

Alternatives to Advance Clean Transit

4th ACT Workgroup Meeting
October 4, 2016

California Environmental Protection Agency

 **Air Resources Board**

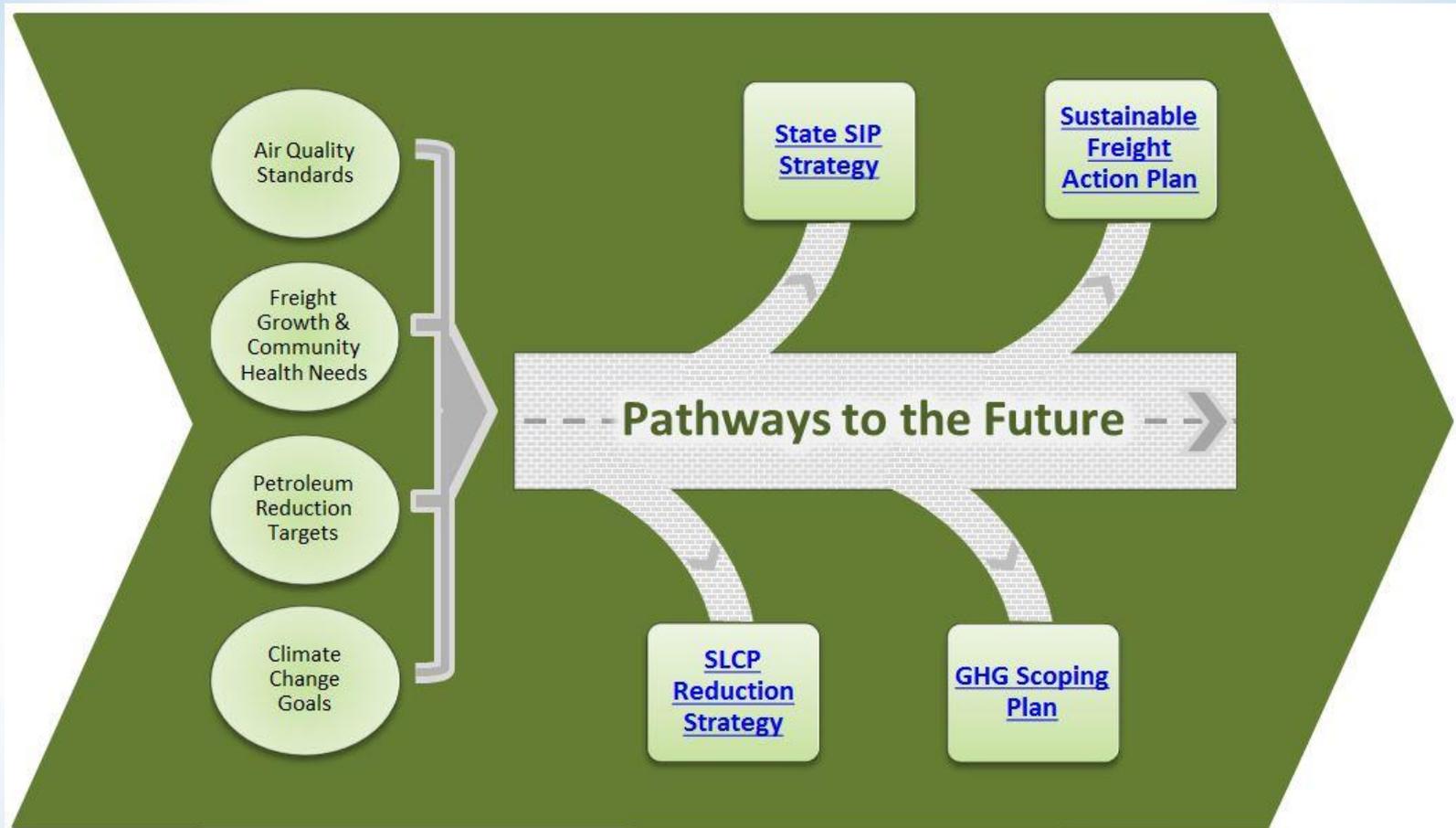
Meeting Objective

- Discuss a variety of control strategies in order to develop the cleanest and most efficient transit systems while contributing to a broader strategy to protect health and meet climate goals
 - Specifically including a discussion of a transit performance standard proposal
- Continue discussion on the latest cost information to identify areas of consensus and additional needs

