

# Improved air quality through the use of Tier 3 fuels in Utah

Presentation to the  
Natural Resources, Agriculture, and Environment Interim Committee  
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# Vehicle Emissions and Fuel Standards

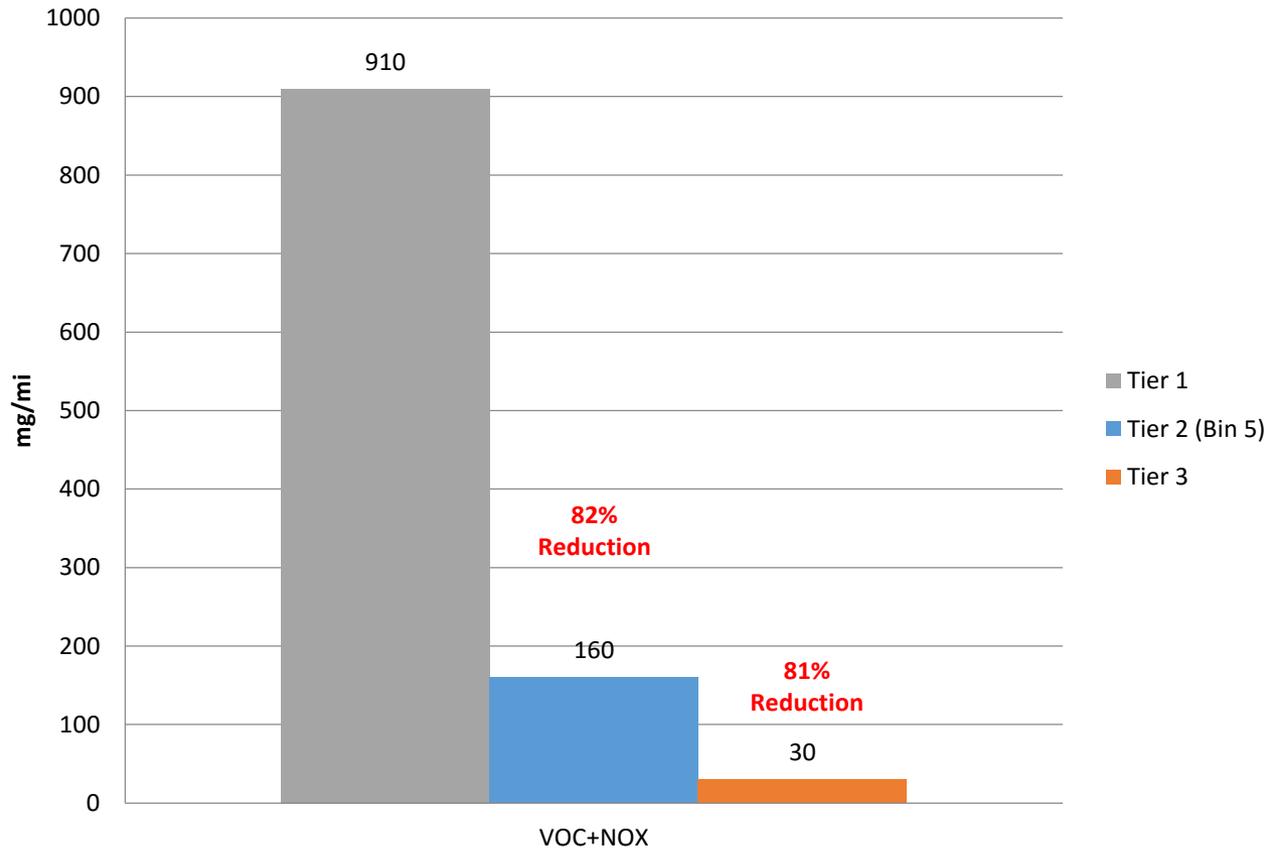
- Tier 1
  - Adopted June 5, 1991
  - Phased-in from 1994-1997
- Tier 2\*
  - Adopted December 21, 1999
  - Phased-in from 2004-2009
- Tier 3\*
  - Adopted April 28, 2014
  - Phased-in from 2017-2025

