

# California Climate Policy

## Successes, Failures, and Lessons Learned

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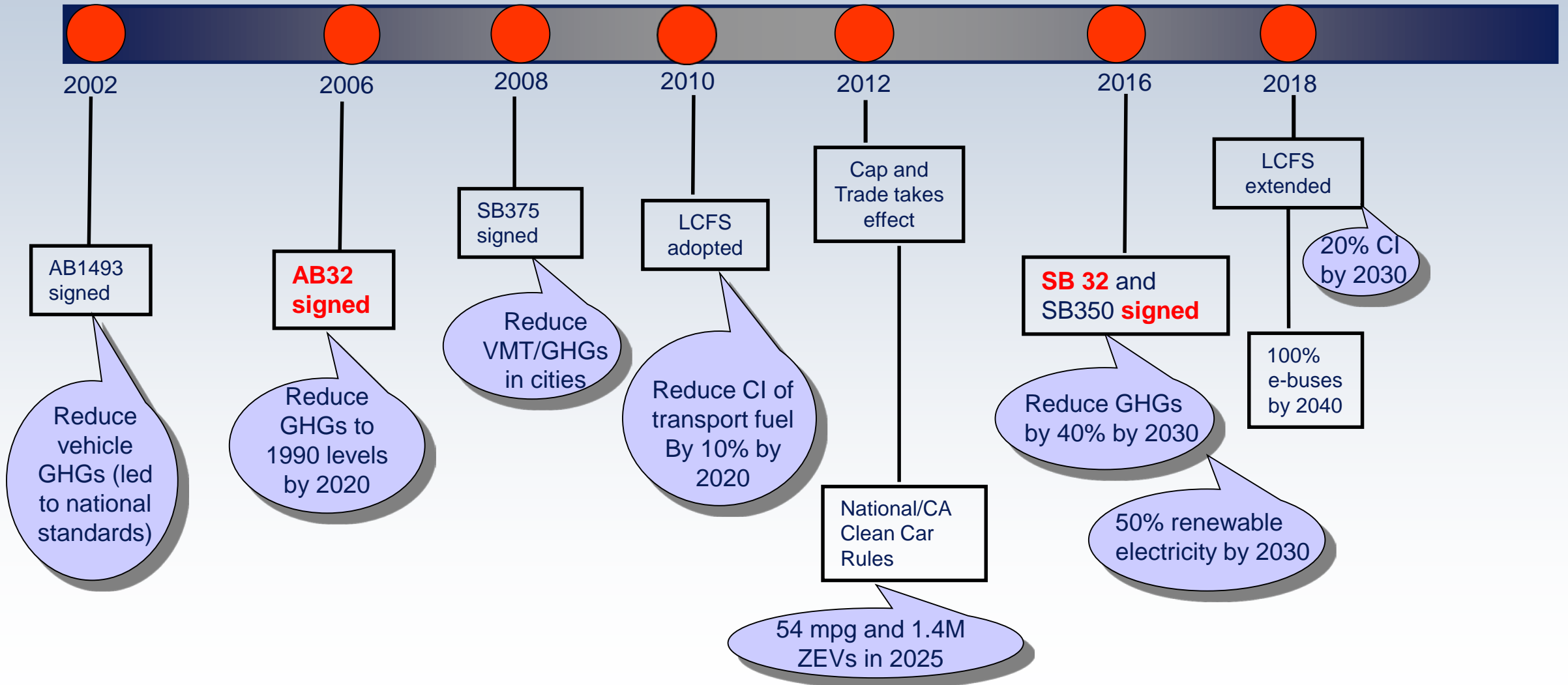
**UCDAVIS** UNIVERSITY OF CALIFORNIA

