2018+ MYs

California Environmental Protection Agency

Air Resources Board

California's ZEV Regulation for 2018 and Subsequent Model Year Vehicles

2016

2018+ MYs

Need for ZEV Regulation

- California is the nation's largest market for passenger cars and light-duty trucks
  - Over 25 million registered vehicles
  - Over 800 million miles driven every day
  - Over 29 million gallons of gasoline consumed each day
- Widespread adoption of ZEVs necessary to meet California's GHG reduction goals
  - 40% below 1990 levels by 2030
  - 80% below 1990 levels by 2050

Citation

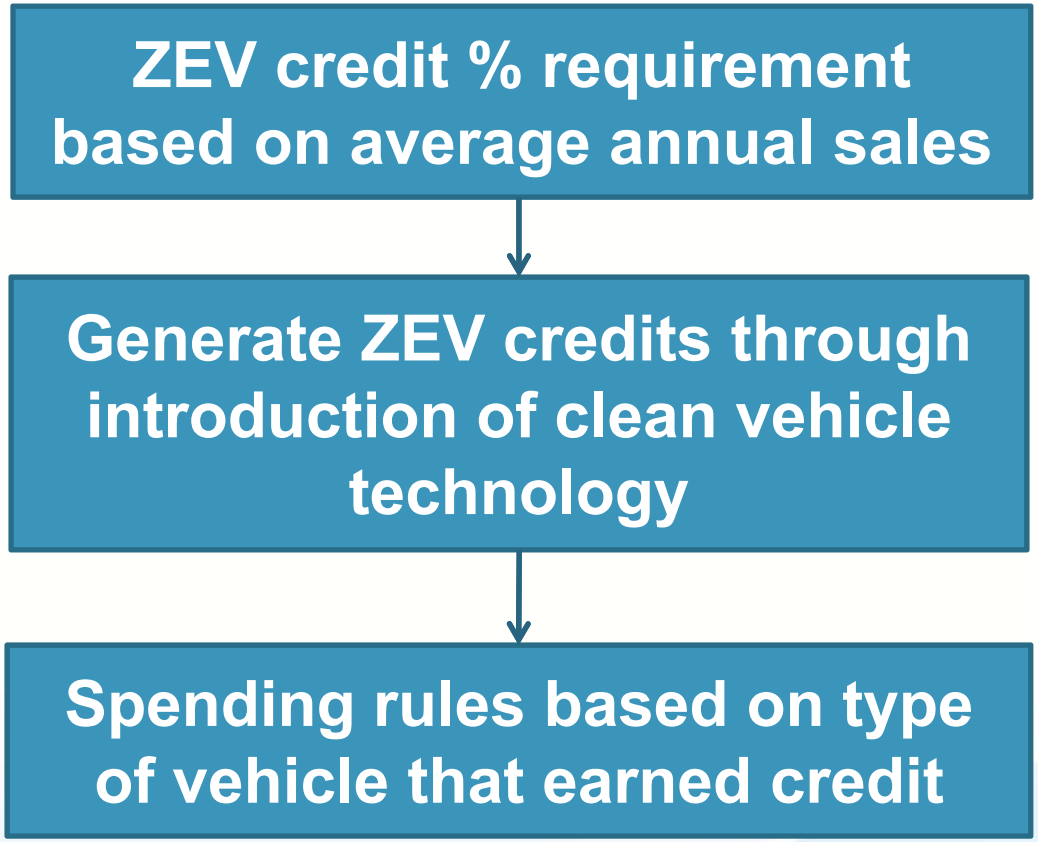
2012 ZEV Regulation Modifications

2018+ MYs

- In 2012 the Board passed sweeping modifications to the ZEV Regulation
  - Simplified ZEV Regulation for 2018 and subsequent model years
  - Substantially increased requirements

How does the ZEV Regulation work?

2018+ MYs



2018+ MYs

Section 177 ZEV States

- ***"Section 177 ZEV State":*** a state that is administering the California ZEV requirements pursuant to section 177 of the federal Clean Air Act (42 U.S.C. Sec. 7507)
- Current S177 ZEV States

Connecticut	**Massachusetts**	**Oregon**
Maine	**New Jersey**	**Rhode Island**
Maryland	**New York**	**Vermont**

advanced clean cars

2018+ MYs

Volume Status

- LEV Regulation Definitions (CCR, Title 13,section 1900)
- Average California Sales
  - Passenger Cars (PC), Light Duty Trucks (LDT) and Medium Duty Vehicles (MDV)
  - Based on three previous consecutive model years
- Small Volume Manufacturer (SVM)
  - Average CA sales ≤ 4500 per year

