

# Overview

- The challenge
- ZEV program history & technology story
- **The 2003 regulation**
- ARB's role in bringing ZEVs to commercialization
- Section 177 States
- Next steps
- Conclusion

# Am I subject to the ZEV Regulation?

- **Small** 
  - CA sales less than 4,500; *Not Subject*
- **Independent Small** 
  - CA annual sales less than 10,000; *Not Subject*
- **Intermediate** 
  - CA sales between 4,501 and 60,000; *Subject to Regulation*
  - *Can meet whole requirement with PZEVs*
- **Large** 
  - CA sales greater than 60,000; *Subject to Regulation*

# How do I calculate my sales volume?

- For 2005: average of 1997, 1998 and 1999 model year sales
- Prior Year Method
- Current Year Method
- All Passenger cars and Light-Truck I
- Include Light-Truck II according to the following schedule:



2007	2008	2009	2010	2011	2012+
17%	34%	51%	68%	85%	100%

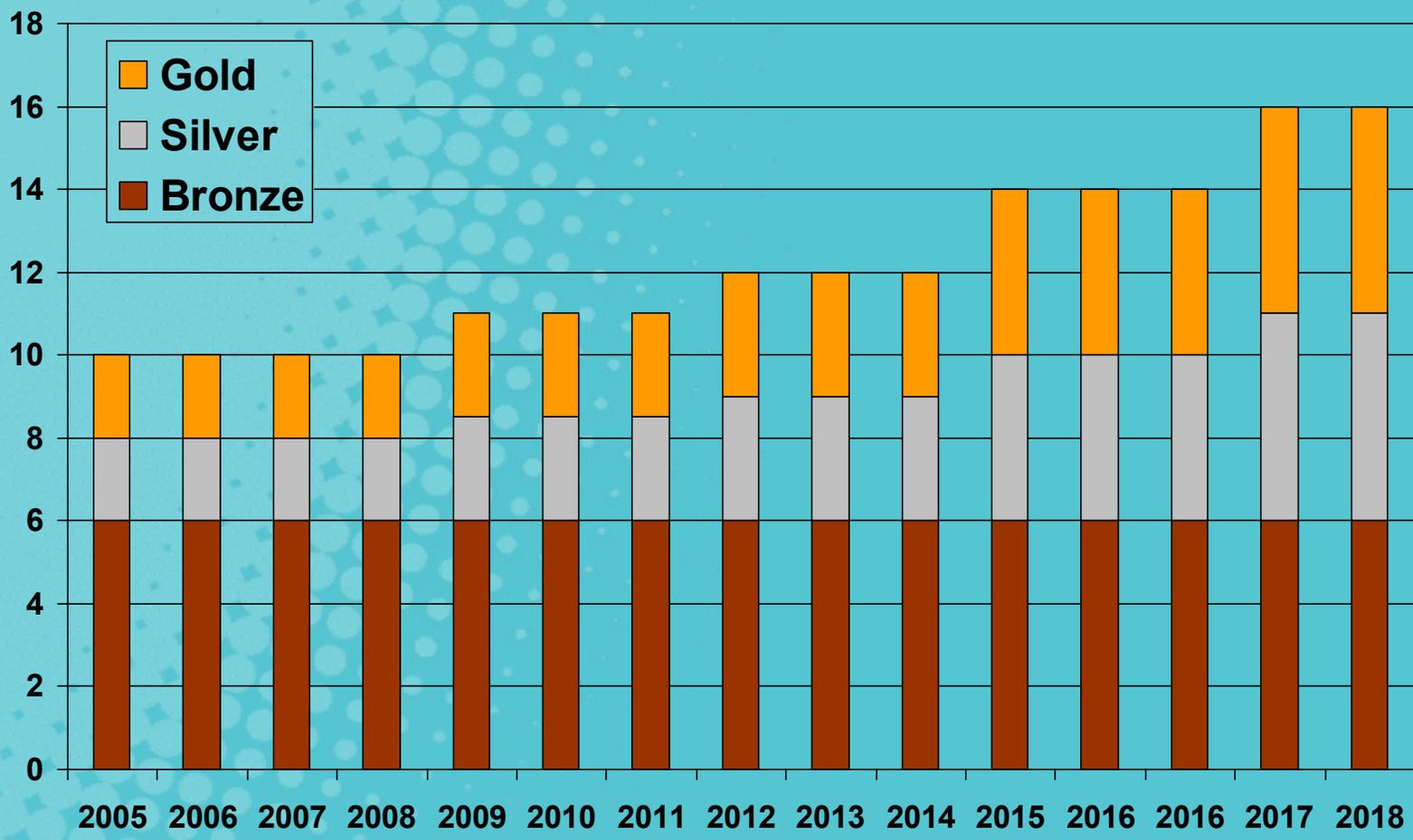
- Subtract ZEVs

# When Do Requirements Start?

- **Model Year 2005**
- **Changes in Volume Status**
  - **From Smaller to Larger**
    - e.g. Intermediate to Large
  - **From Larger to Smaller**
    - e.g. Large to Intermediate



# How Many Cars Do I Have to Produce?



# Example ZEV Obligation Calculation

- Sales Volume = 100,000 cars
- Total 10% credit obligation = 10,000