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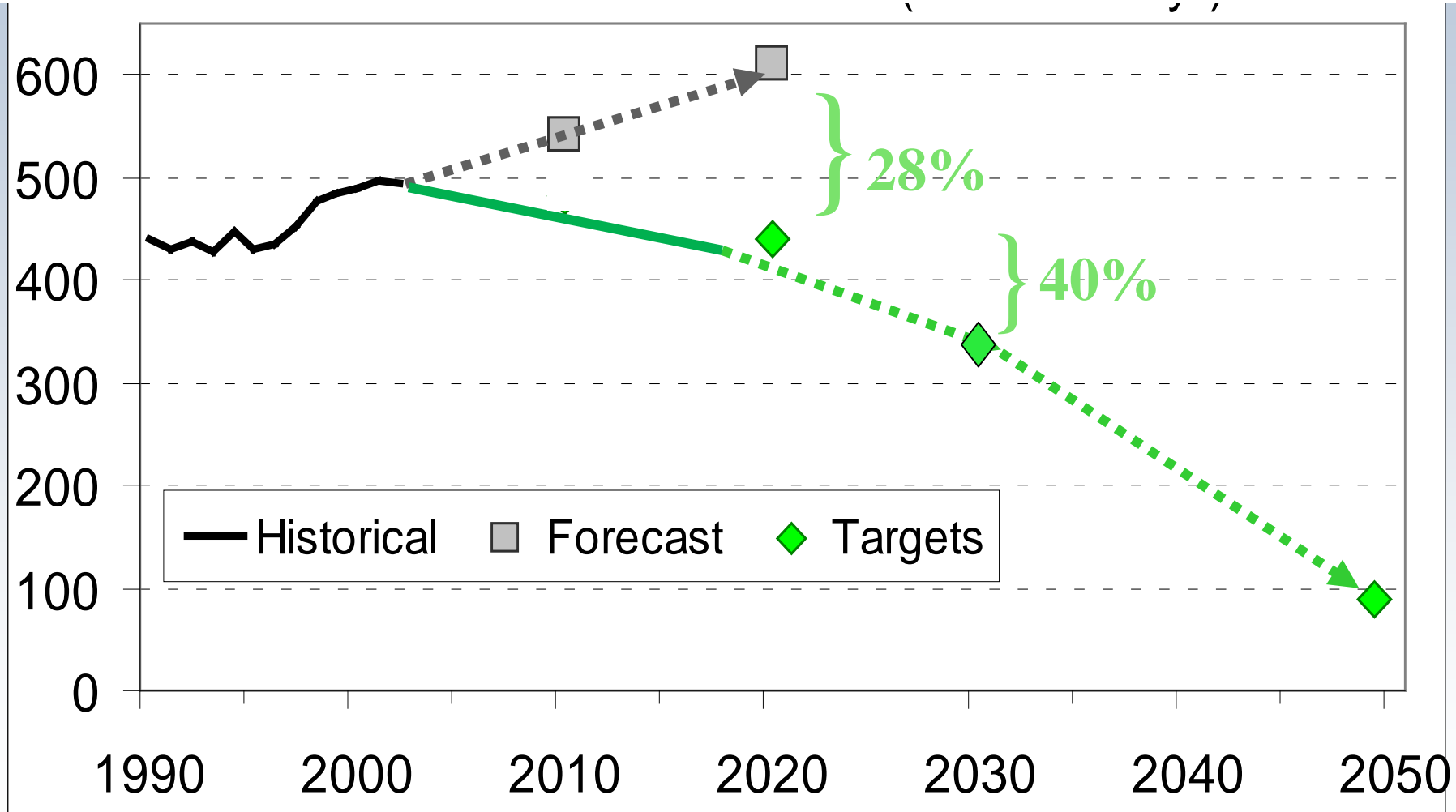
# California Climate Laws and Regulations

## Comprehensive, Aggressive, and "Model"



# California's Ambitious GHG Laws

Cap and Trade Gets Headlines, But Other "Regulations" Play Much Bigger Role (MMT CO<sub>2</sub>e)



# Why Suite of Climate Policies Are Needed

## A Long List of Market “Failures” and “Conditions”

- **Environmental and energy externalities**
- **Principal agent problem** (rental cars, truck trailers, leased vehicles, “company” cars, plus apartments/landlords/buiders, etc )
- **Network externality.** Complementary products requiring large *non-recoverable* investments and investments that cannot be made by individual consumers—such as when different vehicles or different infrastructures are required (H2, bike paths for biking, smart paratransit, etc)
- **Technology lock-in**
- **Market power** (cartels, oligopolies, etc)
- **High entry barriers in auto industry**
- **R&D under-investment** due to:
  - industry diffusion (e.g., truck manufacturing)
  - R&D spillovers. When R&D findings cannot be fully captured (leading to under-investment in R&D)
  - Learning-by-doing spillovers where mfg savings not fully captured
- **Consumer cognition** (eg, buying cars), resulting in under-investment in efficiency (related to information and loss-aversion)
- **Volatile oil prices** create uncertainty which leads to under-investment in alternatives

