

# On-Road Emissions Reductions and the Regional Comprehensive Goods Movement Plan – Background and Policy Questions

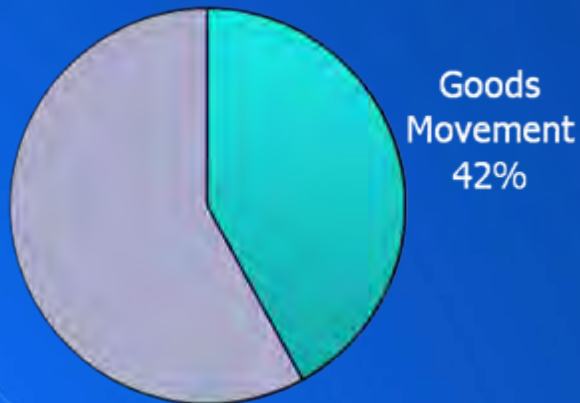
Presented to SCAG Regional Goods Movement Study  
Steering Committee



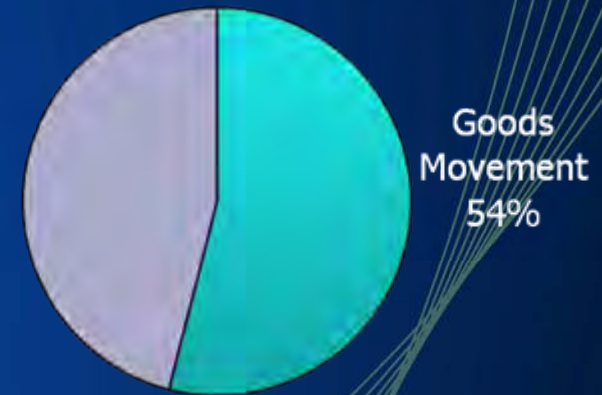
Tom Kear  
Cambridge Systematics  
December 9, 2010