Not Subject to Regulation

- Intermediate Volume Manufacturer (IVM)
  - Average CA sales > 4,500 and ≤ 20,000 per year
- Large Volume Manufacturer (LVM)
  - Average CA sales > 20,000 per year

Subject to Regulation

Volume Status Definition: CCR, Title13, section 1900
Percentage ZEV Requirements: 1962.2(b)

2018+ MYs

Volume Status

Transition in Volume Status

- Increase in Volume Status
  - SVM and IVM – average CA sales > 4,500 based on 3 consecutive 3 year averages
  - IVM and LVM –
    - **Average CA sales > 20,000** based on 5 consecutive 3 year averages
    - **<u>Global revenue test for MY 2018 - 2020</u>**
- Decrease 3 consecutive 3 year averages
- Increase or decrease in volume status effective in the following model year

2018+ MYs

Volume Status

Example: Increase in Size IVM to LVM

Model Year	Annual CA Sales (PC, LDT, and MDV)	Average California Sales		Global Revenue (Billions of $)
2015	19,500			
2016	20,000			
2017	20,600			
2018	20,750	~~20,033~~		~~39.5~~
2019	21,000	20,450	1st	40.1
2020	19,000	20,783	2nd	40.5
2021	22,000	20,250	3rd	
2022	21,500	20,667	4th	
2023	23,000	20,833	5th	
2024	23,500	22,167		

Does not pass revenue test

Subject to LVM Req.

2018+ MYs

Production Volume

- ***Definition: "Calculating the Number of Vehicles to Which the Percentage ZEV Requirement is Applied"***
  - Simply called "Production Volume" for presentation
- The production volume on which **your ZEV requirement** is based
- Not the same as calculation for determining manufacturer's Volume Status