# California's Comprehensive Program to Reduce GHG Emissions from Transportation

## VEHICLES

- **GHG light duty vehicle stds (CA + US)**
- GHG requirements for trucks (CA + US)
- ZEV mandate (light duty)
- \$ for vehicles (ZEVs) (CA + US)

## FUELS

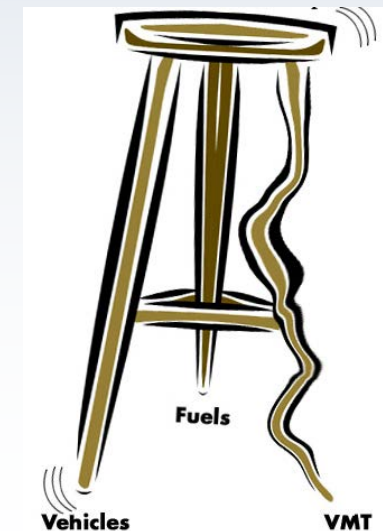
- **Low carbon fuel standard req't for oil companies**
- Funding for EV chargers and hydrogen stations
- Carbon cap and trade
- 50% renewable electricity stds for utilities by 2030

## Mobility, Land Use

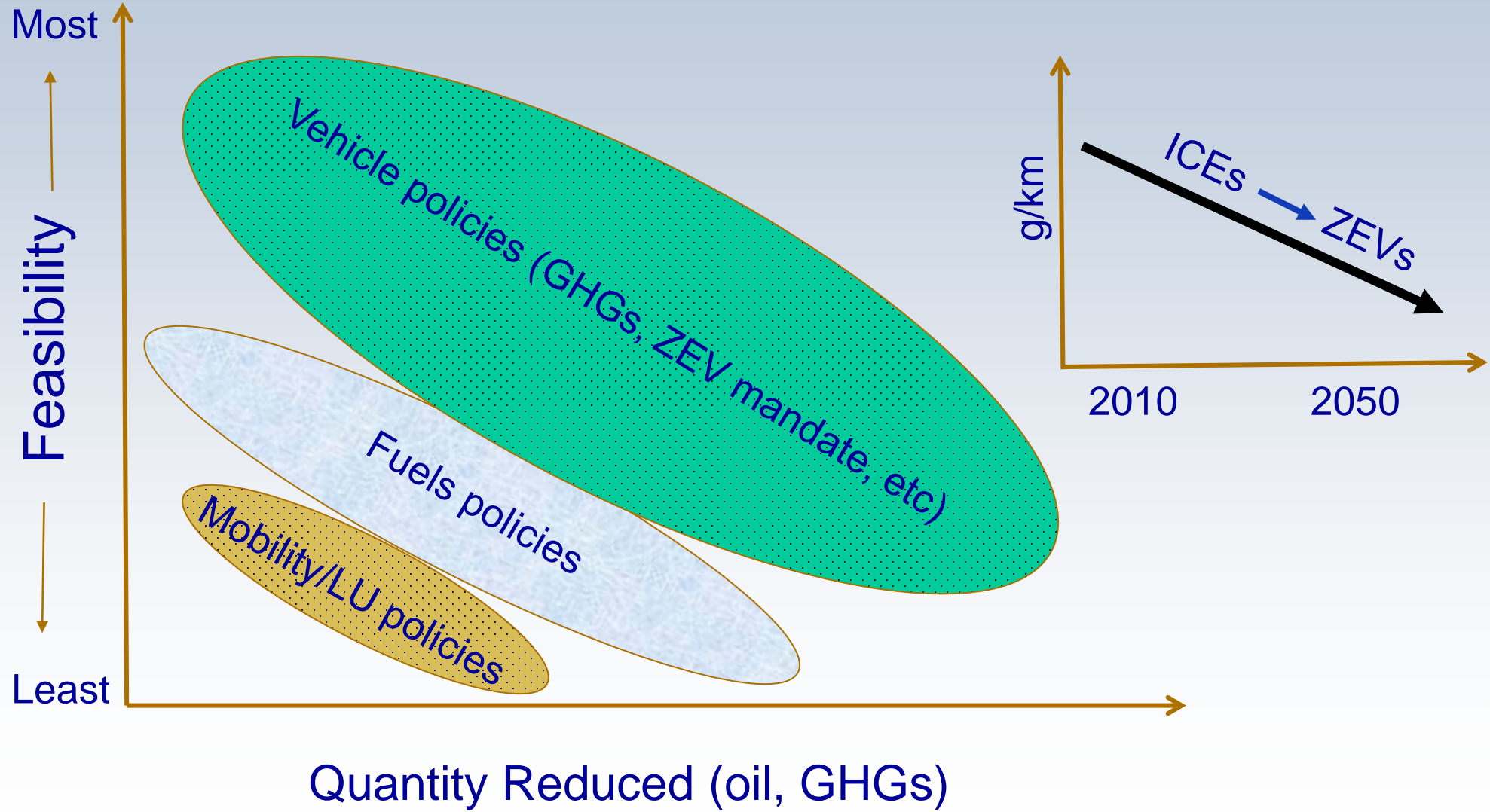
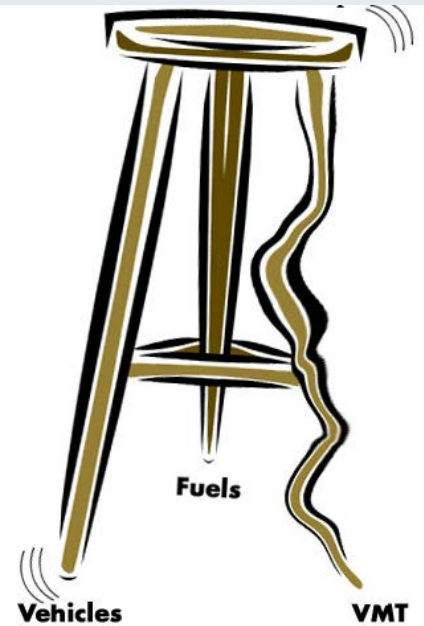
- **Reduce VMT and sprawl (SB375)**
- Sustainable freight initiative



