California Low Emission Truck Policies and Plans

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Outline

• California’s major challenges and goals
• Strategic planning to address greenhouse gas (GHG) & NOx reduction
• Promoting near term emerging technologies
• Providing longer term certainty
  • CA Phase 2 HD GHG program
  • Low NOx program
  • Zero emissions where feasible, near-zero emissions with renewables everywhere else
Reduce GHG Emissions

- California goals
  - Reduce to 1990 levels by 2020
  - Reduce 40 percent below 1990 levels by 2030
  - Reduce transportation GHGs by 80 percent by 2050
- Supporting Governor’s five pillars
Meet Federal Ambient Ozone Standards

8-Hour Ozone Nonattainment Areas (2016)

https://www3.epa.gov/airquality/greenbook/map8hr_2008.html
Transportation is Largest Emissions Source in California

**GHG Sources**
- Transportation: 37%
- Industrial: 24%
- Residential: 6%
- Commercial: 5%
- Agriculture & Forestry: 8%
- Electricity Generation (In State): 12%
- Electricity Generation (Imports): 8%

**NOx Sources**
- Mobile Sources: 81%
- Stationary Sources: 15%
- Areawide: 4%

**Total 2014 GHG Emissions** – 441.5 MMT CO₂
**Total 2015 NOx Emissions** – 1886 tpd NOx

Source – California Air Resources Board Emissions Inventory
Clean Air Plans & Strategies

- Integrated approach
  - Multi-pollutant benefits
  - Identifies interactions between measures to guide policy
- Focus on cleaner technologies and fuels
California Sustainable Freight Action Plan

• Three primary goals:
  – Increase quantity of freight moved per ton CO2 by 25%
  – Deploy over 100,000 zero emission vehicles and equipment in freight sector by 2030
  – Increase economic growth and development in the freight sector

• “Transporting freight reliably and efficiently by zero emission equipment everywhere feasible, and near-zero emission equipment powered by clean, low-carbon renewable fuels everywhere else.”

Source: https://www.arb.ca.gov/gmp/sfti/sfti.htm
Low NOx Engine Technology Evaluation

- CARB sponsored low NOx engine demonstration
  - At Southwest Research Institute with MECA
- Targeting 0.02 g/bhphr NOx
- Natural gas engine’s 0.02g/bhphr NOx and low load NOx control capabilities independently confirmed on 12 liter engine
- Work ongoing for 13 liter diesel engine
  - 0.035 g/bhphr FTP NOx demonstrated at full useful life aging
Recent Pilot Projects and Demonstrations

- $130 million in grant funding
- Multisource projects
  - 36 battery electric trucks and off-road equipment (drayage trucks, yard trucks, forklifts, top picks)
  - Integrated solar and battery storage
- Truck and Bus Pilots
  - 25 fuel cell electric buses
  - 54 battery electric buses
  - 68 battery electric trucks
- Zero-Emission Drayage Truck Demonstration
  - 43 drayage trucks from 4 manufacturers
- Vehicle data collection planned for all projects
Commercial Deployment Incentives

- Voucher incentive programs
  - Heavy duty hybrids & ZEVs: $5M deep waiting list
  - Low NOx Engines: $3M paid, $11M still on hand

- Proposed budget to cover anticipated low NOx engine sales
  - Both 8.9 liter & 12 liter for FY 17/18

- Carl Moyer new guidelines and cost effectiveness
  - Low NOx engine deployment projects
  - Inclusion of infrastructure (charging, fueling, etc.)
Flexibilities for Market Entry

- **Optional low-NOx engine regulation**
  - Defined 50%, 75%, 90% NOx reduction
  - Codified certification and on board diagnostic flexibilities
  - Two CNG engines certified at 0.02g & 0.1g/bhphr levels
  - One propane engine certified at 0.1 g/bhphr

- **Innovative technology regulation**
  - Provides certification pathway for new and aftermarket heavy duty hybrids
  - Provides certification flexibilities for
    - High GHG efficiency engines
    - Certification of multiple low-NOx engine families
Heavy Duty GHG Phase 2

• EPA final rulemaking
  – Requires decrease GHG emissions and fuel usage 25% by 2027
  – Requires enhanced aerodynamics, engine stop/start, weight reductions, and other advanced technologies
  – Compliance dates (2018, 2021, 2024, and 2027)