- Need to generate 2,000 credits from ZEVs
- Can generate 2,000 credits from AT PZEVs
- Can generate 6,000 credits from PZEVs
  
- Translates into vehicle volumes using credits per vehicle

# Gold Requirement

- **Base Path**
  - Credits equal to 2%
  - Banked Credits
- **Alternative Path**
  - New production of ZEVs
    - Fuel Cells
    - Battery BEVs
    - Re-leased BEVs
  - No banked credits
  - Remaining obligation may be met with AT PZEVs



# How Does the Alternative Path Work?

- Requires market share of FCV totals:

2005-2008	250
2009-2011	2500
2012-2014	25000
2015-2017	50000

- Allows:
  - 50% of FCV requirement to be met with BEVs or re-leased BEVs
  - FCVs placed in CA ZEV state (section 177 State) counted and vice versa
  - Rest of ZEV obligation to be met with AT PZEVs



# Calculating the Alternative Path Obligation

- **2005 - 2008**
  - Credits from Type III ZEVs equal to 1.09% of 1997-2001 average annual sales
  - Up to 50% full function BEVs at 10:1, city BEVs at 20:1 or re-leased BEVs at 33:1
- **2009 – 2011** }
- **2012 – 2014** }
- **2015 – 2017** }



# Silver Option

- **Base Path**
  - 2%
- **Alternative Path**
  - 2% plus remaining gold obligation
  - Calculation looks like this:

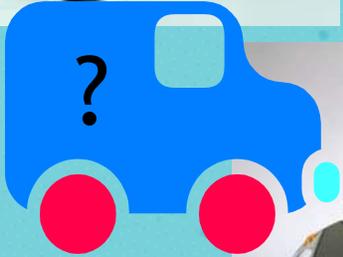
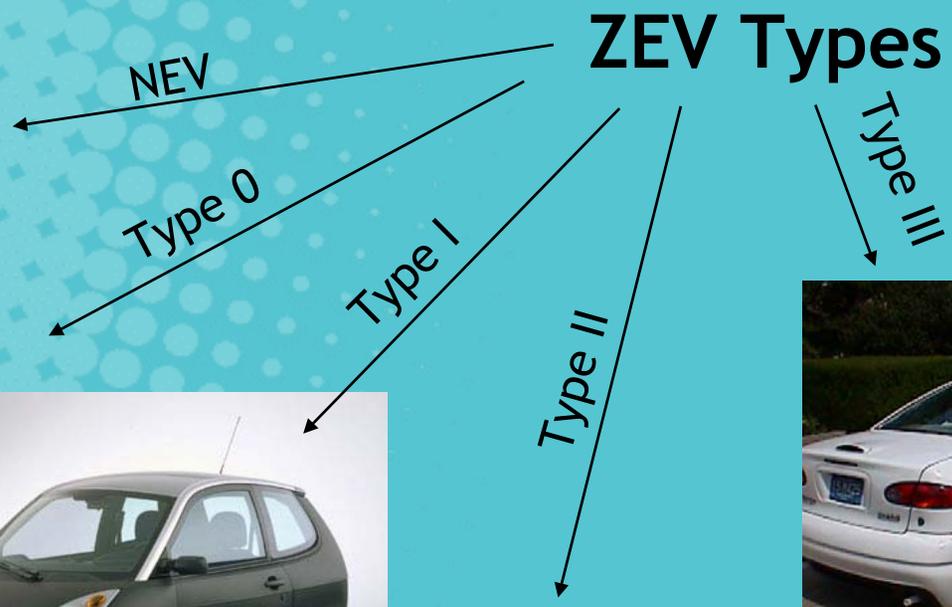