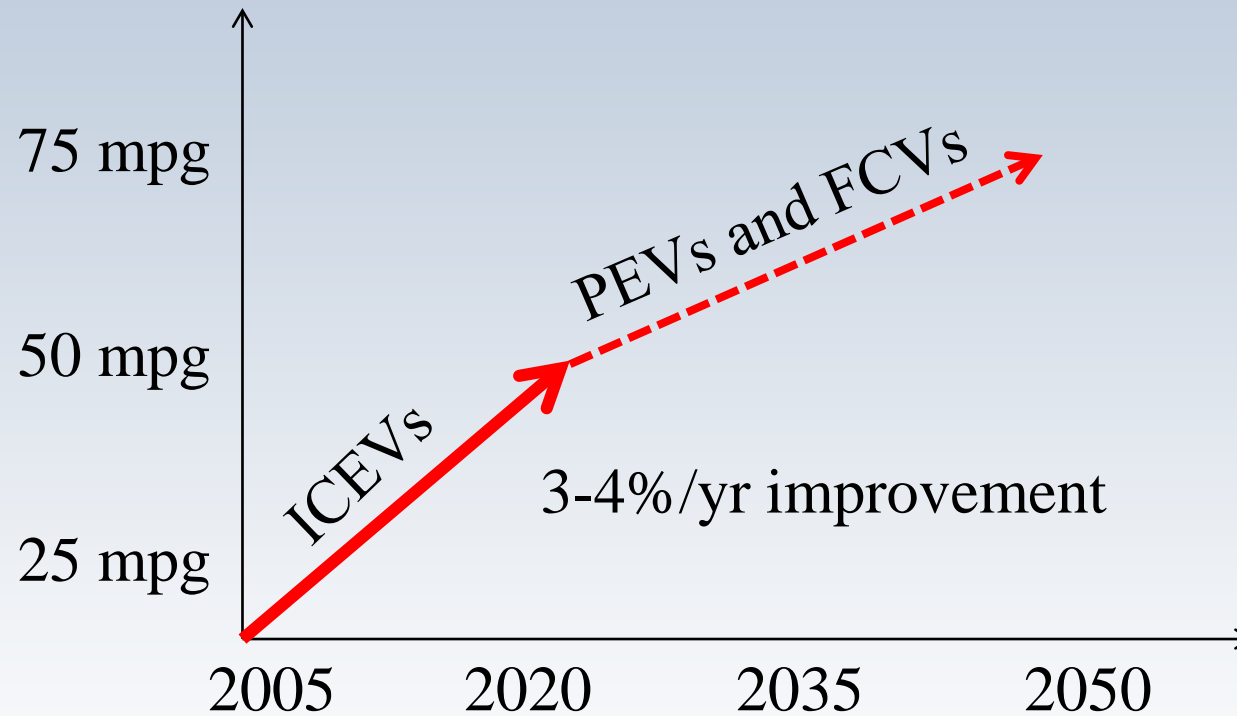
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# Vehicles are “Easiest” Strategy to Reduce GHGs from Transportation