Overview

- Background, program goals and considerations
- Discussion of alternatives
 - Purchase requirements
 - Performance based approach
 - California Transit Association
 - Bus manufacturer sales requirements
 - Voluntary adoption
- Discussion of costs
 - Bus prices
 - Annual maintenance and major mid-life
 - Annual fuel costs
 - Infrastructure

Multiple Air Quality Planning Efforts

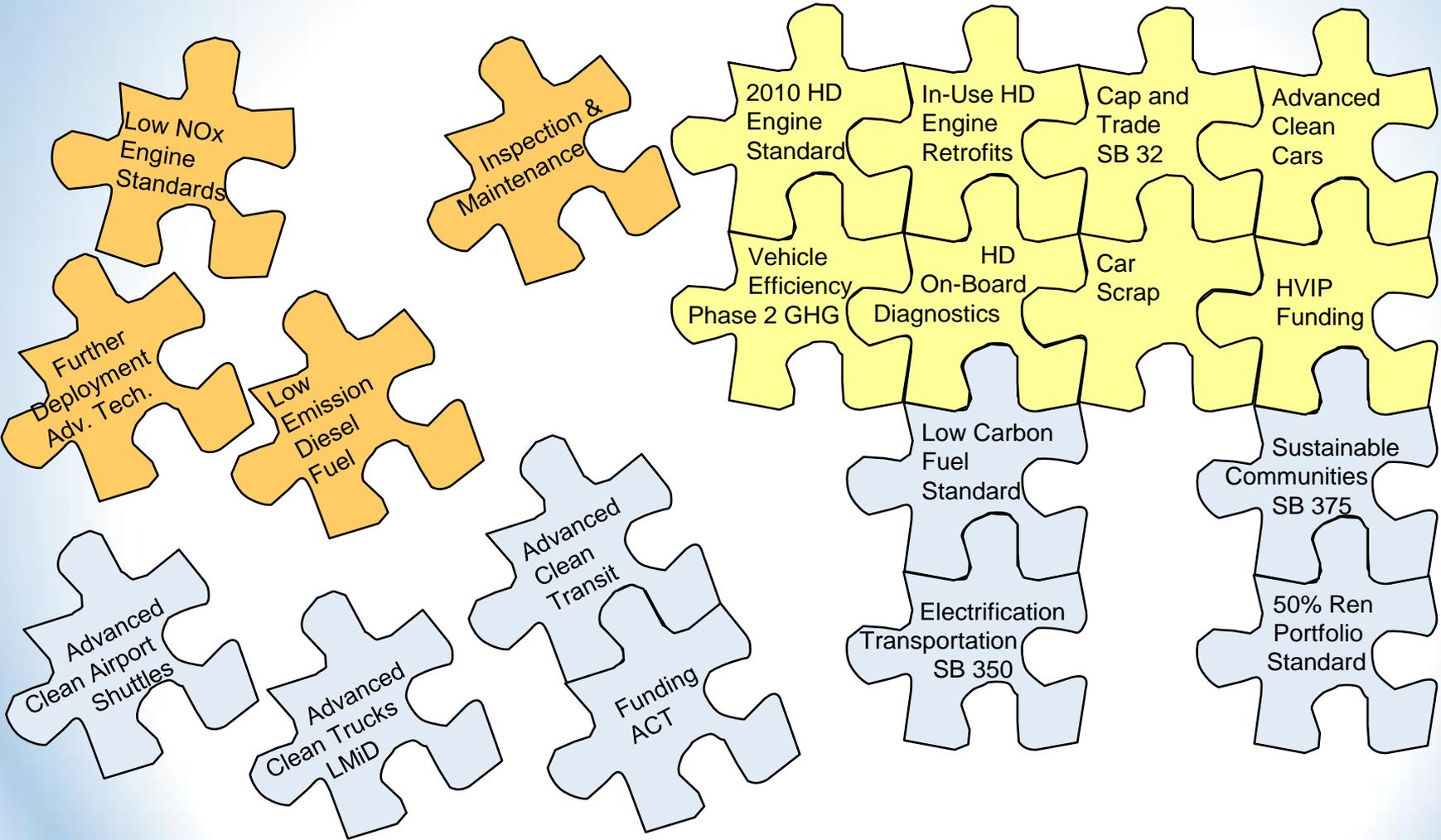


Holistic Approach Needed to Achieve Clean Air

- California has challenging air quality, climate and petroleum use reduction goals
- Coordinated strategies and policies
- Transformational changes in all sectors
- Long range goal of zero emission across multiple sectors



Mobile Source Strategies



Air Quality and Climate Goals

- Local emissions
 - Reduce localized tailpipe emissions on streets and depots
 - Ensure benefits in disadvantaged communities
- Regional emissions
 - Reduce regional NO_x, and PM to meet federal attainment standards
- Global
 - Reduce climate change effects

Advanced Clean Transit

Continue transition to cleaner technologies and increase the penetration of the first wave of zero-emission heavy-duty technology into transit applications

- Need to understand advanced technology opportunities and barriers
- How to address initial costs and total ownership costs
 - Define the appropriate role of incentives
- Balance potential risks, uncertainties and rewards
- Complement existing programs and policies
 - Need to understand available surplus emissions benefits
- How to enhance passenger service and mobility