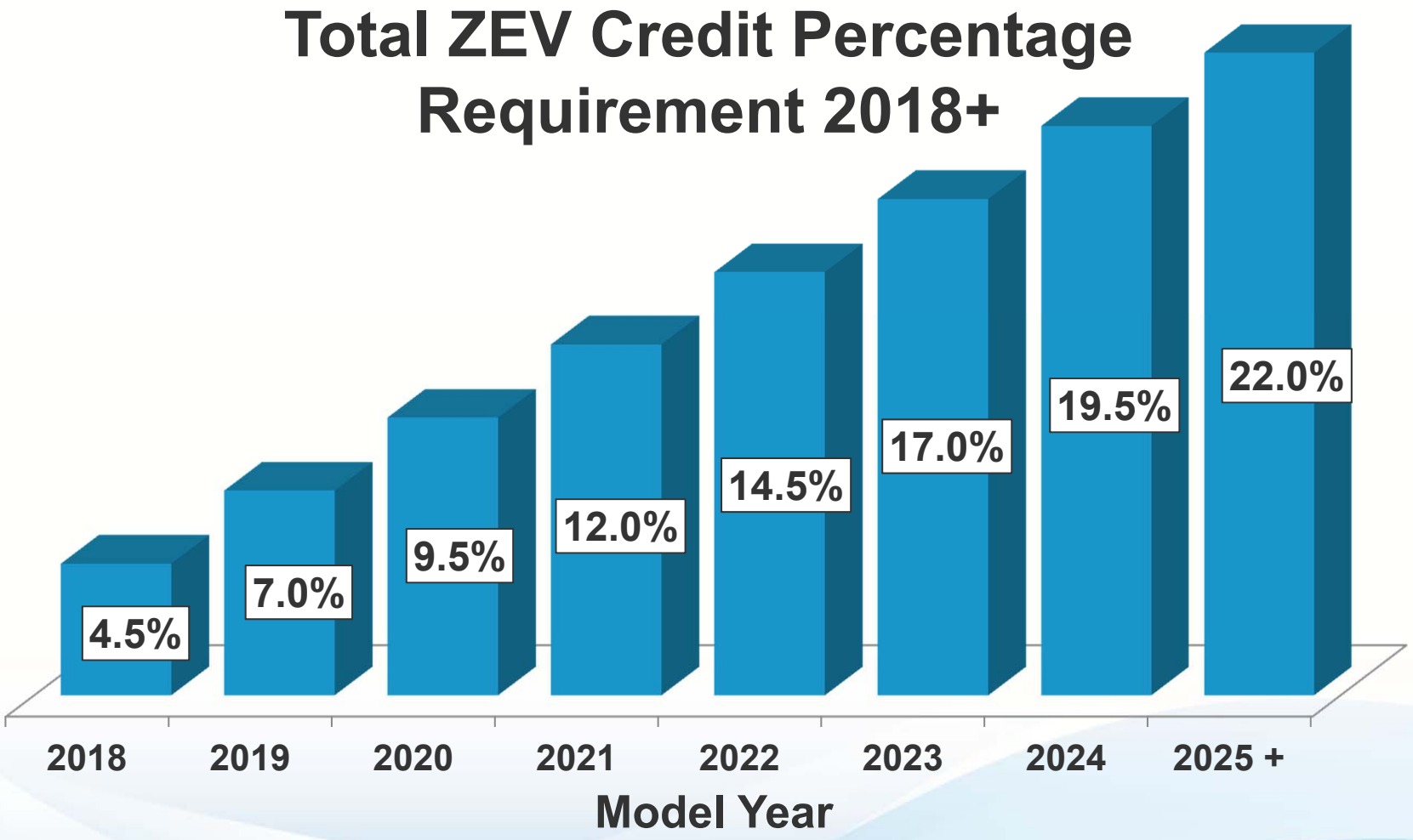
2018+ MYs

Production Volume

- Volume of PCs and LDTs, including ZEVs
- One Method
  - Average of the previous 2nd, 3rd, and 4th model year from model year in which you are complying
  - Example: 2018 MY production volume calculation based on average of 2014 – 2016 MY sales
- May apply to use same year method for two if California sales decrease by at least 30%
  - Two model years between 2018 and 2025
  - Example: 2018 MY sales < 2017 MY sales = production volume based on 2018 MY sales

2018+ MYs

ZEV Requirement



Percentage ZEV Requirements: 1962.2(b)(2)