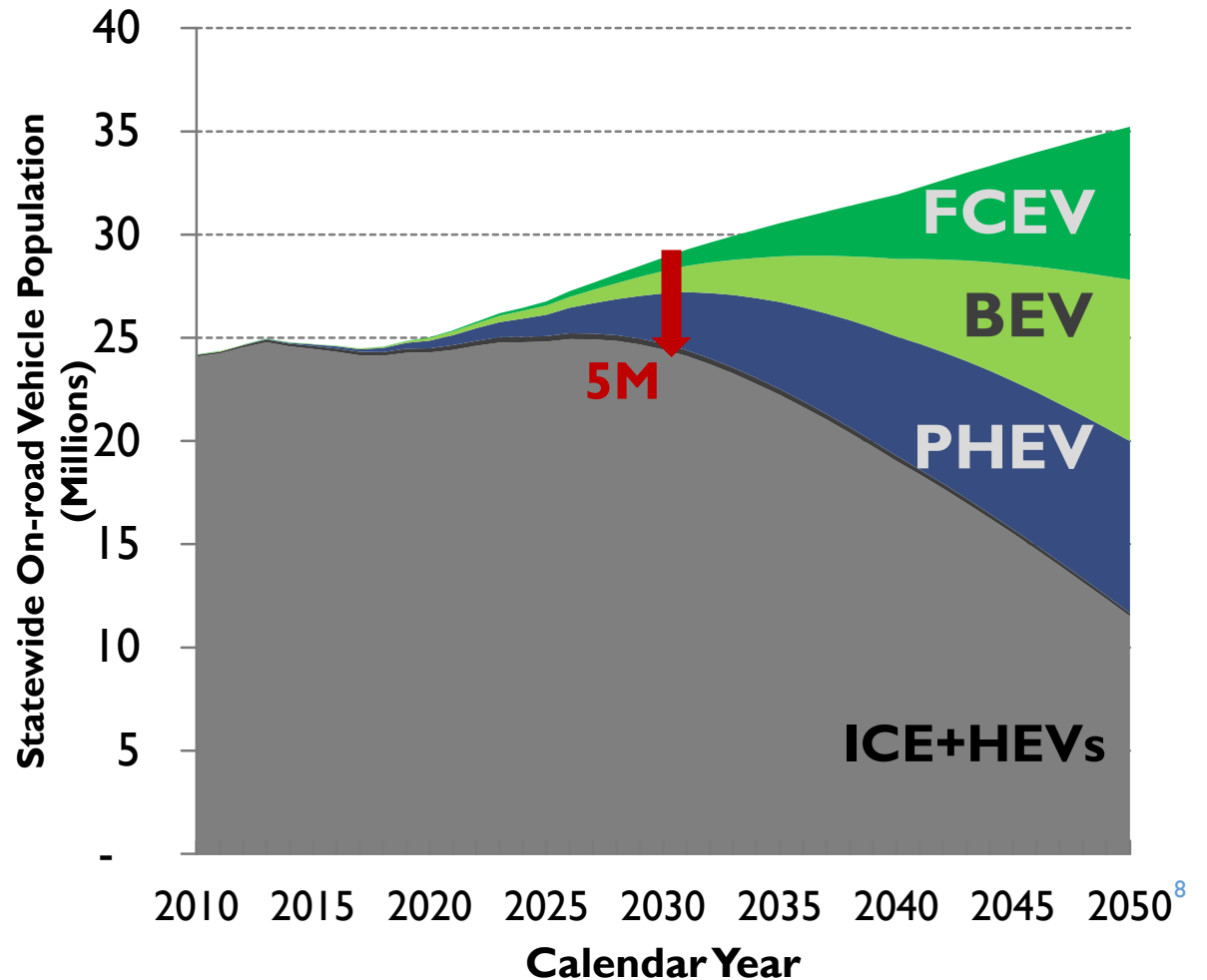


# Auto Industry [Was] on Path to 80% Reduction in GHGs ...California Still Is!



# California/CARB Scenario for ~100% ZEV/PHEV Sales BY 2040 (LDVs)

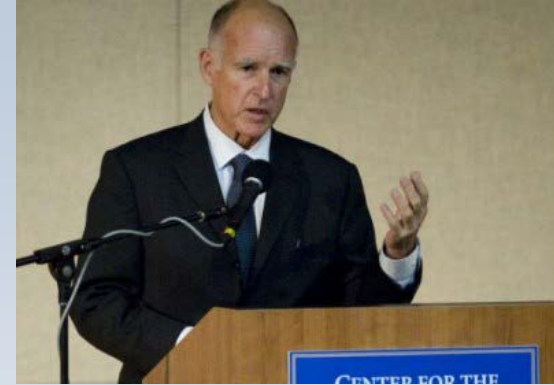
*If this scenario were updated today, there would probably be fewer PHEVs and FCVs, and more BEVs—the “Tesla Effect”*





# California's "ZEV Action Plan" Is Comprehensive Strategy Complementary to ZEV Mandate

- Financial incentives for:
  - ZEV purchase
  - Electric buses and trucks (including H2)
  - Hydrogen stations
  - Charging infrastructure (by State and electric utilities)
- Non-monetary incentives (eg, access to carpool lanes)
- Assistance to local governments for charger permitting, etc
- Financial credits from "low carbon fuel standard"
- Government fleet purchase mandates
- ZEV mandate



# “How (Almost) Everyone Came to Love Low Carbon Fuels in California”



“Automakers and energy utilities now embrace California’s Low Carbon Fuel Standard, and even oil companies accept it”

- Large “incentives” for renewable natural gas