# Goods Movement Emissions as Percent of All Sources, South Coast Air Basin

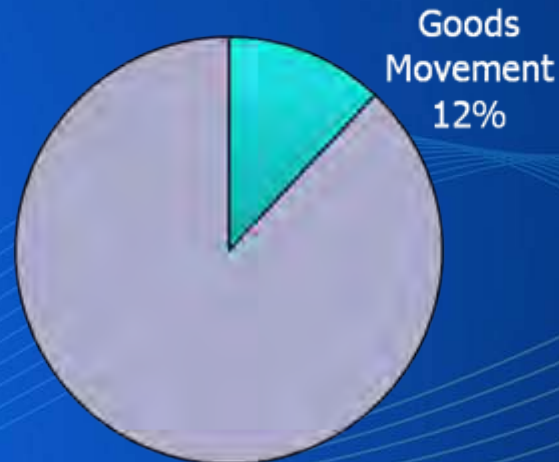
## NO<sub>x</sub> Emissions



## Diesel PM Emissions



## PM<sub>2.5</sub> Emissions

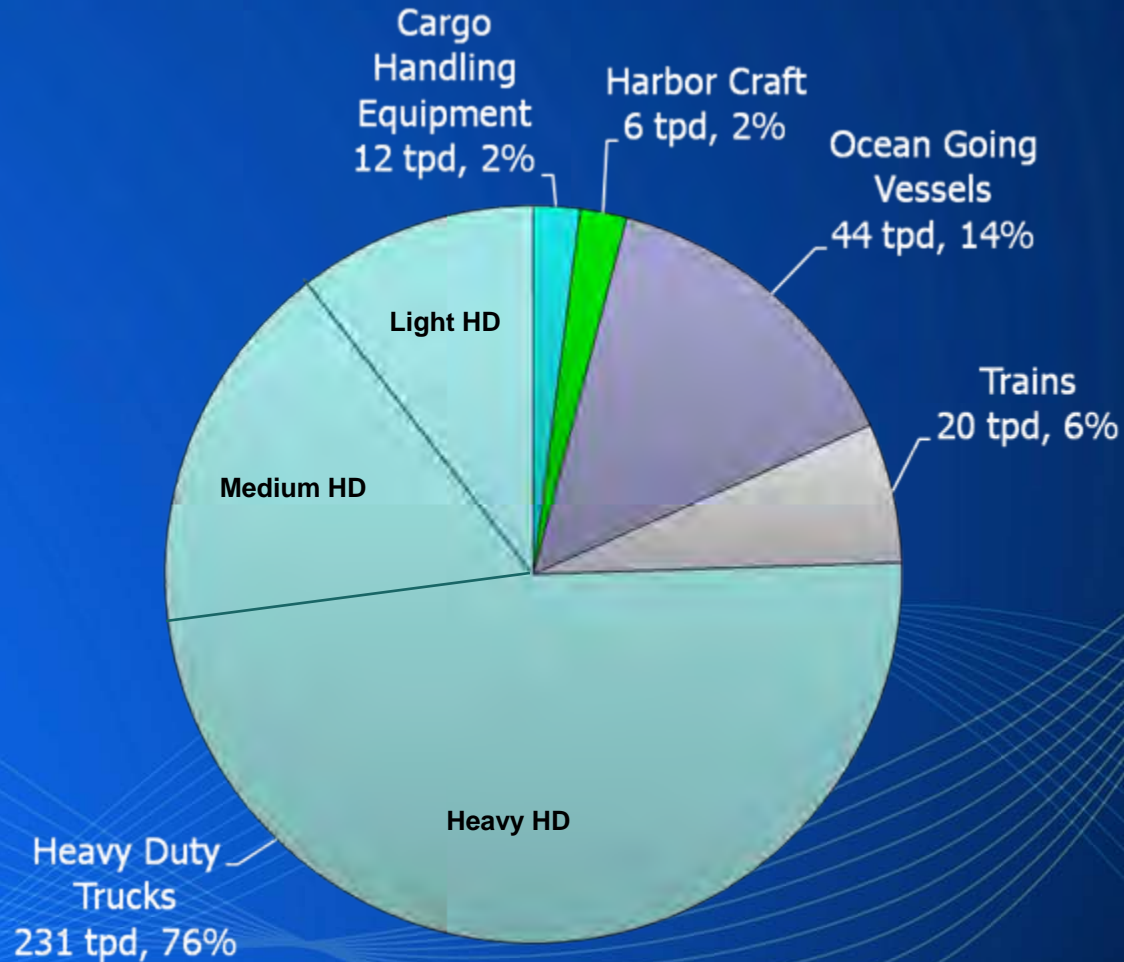




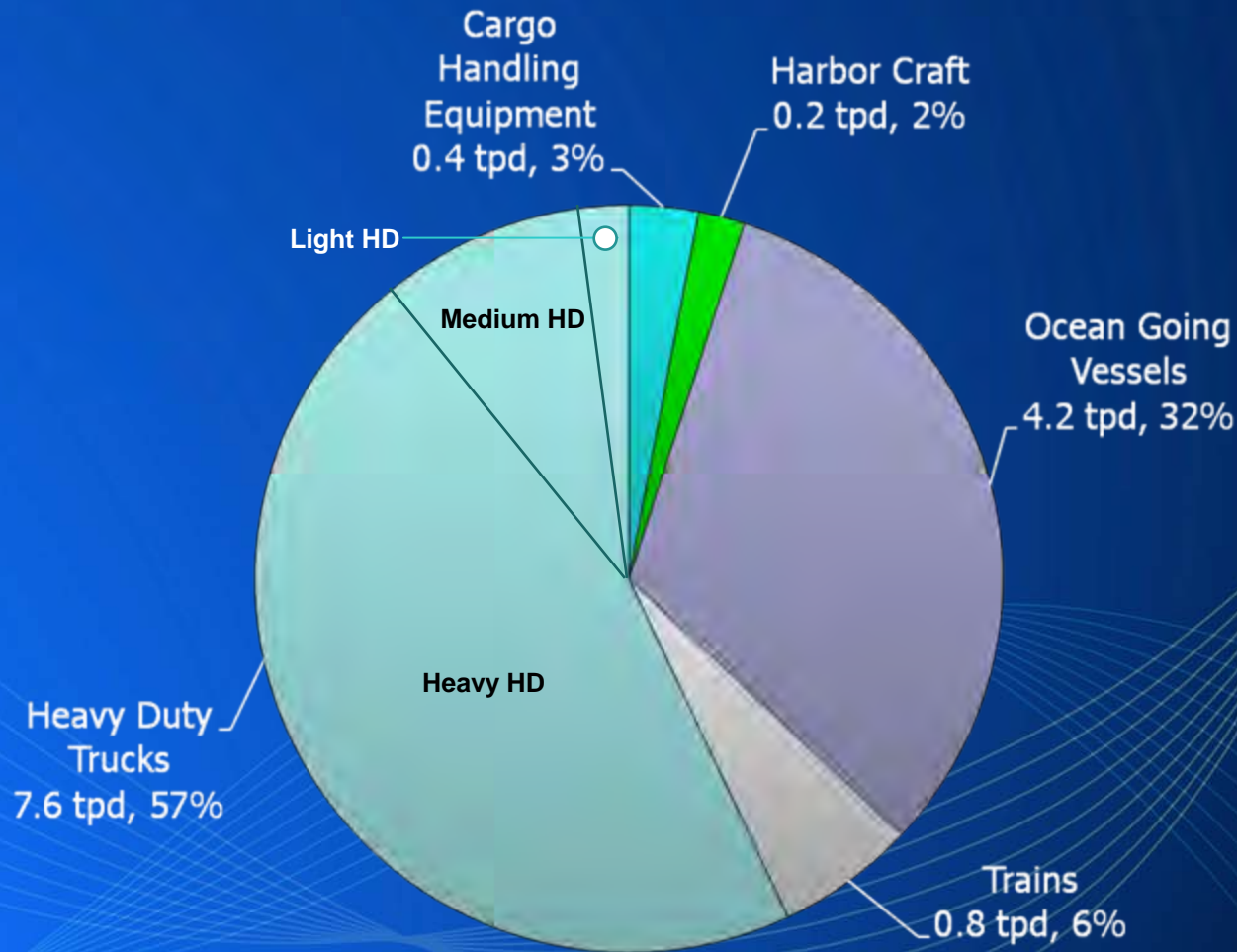
# Discussion Scope & Purpose

- Committee input: Policy on the interplay between zero emission trucks and RTP projects.
- Emission reductions from other modes are being considered but are not in today's discussion.
- Presentation Outline:
  - Current emissions, and major drivers of truck emissions in the future.
  - How can emission control strategies be incorporated into the goods movement plan?
  - Policy implications.