# Bronze Option

- **All Paths - 6%**
- **Accelerated PZEV Production in 2003 and 2004**
  - Early PZEVs produced in excess of 6% may be used as AT PZEVs in 2005 and 2006



# How do I calculate credits?



Gold

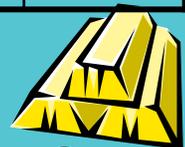
# ZEV Types

- **NEV**
  - Low Speed Vehicle
  - No range requirement
- **Type 0**
  - “Utility”
  - Less than 50 miles range
- **Type I**
  - “City”
  - Range between 50 and 100 miles
- **Type II**
  - “Full Function”
  - Range greater than 100 miles
- **Type III**
  - “Fuel Cell”
  - Range greater than 100 miles
  - Fast refueling



# ZEV Credit Calculation

	Stage I			Stage II			Stage III			
Tier	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012+
NEV	1.25	0.625	0.625	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Type 0 (Utility)	1.5	1.5	1.5	1.5	1.5	1.5	1	1	1	1
Type 1 (City EV)	8	8	8	7	7	5	2	2	2	2
Type 2 (FF EV)	12	12	12	10	10	7	3	3	3	3
Type 3 (Fuel Cell)	40	40	40	40	40	40	4	4	4	3



# AT PZEV Credit Calculation

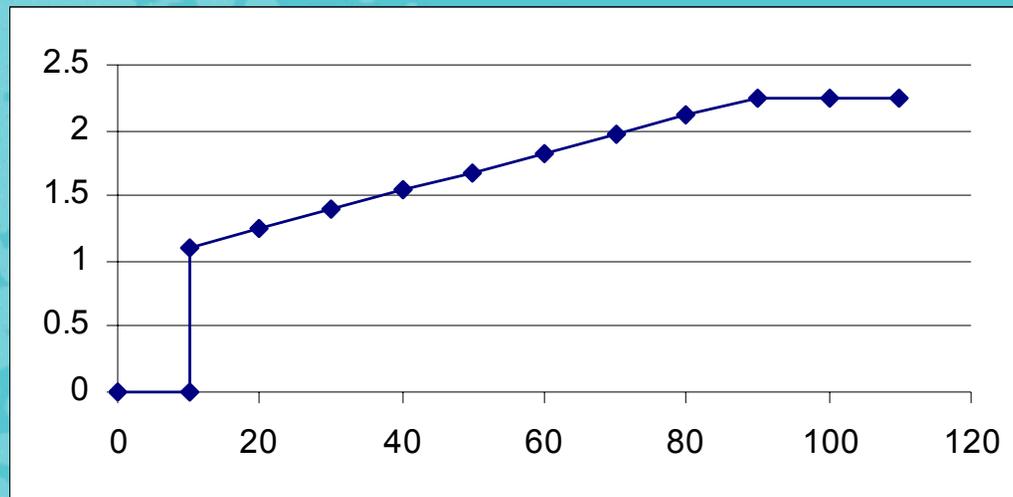
- AT-PZEVs earn PZEV base credit of 0.2 plus allowances for:
  - Zero Emission Range (ZER)
  - Advanced ZEV Componentry
  - Low Fuel Cycle Emissions

$$\text{AT PZEV} = \text{0.2 Base} + \text{ZER} + \text{Advanced Componentry} + \text{Low Fuel Cycle}$$



# AT PZEVs - Zero Emission Range

- Maximum allowance is 2.25
- Vehicles must achieve at least 10 miles of zero emission range to qualify
- Allowance proportional to range:



# Zero Emission Range- Alternative Procedure

- **Manufacturers may submit an alternative proposal for ZEVMT allowance determination, for example:**
  - **Vehicle with zero emissions of one or more regulated pollutants**
    - **Hydrogen ICE vehicles with zero NMOG emissions are expected to apply for credit of 1.5**



# AT PZEVs - Advanced Componentry

- For HEVs to qualify for credit, their electric drive systems must feature:
  - Regenerative Braking
  - Traction Drive Boost
  - Idle Start/Stop Capability
- Credit varies with peak power and system voltage according to the following table
- For AT PZEVs using compressed fuel storage:
  - 0.3 Advanced Componentry credit



