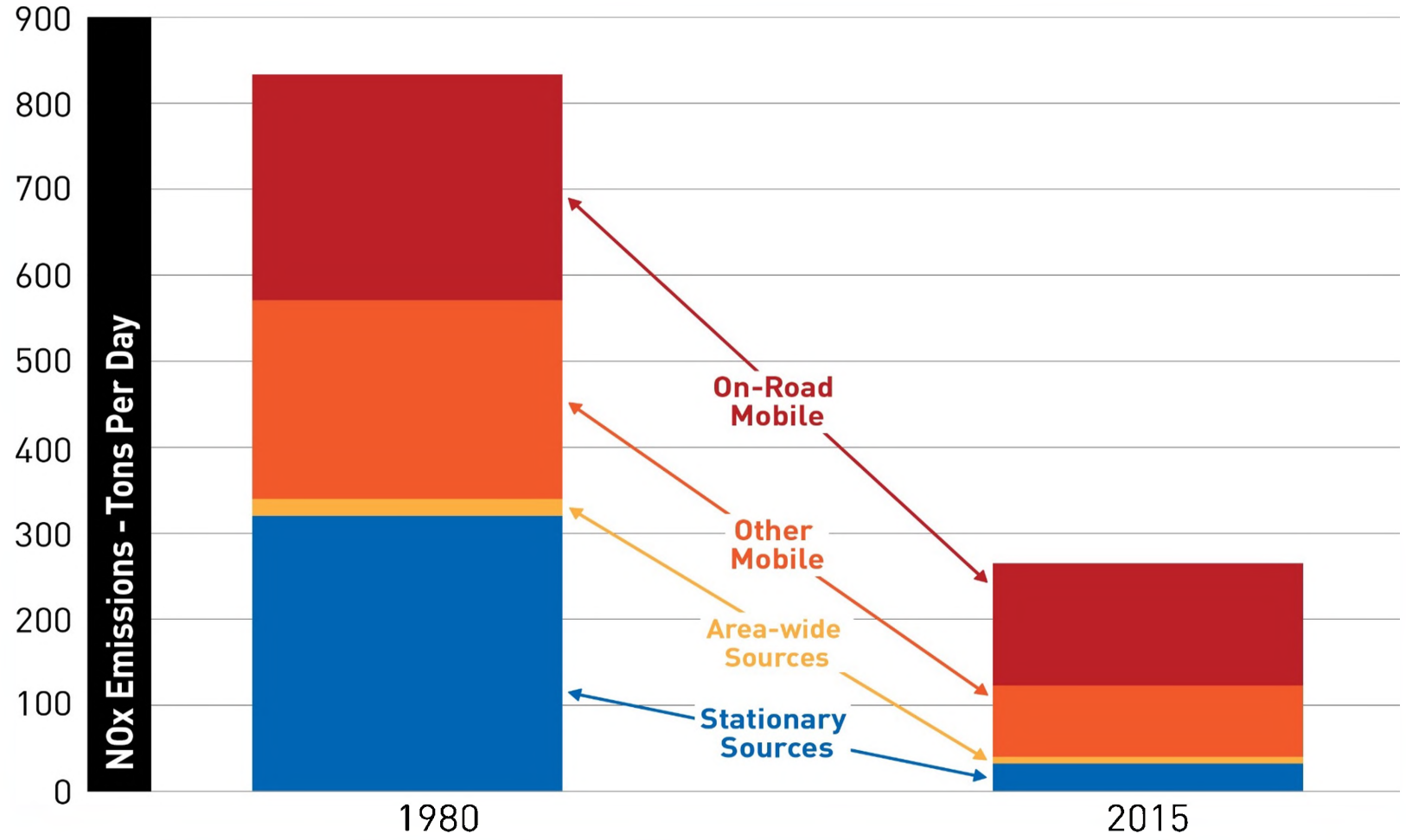
Major Reduction in all Sectors (1980 v. 2015)