# Current (2010) Goods Movement NO<sub>x</sub> Emissions in South Coast Air Basin

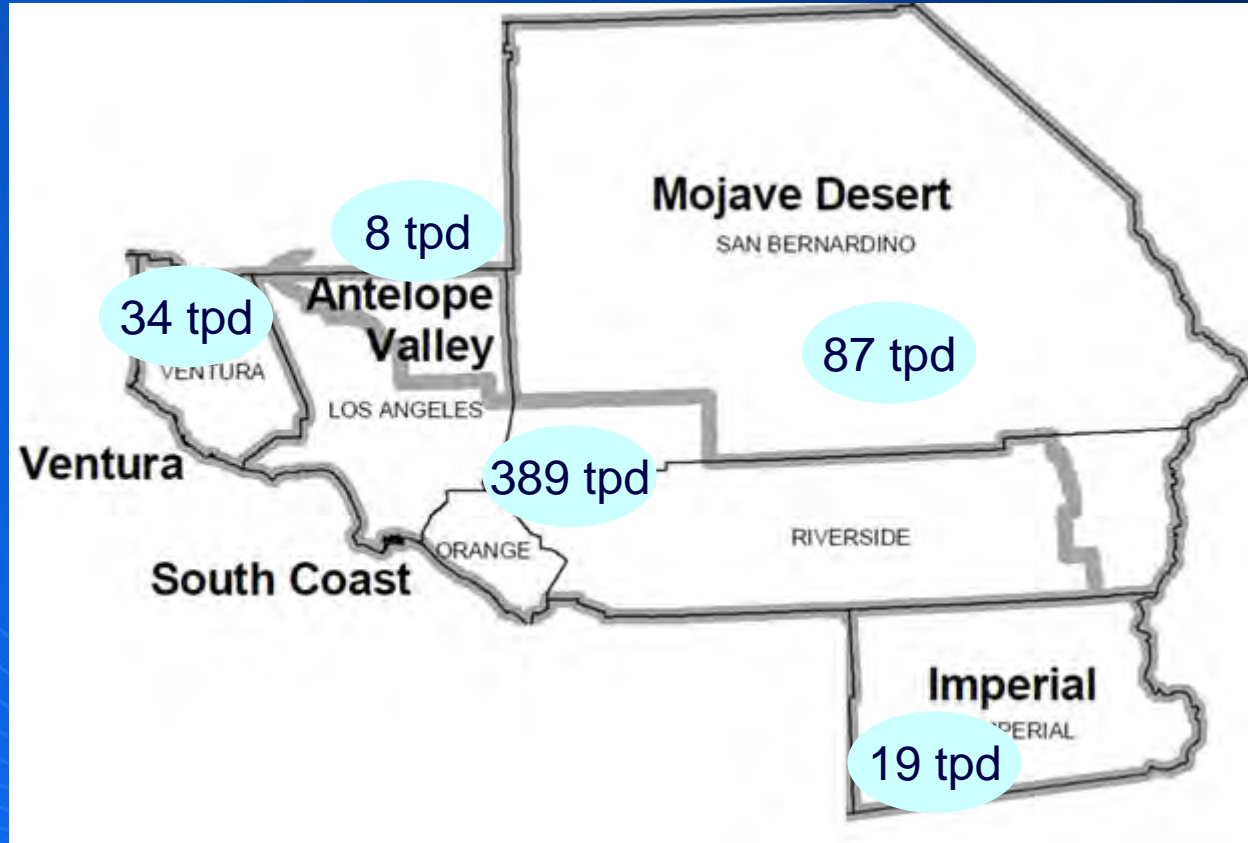


# Current (2010) Goods Movement PM<sub>2.5</sub> Emissions in South Coast Air Basin



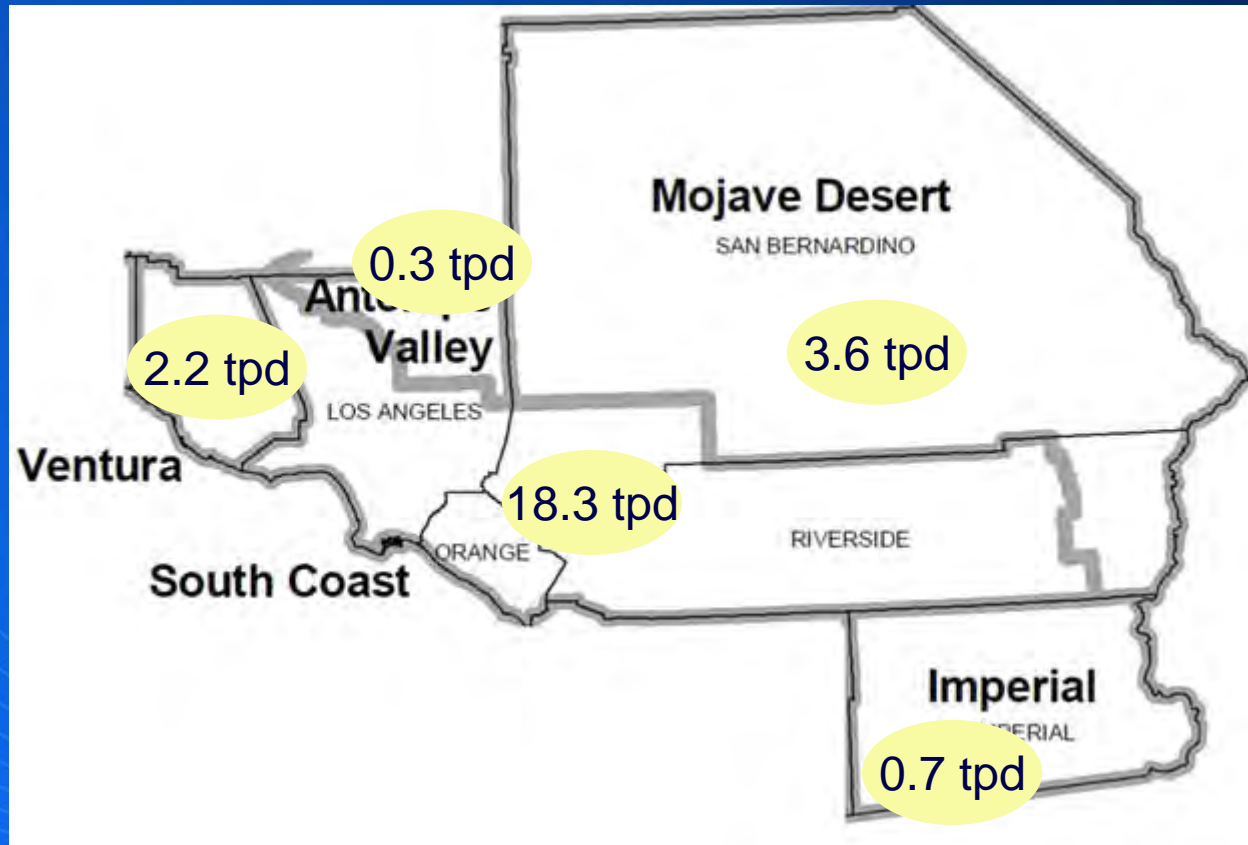


# Current (2010) Goods Movement NO<sub>x</sub> Emissions in SCAG Air Districts



Source: ARB emission inventory data.

# Current (2010) Goods Movement PM<sub>2.5</sub> Emissions in SCAG Air Districts



Source: ARB emission inventory data.