• California program goals
  – To align with the agreed structure, timing and stringency
  – To seek additional GHG benefits while harmonizing with national vehicle & engine requirements

• Update other regulations to harmonize with Phase 2
• Proposal due to ARB board in late 2017
Innovative Clean Transit

• Partner with transit fleets to improve public transportation efficiency and opportunities for zero-emission modes
  – Low-NOx engines and renewable fuels
  – Zero-emission buses where suitable 2018-2040
  – Enhanced mobility and connectivity

• End goal of all zero emission passenger transportation
Zero Emission Buses Lead the Market

• More manufacturers produce zero emission buses than conventional buses
• Battery electric buses in all configurations
  – More than 300 miles on single charge
  – On-route charging
  – Total cost of ownership comparable to conventional
• Fuel cell electric buses
  – Fueling and range similar to conventional buses
• Success in zero emission bus deployment can be replicated in other heavy duty sectors
Zero Emission Bus Market Growing

In Service: 109
Pending Delivery: 241
Total: 350

1 Buses in transit fleets and universities
Advanced Clean Local Trucks

• Long term plan to use performance based strategy to maximize GHG and NOx reductions
  – Wide range of advanced technologies for all truck types

• Evaluating near term strategy for manufacturer sales of trucks with zero-emission capability
  – Class 2B to Class 7 (optional credit for Class 8)
  – Fuel cell, plug-in electric/hybrids, range extenders, electric PTO
Mitsubishi Fuso is first major manufacturer planning to bring a battery electric truck to market in 2017.

Workhorse Group announced plans for first range extended battery electric pickup truck:
- Has been producing range extended battery electric step vans.

Ford recently approve electric drivetrains in its qualified vehicle modifier program.

Several zero emission truck/equipment manufacturers.

Zero Emission Truck Market Status
Low Carbon Fuel Standard

• Phase-in lower carbon intensity of transportation fuels to achieve 10% reduction by 2020
  – Increasing supply of renewable diesel, renewable natural gas, and other low carbon fuels
  – Credits offset higher costs of production. Reflected in pump price.
• Fleet owners can earn credits to sell on open market*
  – Electricity – About $0.06/kWh for use in trucks, $0.11/kWh for buses.
  – Dispense own CNG – About $0.12/DGE in 2017 and declines to $0.04/DGE in 2020
• 2018 updates – may increase credits for battery electric trucks and for fleet owner to claim credit for dispensing hydrogen
• Future carbon intensity reductions needed

*Estimates based on credit value of $100 per credit
LCFS Program: https://www.arb.ca.gov/fuels/lcfs/lcfs.htm
Electricity and Transportation (SB 350)

- Increase grid electricity to 50% renewable by 2030
- Utilities to remove barriers for transportation electrification
- Energy efficiency requirements
- Ensure benefits in disadvantage communities
- Others
Investor Owned Utility Applications
$1 billion  Funding Requested

Potential to offset heavy duty infrastructure costs, establish new EV rates, on-site battery storage, and improve grid reliability
California facing tough challenges in GHG & NOx
Tools exist to address both GHG and NOx simultaneously
Aggressive immediate deployment needed for zero emission vehicles, near-zero technology and low carbon fuels
CARB committed to concerted action with technology providers, regulators, incentive funding and end users
Reference Materials

- Mobile Source Strategy
  https://www.arb.ca.gov/planning/sip/2016sip/2016mobsrc.htm
- Short-lived Climate Pollutant Reduction Strategy
  https://www.arb.ca.gov/cc/shortlived/shortlived.htm
- California Sustainable Freight Action Plan
  http://www.casustainablefreight.org/
- ZEV Action Plan
- Incentive Programs
  https://www.arb.ca.gov/ba/fininfo.htm
- Low NOx Technology Evaluation Activities
  https://www.arb.ca.gov/research/veh-emissions/low-nox/low-nox.htm
- CPUC Transportation Electrification Activities (SB 350)
  http://www.cpuc.ca.gov/sb350te/
- Advanced Clean Local Trucks
  www.arb.ca.gov/msprog/actruck/actruck/htm