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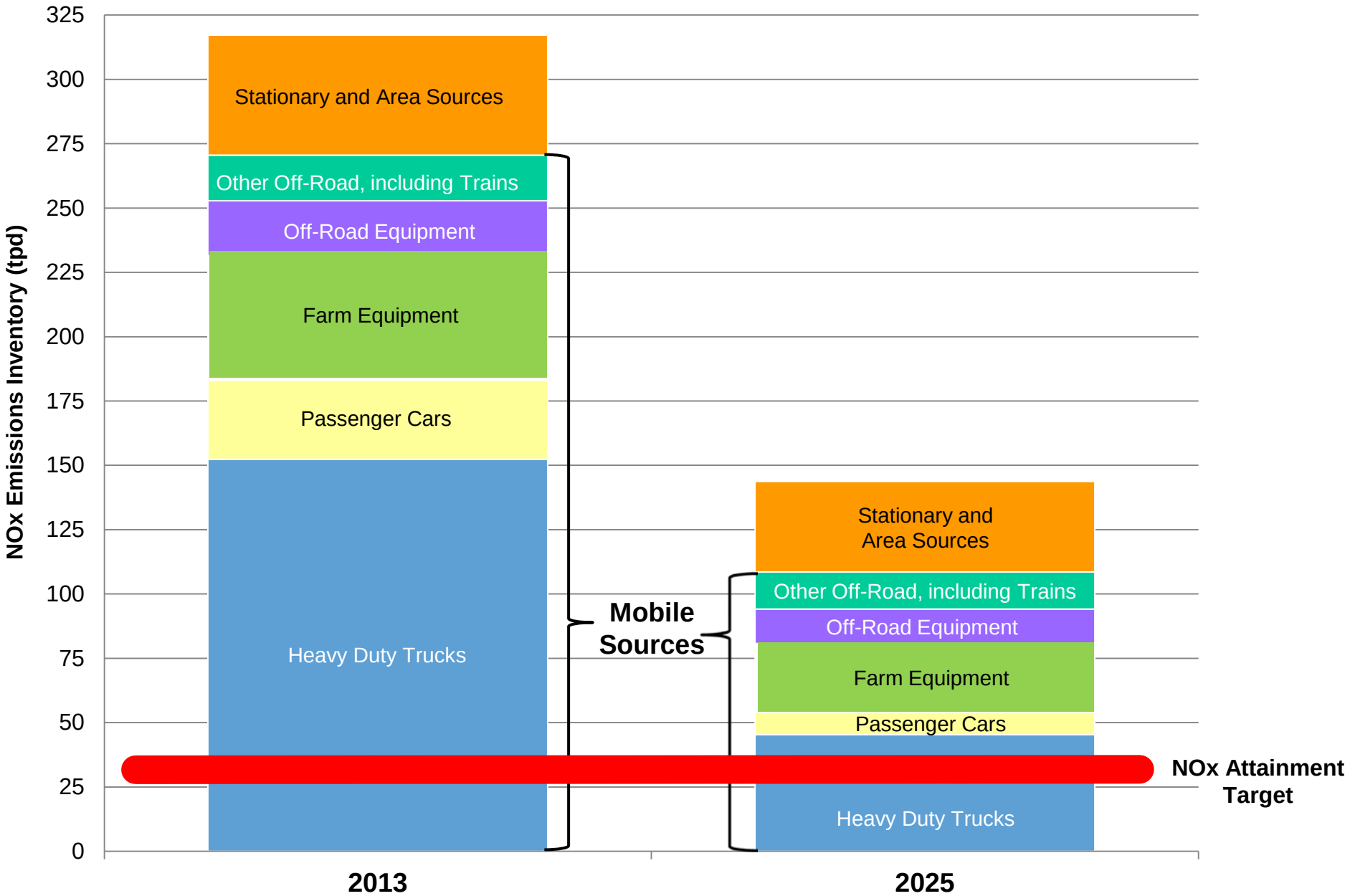
Additional NOx Reductions Needed in SJV

(2025 Serious Deadline for 2012 Annual PM2.5 Std)



San Joaquin Valley Dairy Farms

- 1,058 SJV dairy farms – 76% of CA dairy farms
- 1.54 million milk and dry cows – 89% of total CA dairy cows (CDFA 2016 Dairy Statistics Annual)
- 3.2 million total dairy cattle – 90% of total CA dairy cattle (cows, heifers & calves)
- 12 SJV dairies have operating digesters, all currently use internal combustion engines to produce on farm power

Dairy Contribution to San Joaquin Valley Air Emissions

- Total Valley NOx emissions: 230 tons/day
  - Dairies: ~0 tons/day
- Total PM10: 265 tons/day
  - Dairies: 8 tons/day
- Total PM2.5: 58 tons/day
  - Dairies: 1 ton/day
- Total VOC: 301 tons/day
  - Dairies: 74 tons/day
- Total NH3: 318 tons/day
  - Dairies: 125 tons/day

District Advancement of Low-NOx Biogas Technologies

- NOx emissions from internal combustion engines burning biogas in the San Joaquin Valley:
  - Pre-2000: Rich burn engines at 200-500+ ppmv NOx
  - 2000: Lean burn engines at 50 ppmv NOx
  - 2010: Lean burn with Selective Catalytic Reduction (SCR) at 11 ppmv (78% reduction)
- Advancement continues. District Technology Advancement Program (TAP) has provided funding for several Ultra-low NOx biogas demonstration projects
  - Ultra-low NOx biogas rich-burn engine with Non-Selective Catalytic Reduction (NSCR): goal of 2 ppmv NOx achieved intermittently
  - Ultra-low NOx biogas lean-burn engine with SCR System: 3 yrs successful operation at 0.07 lb-NOx/MW-hr (< 2 ppmv NOx @ 15% O2)
  - TAP currently has a contract to provide funding for a biogas pipeline injection and vehicle fuel demonstration project

Strategies for Air Quality and Climate Change in the SJV

- NOx from all sources in the SJV must be significantly reduced to meet health-based air quality standards for Valley residents
- Methane reduction efforts must be directed at No-NOx solutions in the SJV to simultaneously meet air quality and climate change goals
  - Pipeline injection
  - Vehicle fuel applications
- Agencies and interested parties must work together to find ways to remove barriers to the use of biogas as renewable natural gas and as a vehicle fuel
- Valley Air District will continue to support innovative proposals for demonstration of No-NOx and ultra-low NOx solutions for use of biogas (pipeline injection, vehicle fuel, ultra-low NOx engine controls, etc.)

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