  - Natural gas utilities
- Rebates for electric vehicles
  - Automakers
- Encourages electric vehicle sales
  - Electric utilities
- Credits for carbon capture and sequestration, solar energy at oil fields and refineries, efficiency improvements at refineries

*Lesson learned: be flexible in design and play to possible constituencies*

# VMT is "Failure" (so far 😊)

## Transit Ridership Dropping... and Also Vehicle Occupancy

### Transit ridership fell in 9 of 10 largest markets in 2017

Researchers attributed the decline to ride-hailing services, cheap fuel, and the increase of car ownership, among other factors.

DECREASE

INCREASE



Source: TransitCenter, National Transit Database

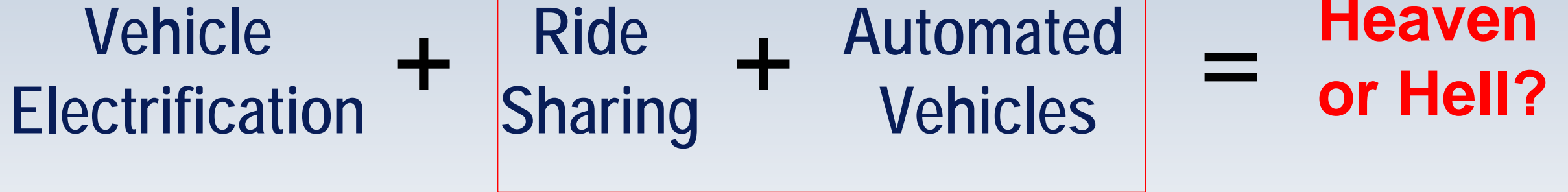
GABRIEL FLORIT/THE WASHINGTON POST

Year	1970	1985	2000	2015
Passenger-distance in airplanes per person (miles)	511	1,159	1,827	2,000
Passenger-distance in light-duty vehicles per person (miles)	9,692	11,693	14,219	11,930
Occupancy rate for short-wheel-base light-duty vehicles (persons)	1.91	1.68	1.59	1.39

