What Are We Trying To Do?

- **Clean, healthy air**
  - Last 20 years
    - 40% improvement in ozone
    - 60% improvement in PM2.5
  - Still ~100 unhealthy days/year (LA)
  - Goal: Clean air every day

- **Reduce GHG emissions 80% by 2050**
  - Leadership role
  - Comprehensive plan – all sectors
    - Passenger vehicles emit 25% of all GHGs
  - Share experiences
Zero Emission Passenger Vehicles Critical to Success – Now to 2050

California Air Resources Board, 2009
Electric Vehicles (ZEVs)
4 Types

- Hybrid
- Fuel Cell
- Plug-in Hybrid
- Battery Electric
How to Make This Happen

1. **Jump start the market for ZEVs**
   - ZEV “mandate“ on vehicle manufacturers
     - Must produce increasing # of ZEVs each year
   - Vehicle purchase incentives needed
     - In introductory volumes, ~$10K premium for ZEVs

2. **Provide needed fueling infrastructure**
   - Electricity and hydrogen

3. **Reduce carbon intensity of fuels**
   - Petroleum
   - Electricity and hydrogen
ZEV Annual Sales Required - California

Historic annual sales 1.5-2M

15.4% of Annual Sales by 2025

Projected: Plug-in Hybrids

Projected: BEVs & FCEV

Annual ZEVs

- 2015
- 2016
- 2017
- 2018
- 2019
- 2020
- 2021
- 2022
- 2023
- 2024
- 2025
Lots of ZEVs Coming!

Plug-In Hybrids

Fuel Cell Vehicles

Battery Electric Vehicles

Lots of ZEVs Coming!
Fueling Infrastructure – Electric

- Current public charging spots
  - ~2000 level 2 chargers (3-6 hour charge)
- Planned expansion
  - ~18,000 level 2 chargers
  - ~200 fast chargers (~30 minute charge)
- $3 million in grants to local government for electric vehicle readiness preparation
Fueling Infrastructure - Hydrogen

- 68 stations statewide by end of 2015 planned
  - Support 20,000 fuel cell vehicles
  - Mostly government funded

- Regulatory requirement ("CFO") to expand as FCEV population grows, up to 500 stations
  - Obligation on larger oil companies
  - Positive business case before 100th station due to increasing # of vehicles and fuel demand
HYDROGEN FUELING NETWORK - SOUTHERN CALIFORNIA
PLANNED STATIONS TO SUPPORT COMMERCIAL VEHICLE LAUNCH - 42 STATIONS

Open Stations
Under Construction
Funded & In Development
Proposed for Funding, April 2012
Additional Stations Planned for 2016

Statewide Network (68 Stations)
Fuel Needs To Be Cleaner -- Low Carbon Intensity Fuel Requirements

- Gasoline and diesel
  - 10% reduction in carbon intensity (CI) by 2020
- Electricity
  - 33% renewable by 2020
- Hydrogen
  - 33% renewable, and 30% lower GHG (vs gasoline)
- Goal for alternative fuels is 60-70% lower CI
  - Both electricity and hydrogen can meet this level!
Summary

- Meeting climate goals requires ZEVs
  - Most new passenger vehicles sold by 2040 must be ZEVs
    - ZEV mandate will accelerate ZEV commercialization
    - Challenge is continuing incentives until volume is up and prices down
  - Both battery EVs and hydrogen fuel cell vehicles needed to meet driver needs
    - Challenge to create a ‘buzz’ that these vehicles are desirable and ‘cool’
Summary continued

- Fuels must have low carbon intensity
  - Plans in place to achieve this

- Public infrastructure
  - Public electric charging infrastructure being installed, but how much more needed still uncertain
  - Hydrogen infrastructure must precede cars
    - Need $65M to complete initial fueling network
    - Source for $25M not yet identified

- Need to address remaining mobile sources in similar manner