# Policy Implications

- Goods movement related emissions in the SCAB are key to the regions attainment strategy.
- What is the appropriate scope for emission mitigation in the goods movement plan:
  - Port Emissions will recognize existing strategies (i.e., the port CAAP). Should we go further?
  - Infrastructure projects benefiting one air basin vs. vehicle technology measures benefiting the region?
  - Others?



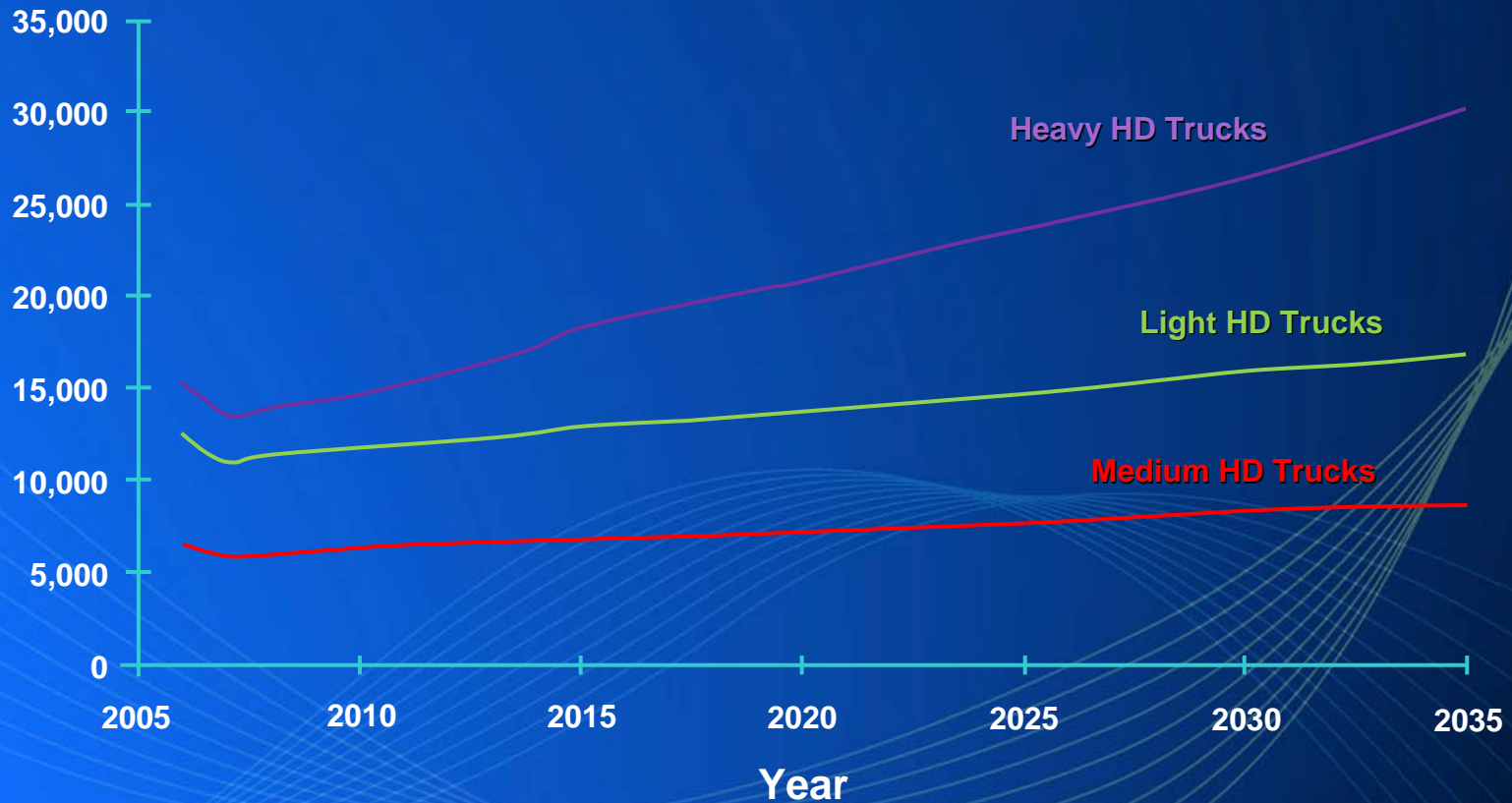
# Anticipated Heavy Duty Truck Emissions Reductions