\*Include both vehicle emission and fuel standards as an integrated system

# Tier 3 Vehicle Emission Standards

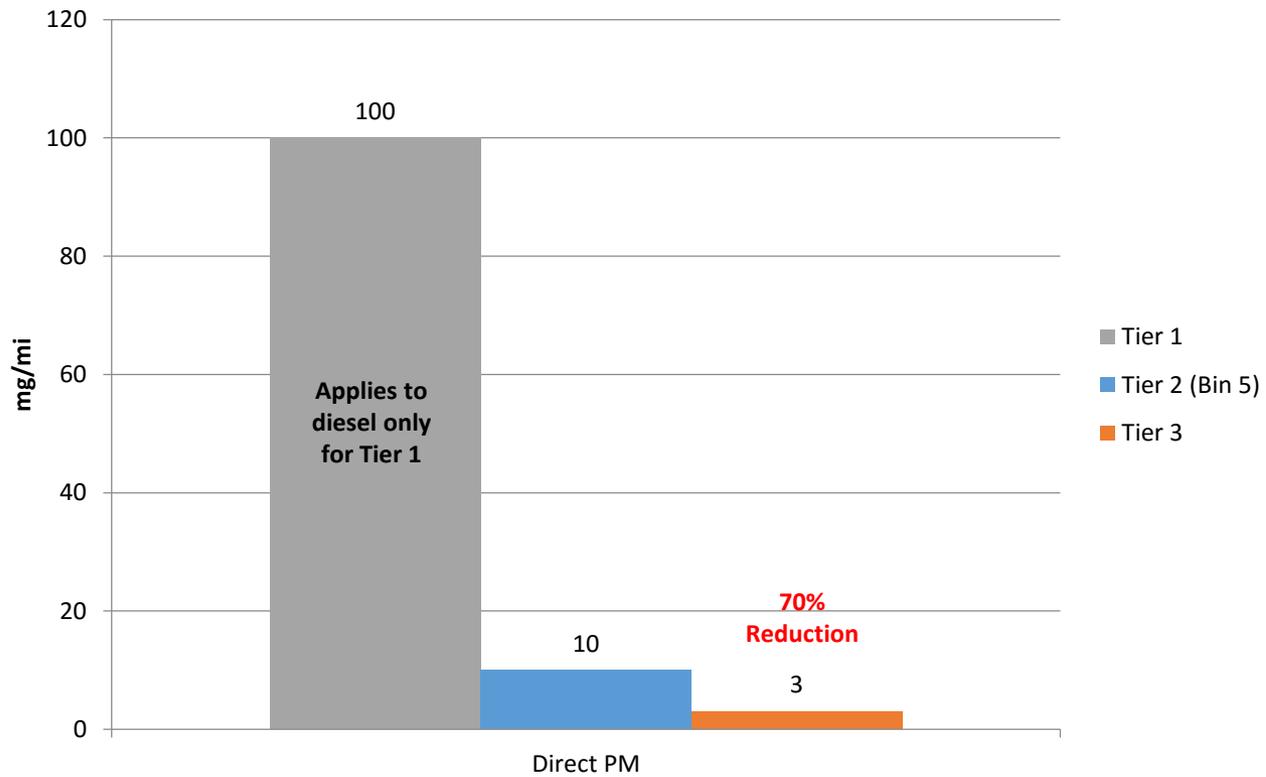
- 80% reduction in combined NMOG/VOC and NO<sub>x</sub> emissions on a corporate fleet average basis
- 70% reduction in direct PM emissions on a per vehicle basis
- Begins in 2017 and phased in through 2025
- Improved emissions for medium- and some heavy-duty vehicles as well
- Improved evaporative emissions
- Useful life of the vehicle extended from 120,000 miles to 150,000 miles
  - Improved durability of vehicle emissions controls