# AT PZEVs - Advanced Componentry

Characteristics	Type A	Type B	Type C	Type D	Type E
Examples	TBD	TBD	TBD	Honda Civic HEV	Toyota Prius, Ford Escape
Traction Drive Peak Power	$\geq 4$ kW	$\geq 4$ kW <10 kW	$\geq 10$ kW	$\geq 10$ kW	$\geq 50$ kW
Traction Drive System Voltage	< 60 volts	$\geq 60$ volts	< 60 volts	$\geq 60$ volts	$\geq 60$ volts
AT Credit 2003-2008	0	0.2	0.2	0.4	0.5
AT Credit 2009-2011	N/A	N/A	0.2	0.4	0.5
AT Credit 2012-2014	N/A	N/A	N/A	0.35	0.45
AT Credit 2015+	N/A	N/A	N/A	0.25	0.35



# AT PZEVs - Low Fuel Cycle Emissions

- LFCE fuels are those with  $< 0.1$  g/mile equivalent NMOG
- If exclusively fueled by LFCE fuel, credit = 0.3
- If not, up to 0.15 credit proportional to LFCE fuel use
- Examples:
  - CNG (0.3)
  - Hydrogen (0.3)
  - Grid HEVs (0.15 max.)



# AT PZEV Examples:

AT PZEV Type	PZEV Base	ZER	Adv. Comp.	LFCE	TOTAL
MY 2003 Civic HEV	0.2	0	0.4	0	0.6
MY 2003 Prius	0.2	0	0.5	0	0.7
CNG	0.2	0	0.2	0.3	0.7
Hydrogen ICE	0.2	1.5 (alt)	0.3	0.3	2.3
Hydrogen ICE HEV	0.2	1.5 (alt)	0.8	0.3	2.8
Maximum AT PZEV	0.2	2.35	0.8	0.3	Capped @ 3.0 or <T III



# What Other Kinds of Credits Can I Earn?

- **Extended Service Multiplier**
- **Multiplier for extended lease or sale**
- **Advanced Technology Demonstration Programs**
- **Transportation Systems**



# Re-Leasing Vehicles- pre 2001 thru 2003 MY

- ZEVs and some AT PZEVs may earn credits for releasing vehicles for each year after three years of service
- Must be registered for operation on public roads in California
- Multiply credit earned by vehicle leased or sold new in that year by:
  - .1 for pre 2001 model year
  - .2 for 2001 thru 2003 model year
- Can be used to meet Alternative Path 50% BEV



# **Sale or Extended Lease 2004-2011 MY**

- **City and Full Function EV**
- **Sold**
- **Leased for 3+ years and given option to purchase or re-lease for 2 years or more**
- **Receive one time multiplier 1.25 first year of purchase or lease**



# Advanced Technology Demonstration Programs

- **May earn credits for advance technology vehicles in a demonstration program**  
eg. fuel cell vehicles
- **Vehicles that may or may not be registered**
- **Must be in CA more than 50% of first year operation**
- **Approval by ARB's Executive Officer is required**



# Transportation Systems

- **ZEVs, AT PZEVs and PZEVs may earn credits**
- **Vehicle used as part of project that uses an innovative transportation system**
- **Meet shared use/intelligent technology and/or link to mass transit**
- **Approval by Executive Officer required**



# What If I Make Vehicles Early?

Receive early multipliers

## ZEV

	<b>MY 2001-2002</b>
<b>Multiplier</b>	<b>4.0</b>

AT PZEV with Zero VMT (Hydrogen ICE, Grid HEVs)

	<b>MY 2000-2008</b>	<b>2009-2011</b>
<b>Multiplier</b>	<b>6.0</b>	<b>3.0</b>

## PZEV

	<b>MY 2000-2003</b>	<b>MY 2004</b>	<b>MY 2005</b>
<b>Multiplier</b>	<b>4.0</b>	<b>2.0</b>	<b>1.33</b>



# What If I Only Produce ZEVs?

- Can store credits in ZEV Bank
- Manufacturers subject to regulation may purchase credits
- Manufacturing ZEVs-only does not incur a ZEV requirement