Background on Existing Programs

New Engine Standards

LCFS

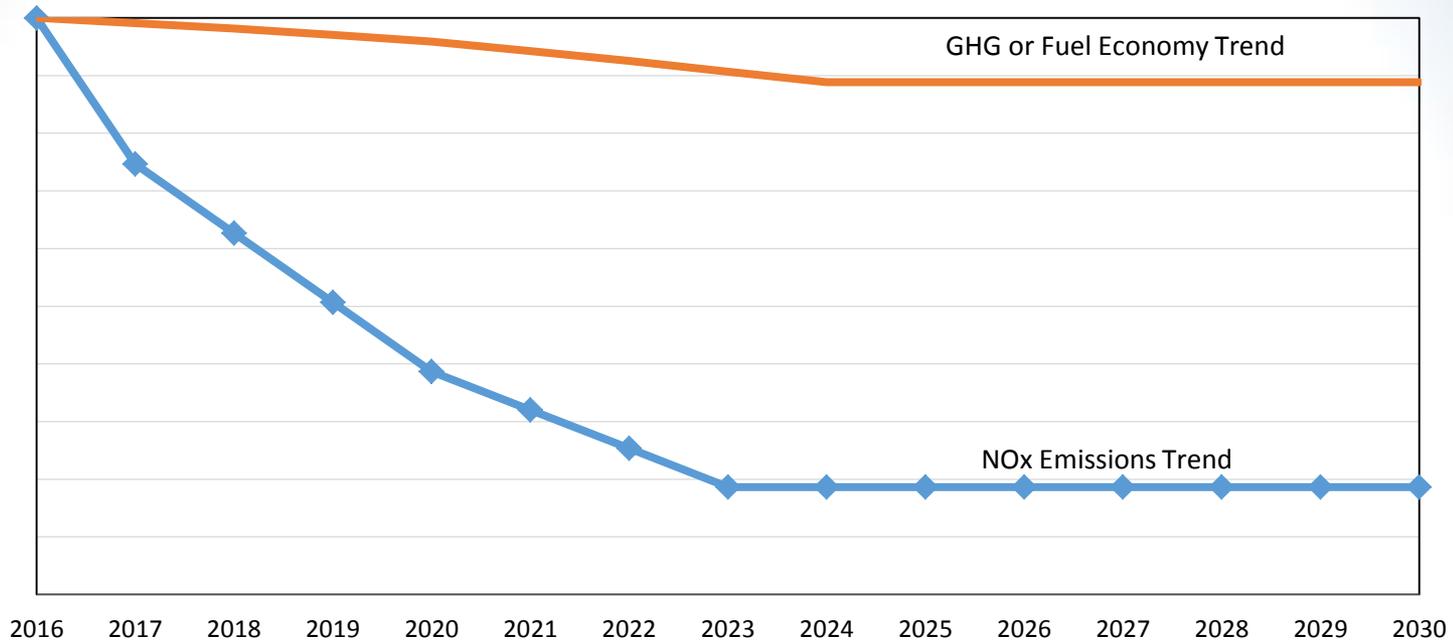
SB350

Complementing Existing Programs

- Achieve NOx and GHG reductions beyond existing programs (cannot double count)
 - Engine emission standards (normal replacements)
 - Sustainable Communities and Climate Protection (SB 375)
 - Low Carbon Fuel Standard
- Emission reductions from new measures must be real, quantifiable, verifiable, and enforceable

Emissions Decline with Normal Vehicle Replacements (Illustrative)

- Business as usual replacements achieve reductions



Note: Figure represents emissions trend for a single bus fleet without changing number of buses and miles traveled.

Transit Bus Emissions

- Diesel and Diesel Hybrid
 - NO_x – 0.2 g/bhp/hr (est 0.02g available in 2023+)
 - PM – 0.01 g/bhp-hr