# Tier 1, Tier 2, and Tier 3



Fleet average basis

# Tier 1, Tier 2, and Tier 3

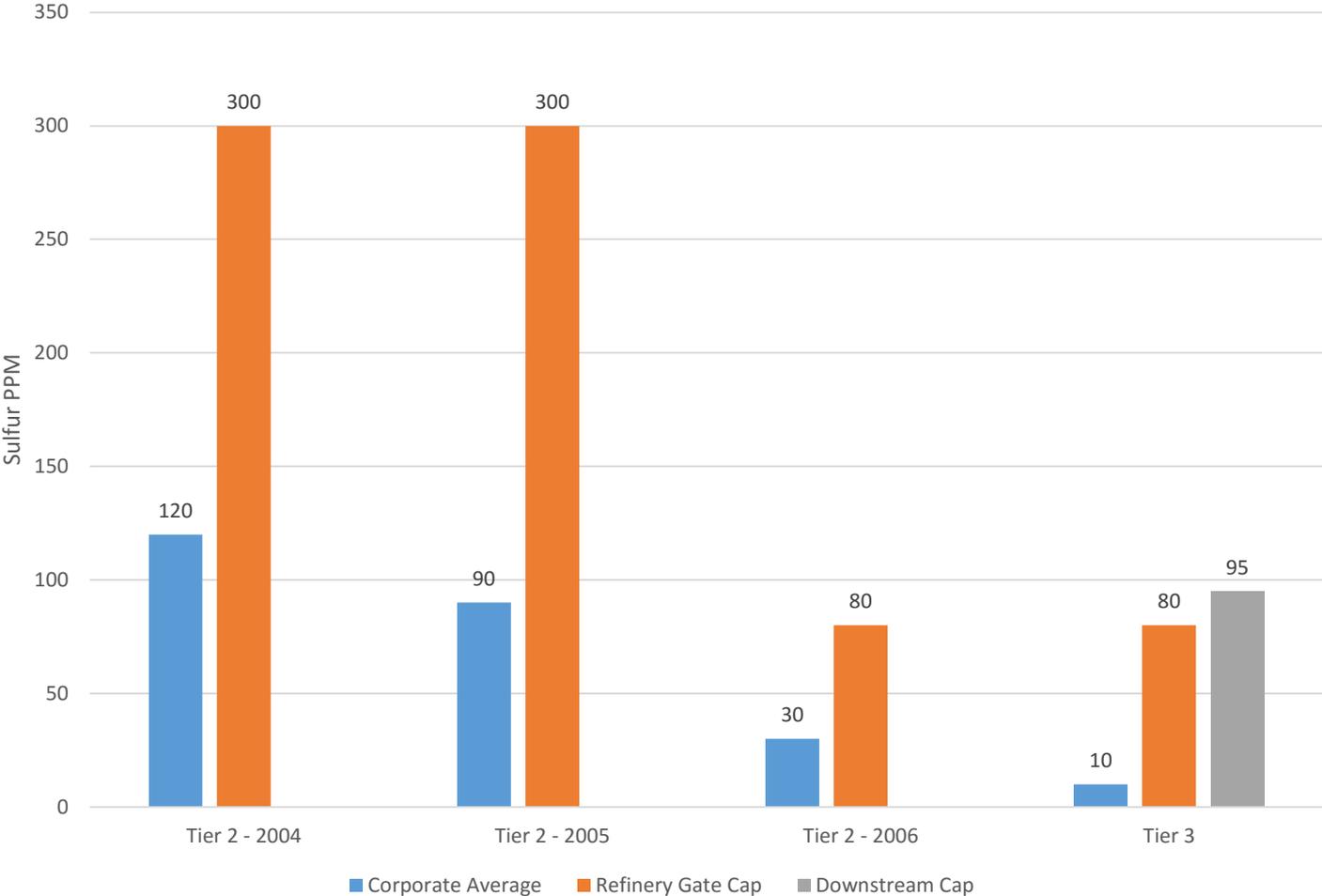


Per vehicle basis

# Tier 3 Fuel Standards

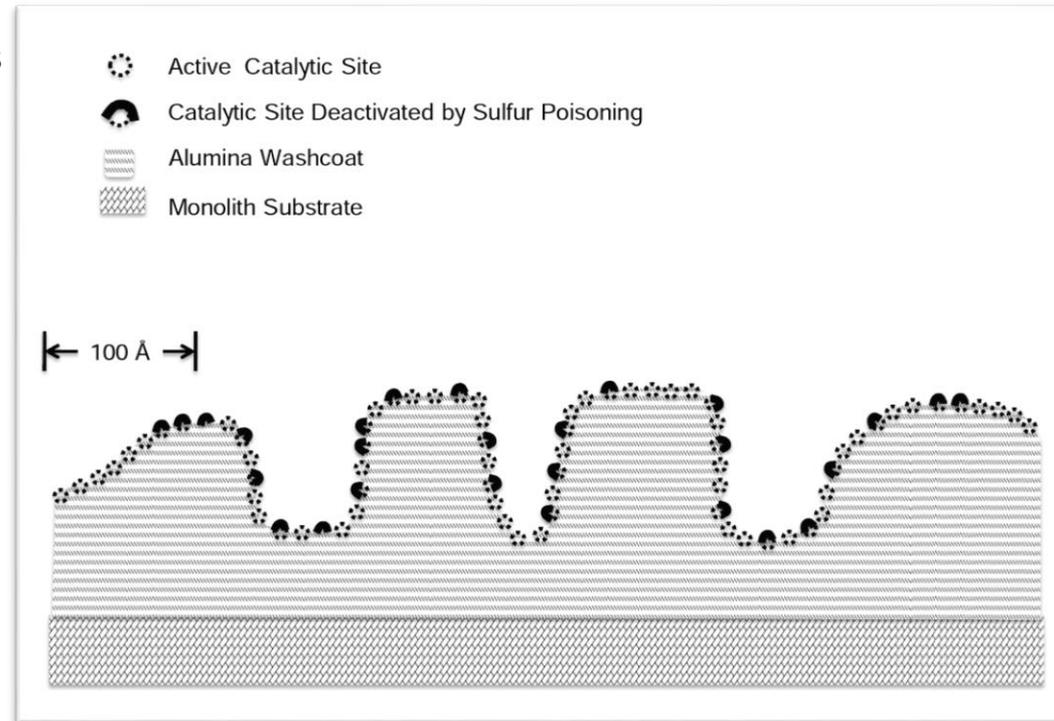
- Beginning January 1, 2017, limits sulfur in gasoline to:
  - 10 ppm nationwide average
  - 80 ppm refinery gate cap (proposed 50-80)
  - 95 ppm downstream per gallon cap (proposed 65-95)
- Improves efficiency of Tier 3 vehicle emissions controls
- Additional and immediate benefit from using low-sulfur fuel in existing (pre-Tier 3) vehicles
- Includes measures to mitigate the economic impacts of the fuel standards on refiners
  - Averaging, banking, and trading (ABT) program
  - Hardship provisions
  - Flexibility for small volume (i.e., 75,000 barrels/day or less) refiners such as those that operate in Utah: 3-year delay