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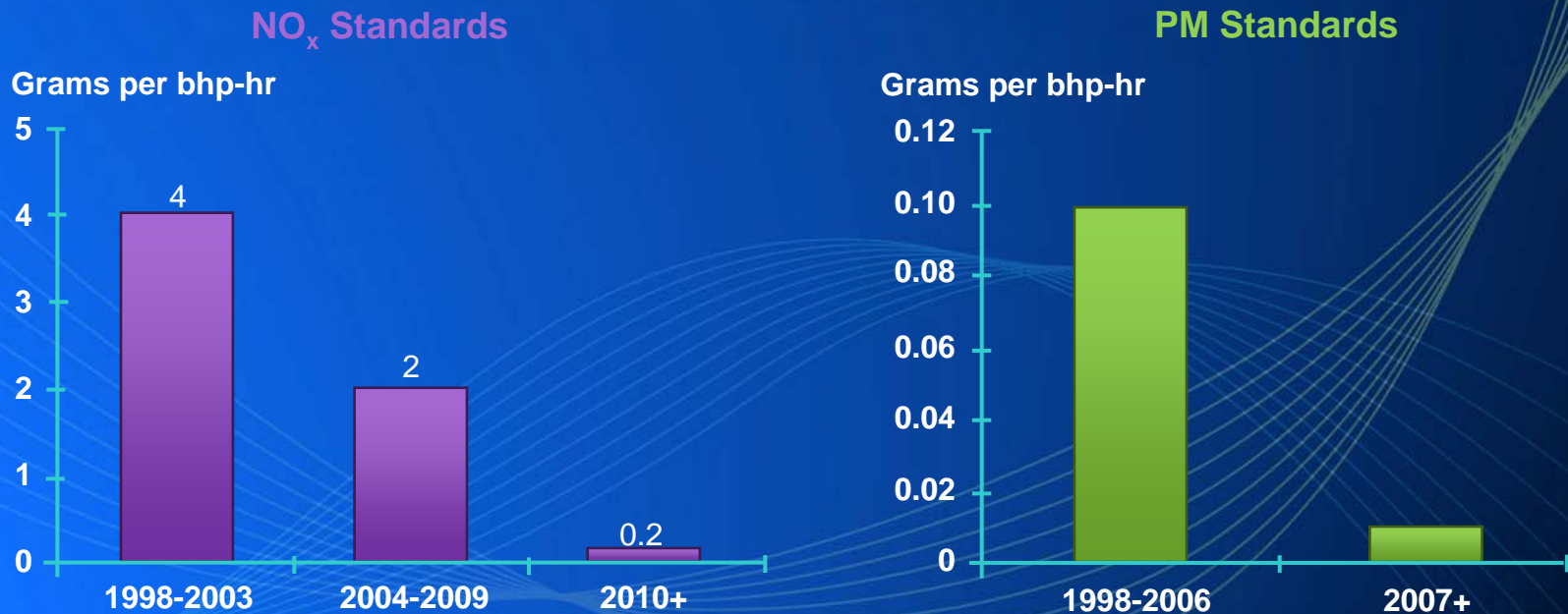
# SCAG Region Truck VMT Projections

Average Daily VWT (000)



# U.S. EPA Truck Emission Standards

- New 2010 trucks have 90 to 95 percent lower emissions than 2006 and older trucks