2018+ MYs

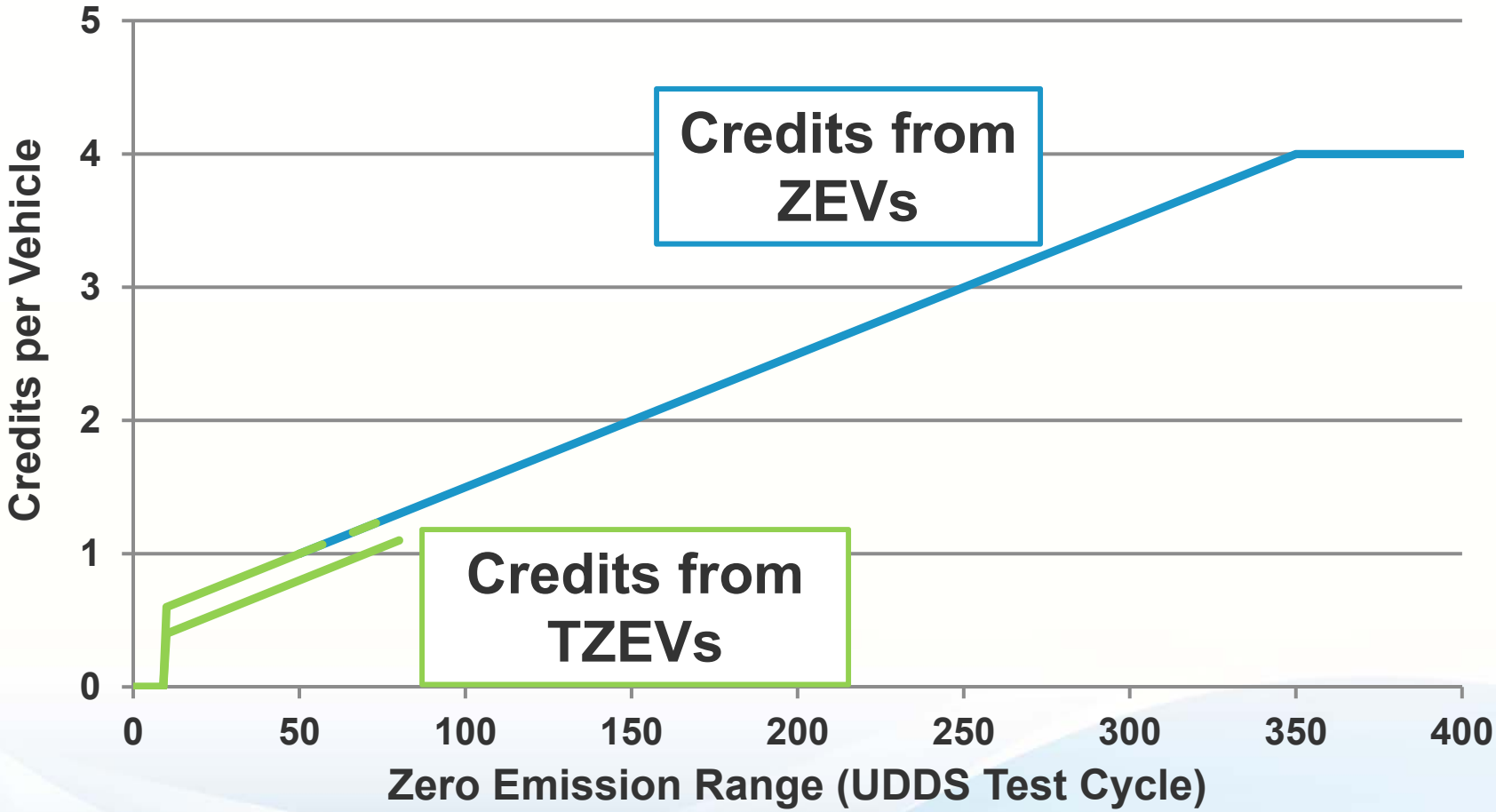
ZEV Credits

- Only one type of credit: ZEV Credits
- Several types of vehicles eligible to earn credits
  - ZEV – Zero Emission Vehicle
  - TZEV – Transitional Zero Emission Vehicle
  - HICE – Hydrogen Internal Combustion Engine Vehicle
  - BEVx – Extended Range BEV
  - NEV – Neighborhood Electric Vehicle
- PZEVs and AT PZEVs no longer eligible
- Credit value simplified

Transitional Zero Emission Vehicle (TZEV): 1962.2(c)
Credits from ZEVs: 1962.2(d)

2018+ MYs

ZEV Credits 2018 and Beyond



Citation

ZEVs

2018+ MYs

ZEV – Zero Emission Vehicles

- Zero exhaust emissions of any criteria pollutant or greenhouse gas under any and all possible operational modes and conditions
- Types of ZEVs
  - Battery Electric Vehicles (BEV)
  - Fuel Cell Electric Vehicles (FCEV)
- Credit based on all-electric range of vehicle

ZEV Credits

ZEVs

2018+ MYs

Urban All-Electric Range Test (Test Procedures F.3.1.1)

All-electric Range (AER) UDDS Test Cycle

< 50 mi	≥50 miles	>350 miles
0.00	(0.01 x UDDS) + 0.50	4 (cap)

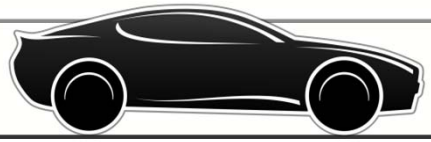
UDDS = AER

- Credits awarded when vehicle is delivered for sale
- Fast Refueling discontinued

ZEVs

2018+ MYs

2015 Hyundai Tucson FCV
EPA Label = 265
Approx. AER = 360
Credits for 2018 MY = 4



200 mile ZEV
EPA Label = 200
Credits for 2018 MY = 3
credits per vehicle

70%

2016 Nissan LEAF (30 kWh)
EPA Label = 107
Approx. AER = 160
Credits for 2018 MY = 2

Credits per Vehicle

0 1 2 3 4 5

0 50 100 150 200 250 300 350 400

Zero Emission Range (UDDS Test Cycle)

2018+ MYs

TZEVs

TZEV - Transitional Zero Emission Vehicles

- PHEV – Plug-in Hybrid Electric Vehicles
- Requirements
  - SULEV emission standards
  - Zero evaporative emissions
  - 15 year/150,000 mi extended emissions warranty
  - 10 year/150,000 mi warranty on energy storage device
- Zero Emission Vehicle Miles Traveled (VMT) TZEV Allowance
- HICE – Hydrogen Internal Combustion Engine Vehicle

2018+ MYs

TZEVs

Zero Emission VMT TZEV Allowance

All-electric Range (AER)
UDDS Test Cycle

< 10 mi	≥10 miles	>80 miles
0.00	(0.01 x EAER) + 0.30	1.10 (cap)