# History of gasoline sulfur standards



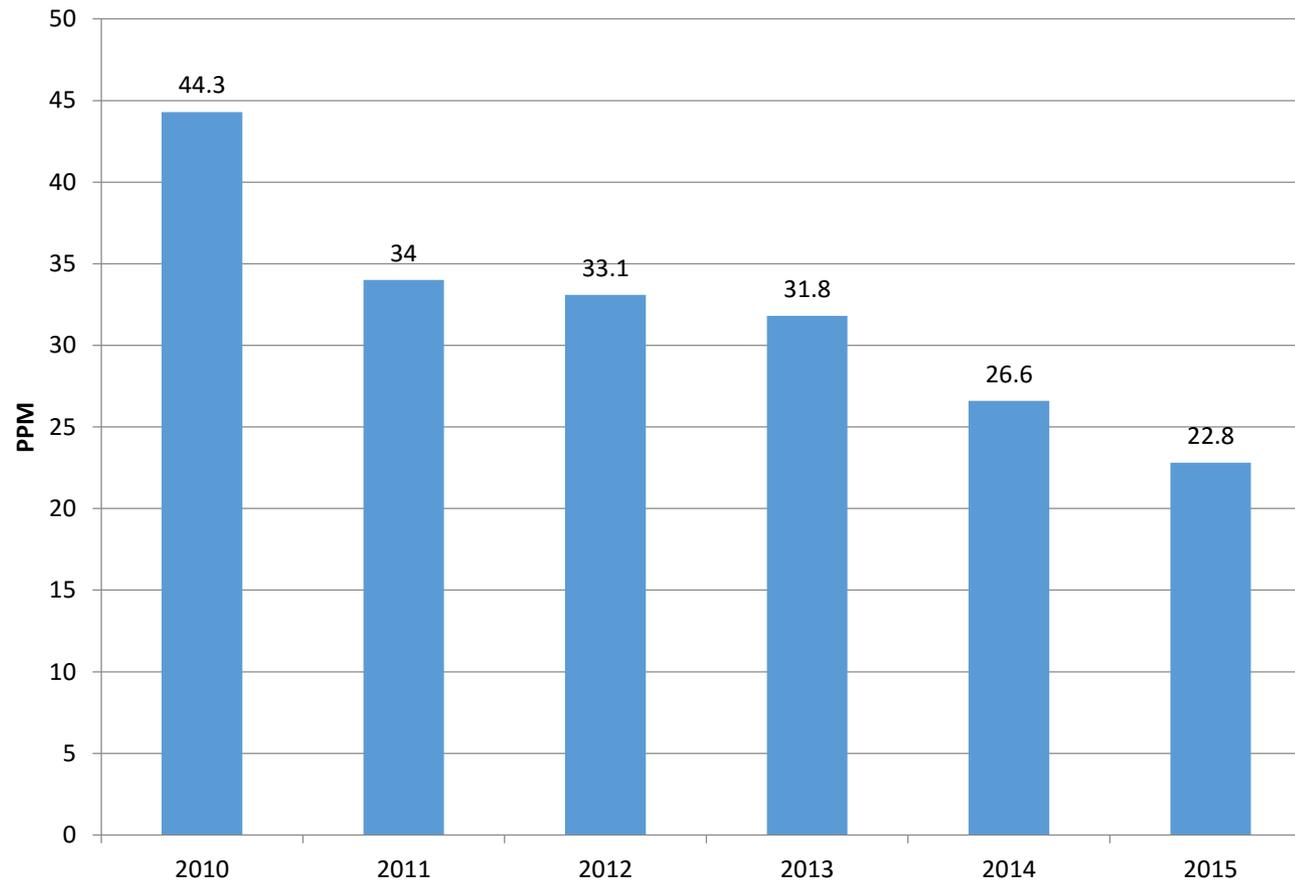
# Gasoline sulfur impacts on exhaust catalysts

- Sulfur oxides bind and react with active sites and coating materials within the catalyst, inhibiting the intended reactions (i.e., emissions reductions)
- The effect of sulfur loading is largely reversible using lower sulfur fuel
- Reducing fuel sulfur from Tier 2 to Tier 3 levels (30 to 10 ppm) will yield significant emissions reductions from existing vehicles
  - EPA found a 13% reduction in NMOG+NO<sub>x</sub> for existing in-use Tier 2 vehicles
- The exhaust controls of Tier 3 vehicles are even more sensitive to changes in gasoline sulfur levels
  - Two studies: 55-56% increase in NMOG+NO<sub>x</sub> when increasing from 10 to 30 ppm for Tier 3 equivalent vehicles