 - GHG – renewable diesel available
- CNG
 - NO_x – 0.02 g/bhp-hr available
 - PM – 0.01 g/bhp-hr
 - GHG – limited renewable NG available
- Electric
 - NO_x and PM – zero local; limited regional
 - GHG – significant renewable available

LCFS Program

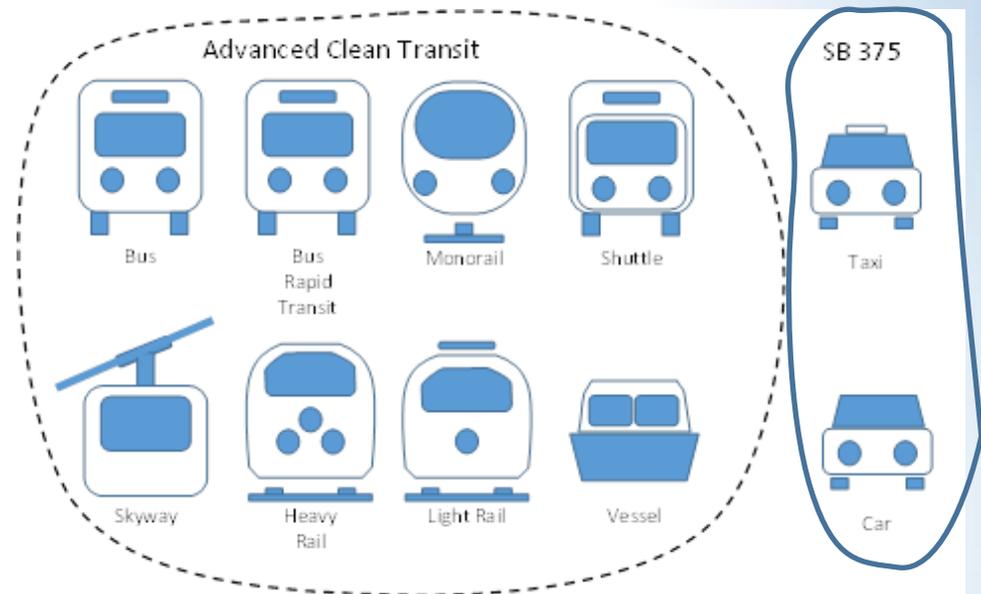
- Reduces GHG emissions associated with the lifecycle of transportation fuels used in California
 - Decrease carbon intensity 10% by 2020 and beyond
 - Low Emission diesel fuel control measure
- GHG reductions attributed to LCFS
 - Renewable natural gas, renewable diesel
- Actions attributable to new measures (not claimed by LCFS)
 - Switch to battery electric/fuel cell vehicles
 - Recognizes additional measures needed to change vehicle technology
 - Earns credits but GHG reductions attributable to new program