US BTS, from Sivak, 2018

## New Challenges and Opportunities

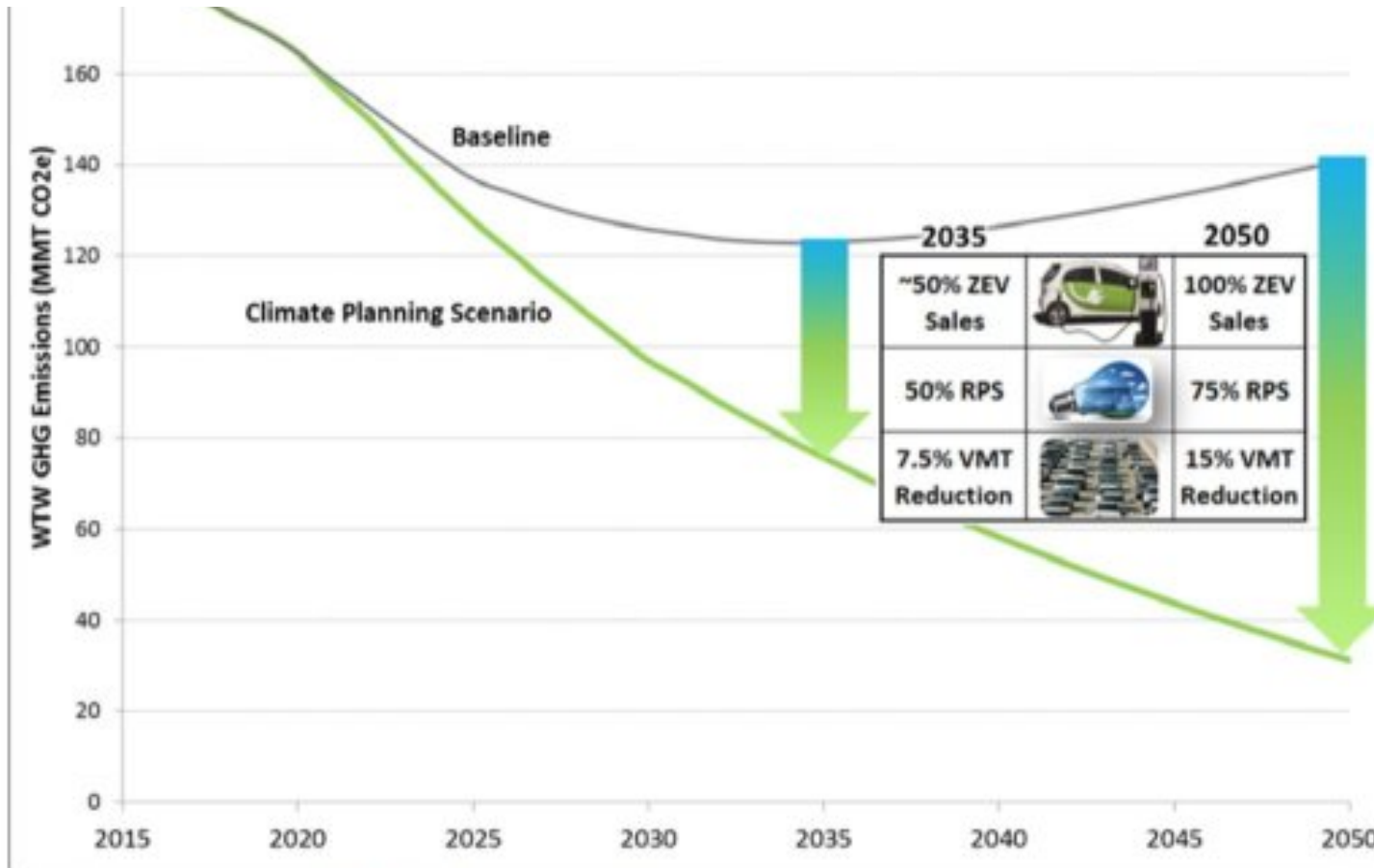
# 3 Revolutions



### Strategies and Policies Should Encourage:

- Electrification of shared and automated vehicles (AB 1014 in California)
- “Pooling” (including mass transit) over single-passenger services (eg, Massachusetts Commission on the Future of Transportation)
- Shift from car ownership to pooled mobility services (and micro-mobility)

# California Transportation “Plan” for Achieving Climate Goals On Track with ZEVs and RPS, But Not VMT



WTW = well-to-wheel emissions

MMT CO<sub>2</sub>e = million metric tons carbon dioxide equivalent

RPS = renewable portfolio standard

# What About Freight?

~20% of Total GHGs and Growing

- Governor's Freight Action Plan (2017)
- Plans for ZEV mandates for targeted truck applications (off-road vehicles at ports and airports, drayage trucks, local delivery, ...)
- Large incentives for electric (and hydrogen) trucks (~\$500M/yr?)
  - CARB, CEC, electric utilities, AQ districts
- Aiming for “full” electrification (plus low-NOx engines with low-carbon biofuels)
- Less success with Truck VMT

*California Showing the Way to the Promised Land?!*

# California Climate Policy ... Model? Replicable?