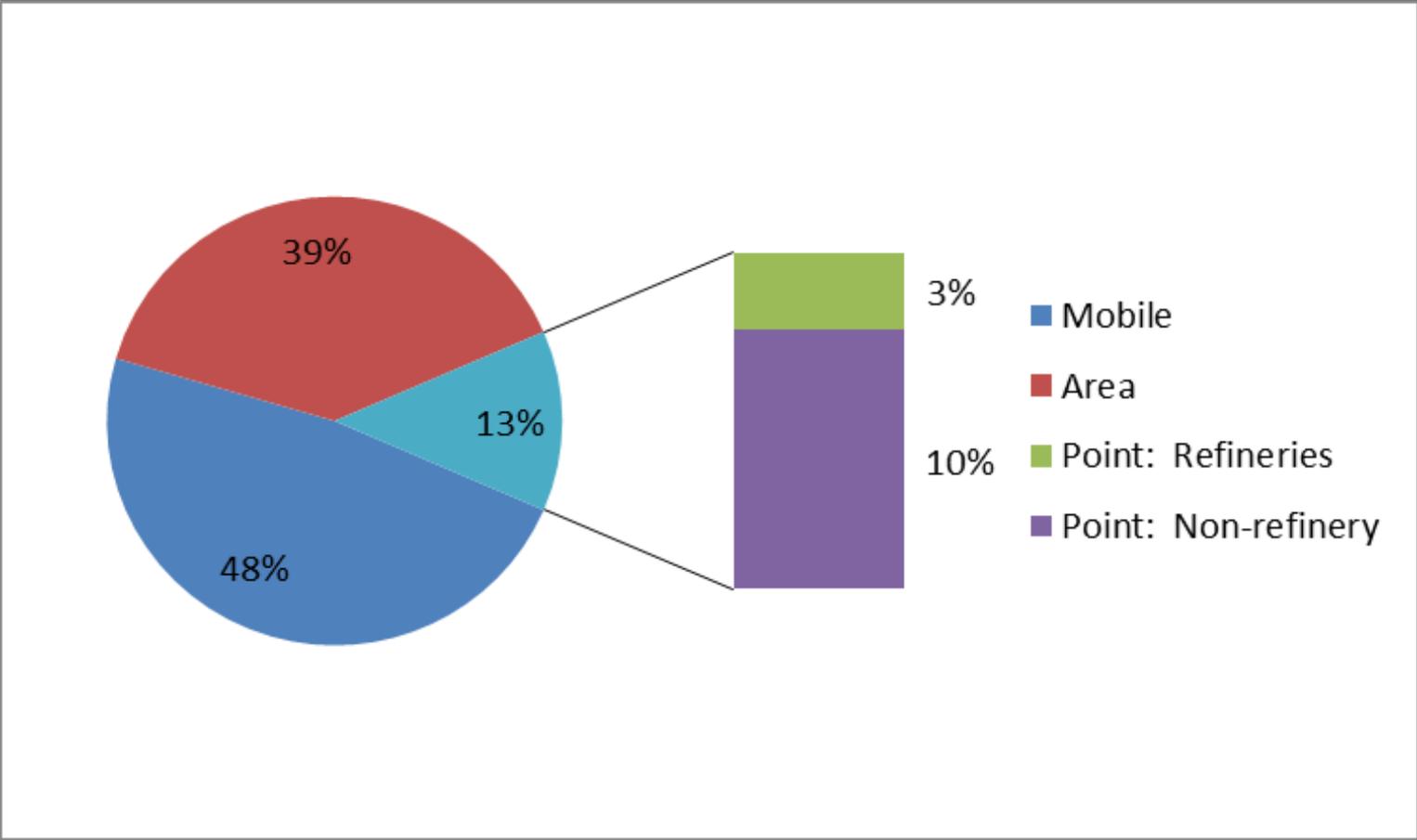
Source: EPA

# Volume-weighted average fuel sulfur levels from refineries serving Utah



Source: EPA

# 2014 Average Winter Day Emissions of NOx, VOC, SO2, and Direct PM2.5 for Wasatch Front Counties: Utah, Salt Lake, Davis, and Weber



# Questions?