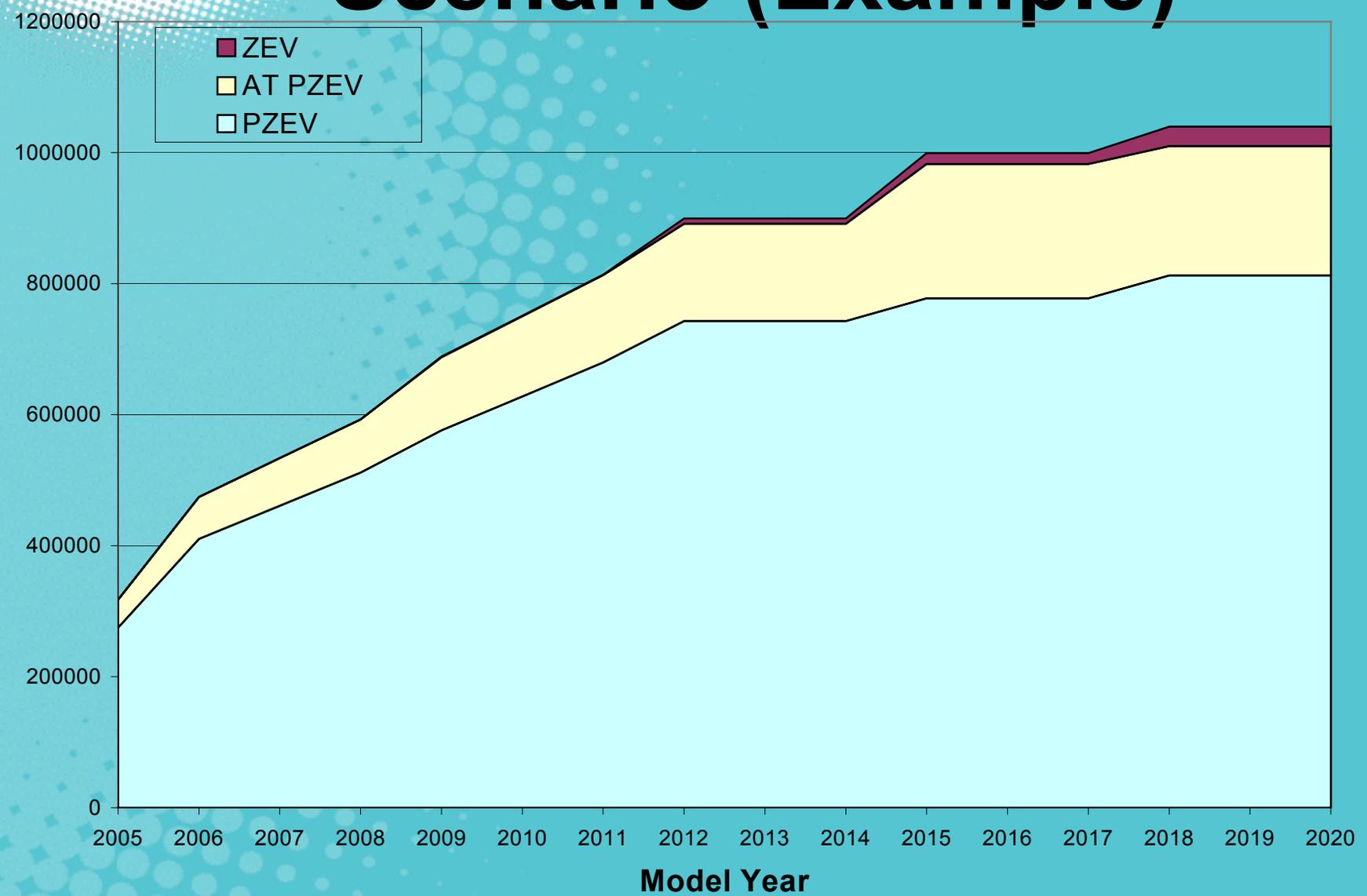
# Resulting Number of Vehicles

- **Not possible to provide firm estimates**
  - Program provides great flexibility
- **Overall effect of 2003 modifications**
  - Reduce number of ZEVs and increase number of AT PZEVs
  - PZEV totals not significantly affected

# AT PZEVs and PZEVs

- **AT PZEVs**
  - In near term, depends on manufacturer capability and strategy regarding use of banked credits
  - In long term, depends on types of vehicles marketed
- **PZEVs**
  - Staff expects manufacturers to take full advantage of PZEV option

# Vehicle Production Scenario (Example)



# Percent of Total Sales