Sustainable Communities and Climate Protection Act (SB 375)

- Reduce greenhouse gas (GHG) emissions
 - Coordinated transportation strategies, housing, and land use planning investments
 - Developed by Metropolitan Planning Organizations
- Directs ARB to set regional targets from passenger cars and light-duty trucks
- ARB established targets for 2020 and 2035
- Encourages transit system expansion and actions to increase ridership

SB 375 Implementation

- Counts reduction in light-duty vehicle usage
- Change in emissions from heavy-duty sources not counted
- Opportunities to complement SB 375 with advanced clean transit vehicles/modes
- Potential for cross-over to further enhance mobility



Cross-Over Opportunities for Transit Mobility Enhancements

- First and last mile connectivity
 - Bike sharing, car sharing, micro transit, and ride sourcing services
- Example transit agency programs
 - Coordination with local services (ie. hospitals, schools...)
 - Fare subsidies for riders or partners
 - Technology-enabled mobility services
 - More efficient vehicles to connect to transit backbone
- Public and private mobility partnerships

Multiple Methods to Achieve Goals in Transit Sector

- Zero emission buses, rail and other modes
- Low NOx engines
- Cleaner fuels
- Improve ridership density
- Enhanced mobility and first/last mile connectivity
- Innovative transit solutions
- Other

Alternatives Discussion

Purchase requirements

Performance based approach

Bus manufacturer sales requirements

Voluntary based approaches

Considerations of Alternatives

Health and Environment Benefits

- Protect public health
- Reduce NOx, PM, GHG emissions
- Reduce other environmental risks

Regulatory Structure and Incentives

- Support existing programs
- Promote new actions , no double counting
- Equity among different transit fleets
- Ensure measure is implementable, enforceable, and quantifiable
- Impacts on funding opportunities

Disadvantaged Community (DAC)

- Ensure DAC benefits, and equitable benefits distribution
- No service cut

Transit Agency

- Ensure operational capability
- Improve transit efficiency
- Enhance mobility, first/last-mile connectivity
- No service cut

Industry

- Support zero and near zero technologies
- Provide clear market signal to build economies of scale for zero emission buses
- Support transition to other HDV categories

Purchase Requirements Concept

- Gradual phase-in of zero emission bus (ZEB) purchases
- Bus replacements on normal schedule (not early)
 - Purchase low NOx engines if available
- Renewable fuels at time of next purchase/contract
 - Supports existing LCFS regulation but does not achieve new GHG reductions
- Establish periodic purchase milestones

Considerations for Purchase Requirement

- How to adjust purchase targets to balance emissions benefits/market push with transit implementation and cost concerns
- How to ensure service maintained and enhanced
- How to credit advanced mobility options
- How to set appropriate off-ramps
- How to integrate incentives

Performance Based Concept

- *Proposal description by California Transit Association*

Bus Manufacturer Sales Concept

- Require percent of manufacturer sales in California to be zero emissions and low NOx engines
- Credit-and-deficit program similar to light duty
 - Zero emission bus manufacturers could sell credits
 - Would need to accommodate different bus types

Considerations for Bus Manufacturer Sales Concept

- How to adjust sales requirements to balance emissions benefits/market push with transit implementation and cost concerns
- How to ensure infrastructure and implementation issues are being addressed
- How to achieve zero-emission buses across all major fleets
- How to credit advanced mobility options
- How to integrate incentives
- How to establish point of regulation for cutaways

Voluntary Adoption Concept

- Allow transit agencies to set its own course in bus procurement without a statewide direction
- Coordinate State funding with other State Agencies
- Focus funding on zero-emission buses
- Possible regulatory backstop

Considerations for Voluntary Adoption Concept

- How to ensure sufficient demand to provide emissions benefits and market signal
- How to achieve zero-emission buses across all major fleets
- How to promote advanced mobility options

Combination of Options

- Use multiple approaches paired with incentives to meet range of objectives
 - Manufacturer sales and transit purchase
 - Manufacture sales and performance based
 - Voluntary with regulatory backstop
- Other ideas