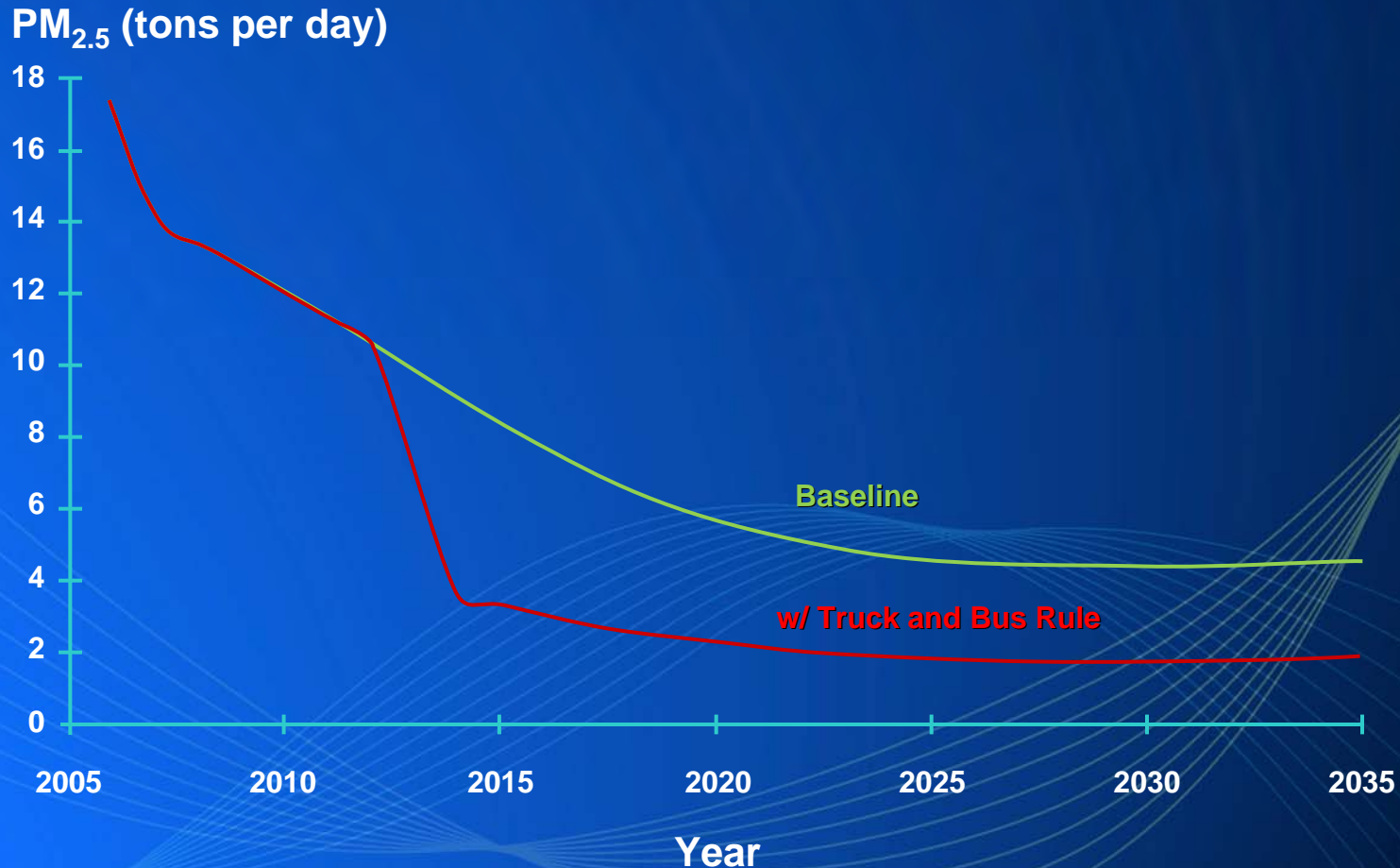


# ARB In-Use Truck and Bus Rule

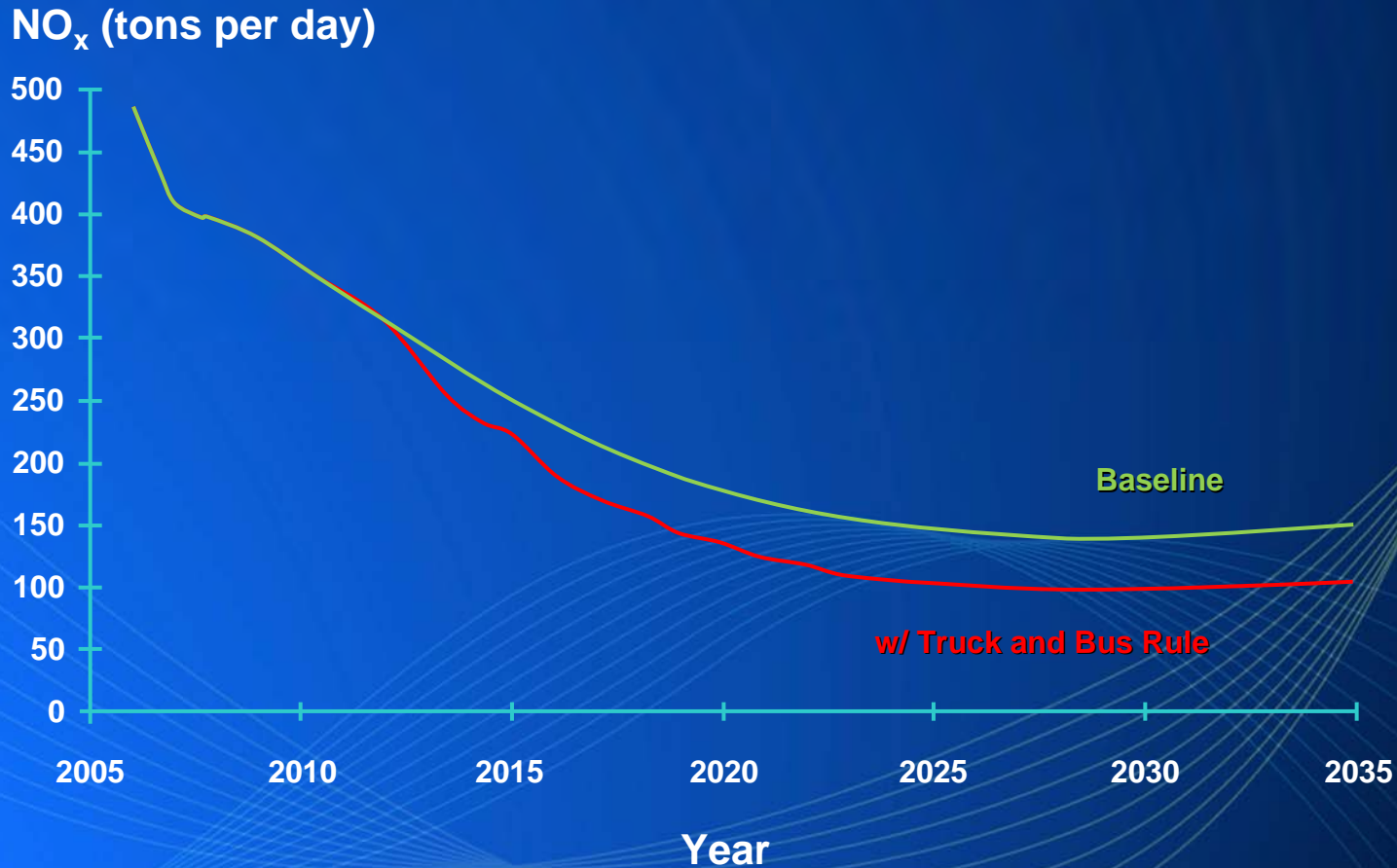
- Accelerates introduction of 2010-compliant trucks
- Applies only to trucks with GVW >14,000 lbs.
- Compliance schedule for trucks with GVW >26,000 lbs.:

Existing Engine Model	Replace with 2010 Engine by:
1993 and older	January 1, 2015
1994-1995	January 1, 2016
1996-1997	January 1, 2017
1998-2000	January 1, 2020
2001-2004	January 1, 2021
2005-2006	January 1, 2022
2007-2009	January 1, 2023

# Effect of In-Use Truck and Bus Rule on PM<sub>2.5</sub>, SCAG Region



# Effect of In-Use Truck and Bus Rule on NO<sub>x</sub>, SCAG Region





# Policy Consideration

- 90-95% reduction in  $\text{NO}_x$  and  $\text{PM}_{2.5}$  emissions make many previous strategies less cost effective for mitigation.
- To what extent should the RTP mitigations consider cost effectiveness?

# Trucks – Emission Reduction Options for 2025 and Beyond



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# Current Truck Emission Control Strategies

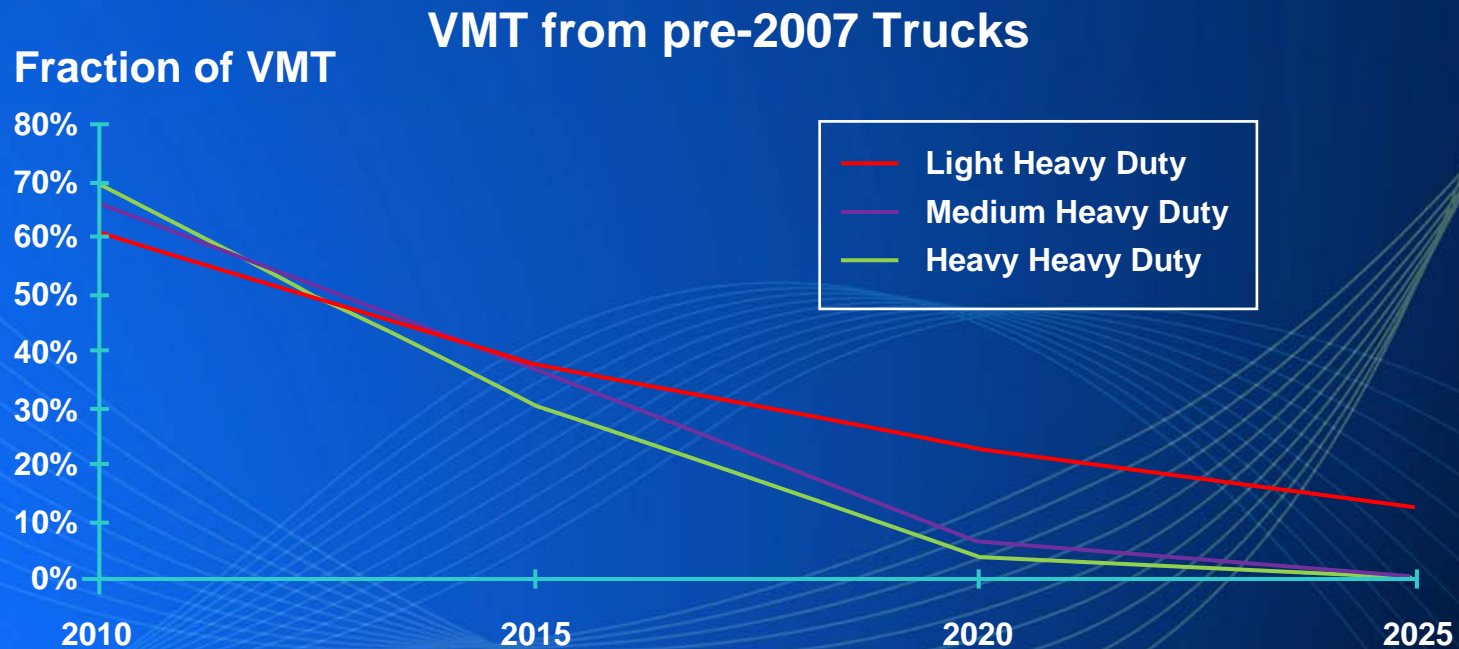
- Replacement with 2007/2010 truck
- Replacement with natural gas truck (similar to 2010 truck)
- Exhaust retrofits:

Technology	Typical Applicability	PM Reduction (minimum)	NO <sub>x</sub> Reduction (minimum)
Diesel Oxidation Catalyst	1988-2002 Engines	25%	No Effect
Flow Thru Filter	1991-2002 engines and some 2003-2006 engines	50%	No Effect
Diesel Particulate Filter	1994-2006 engines	85%	No Effect
DPF+LNC	1993-2003 turbocharged engines	85%	25%



# Current Truck Emission Control Strategies

- Current strategies will have little to no effect by 2020/2025



# Potential Future Low Emission Truck Technologies

- Hybrid-electric drive
  - Parallel hybrid
  - Series hybrid
  - Other configurations
- Hydraulic hybrid
- Full battery electric
- Fuel cell vehicles
- Electric drive with overhead catenary system
- Electric drive with electromagnetic induction (power system in roadway)
- Electric drive with third rail power



# How to Implement Low Emission Truck Technologies?

- Barriers (URS will discuss specific technologies)
  - Vehicle cost.
  - Limited performance (range, speed, load, charging time).
  - Highly dispersed ownership of trucks.
- Implementation mechanisms
  - Use of facility access to encourage purchase and use of low emission trucks (limited by fleet that must use those facilities).
  - Use of vehicle purchase incentives (limited by cost).



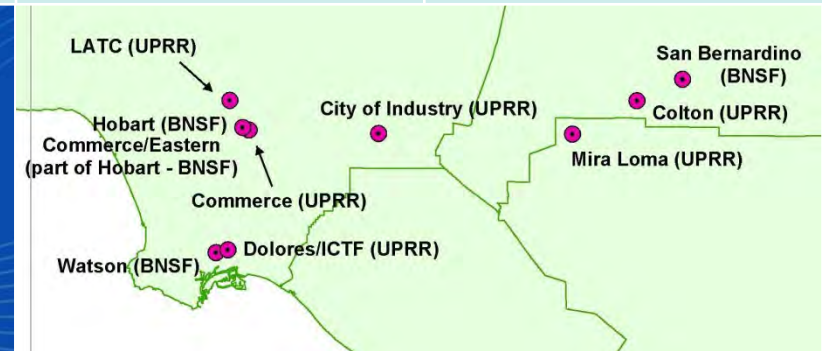
# Facility Access Limitations – Ports and Yards

- Ports

- SPB Port trucks account for 5 to 10 percent of total SCAB truck VMT and emissions (2008)

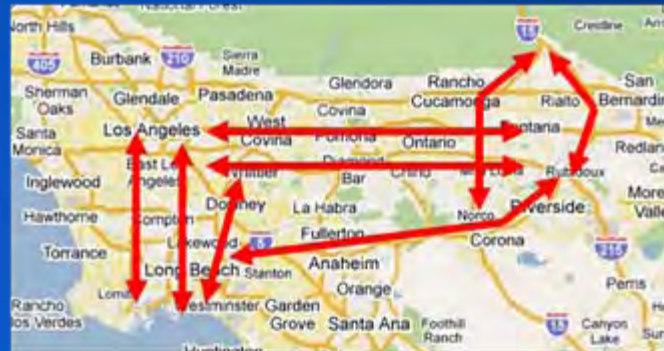
	All SCAB HDTs	SPB port Trucks	Percent
VMT/Average Weekday	21,863,585	1,175,979	5%
NO <sub>x</sub> (tons/day)	231	20.9	9%
PM <sub>2.5</sub> (tons/day)	7.6	0.5	7%

- Intermodal yards  
– 9 major yards



# Facility Access Limitations – Highways

- Major N/S and E/W truck corridors
  - I-110, I-710, I-605, I-10, SR 60, SR 91, I-15, I-215



– Accounts for ~20 percent of total SCAB truck VMT (2008)

	All SCAB HDTs	Thru Trucks on Major N/S and E/S Corridors	Percent
VMT/Weekday	21,863,585	3,670,000	17%

# Truck Purchase Incentives

- Existing programs
  - Ports' Clean Truck Program
  - Carl Moyer Program
  - State and Federal tax incentives for alt fuel vehicles
- To have a significant impact, costs could be huge
  - More than 400,000 HDTs in SCAG region
  - More than 80,000 Class 8 trucks (HHDT)
  - Incremental costs may be \$50,000/vehicle, or much more



# Policy Implications

- How should projects in the goods movement plan implement specific emission reduction strategies:
  - Access limitations to encourage adoption of specific technologies (i.e., electric trucks)?
  - Provide adequate right-of-way to subsequently build enabling infrastructure (i.e., ability to accommodate catenary power)?
  - Providing specific technologies under RTP projects (i.e., catenary power and funds to purchase trucks)?

# Next Steps for Consultant Team

- Evaluate the effectiveness of truck and rail emission reduction strategies in 2023 and 2035
  - Identify goods movement markets/segments to target emission reduction strategies
  - Assess emissions impacts of selected infrastructure and operations strategies
  - Assess truck emission reduction strategies
  - Assess rail emission reduction strategies
  - Estimate cost to achieve target emission reductions in select market segments

# Guidance Recap

- What is the appropriate scope for emission mitigation in the goods movement plan:
  - Port Emissions, or other sources not directly effected by the RTP, will recognize existing strategies (i.e., the port CAAP). Should we go further?
  - Infrastructure projects benefiting one air basin vs. vehicle technology measures benefiting the region?
  - Others?
- To what extent should the RTP mitigations consider cost effectiveness?



# Guidance Recap (cont)

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