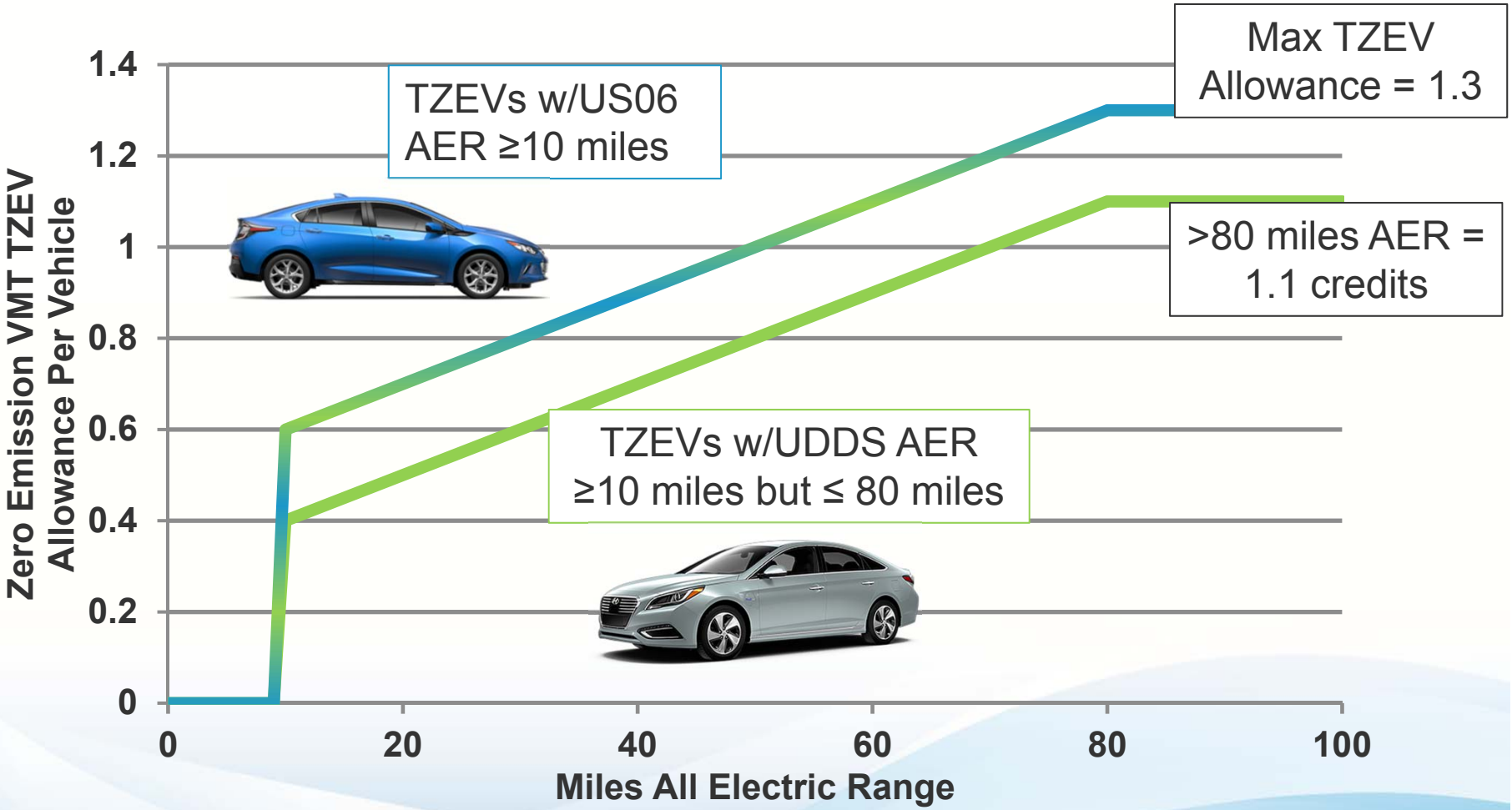
Equivalent All-Electric Range (Test Procedures G.11)

≥ 10 miles of AER on US06 test cycle add additional 0.2 credits

2018+ MYs

TZEVs

Zero Emission VMT TZEV Allowance



2018+ MYs

HICE

Credits for Hydrogen Internal Combustion Engine (HICE) Vehicles

- Vehicles with a total range of at least 250 UDDS miles earn a base of 0.75 credits
- Can be combined with Zero Emission VMT TZEV Allowance
  - Total credit subject to a 1.25 credit cap when combined with VMT TZEV allowance

2018+ MYs

BEVxs

BEVx – Range Extended BEVs

- APU – Auxilary Power Unit
  - On-board ICE generator
  - Gasoline range must not exceed AER
  - Must meet emissions requirements as TZEVs
- Credits based on AER
  - Same as ZEV calculation
  - Minimum 75 miles AER on UDDS drive cycle

2018+ MYs

NEVs

NEV - Neighborhood Electric Vehicles

- Vehicles earn 0.15 credits per vehicle
- Technological Requirements:
  - Acceleration: 0 – 20 mph in 6 sec or less
  - Top Speed: ≥ 20 mph
  - Constant Speed Range: ≥ 25 miles
  - Sealed, maintenance-free batteries
  - 24 month warranty on drivetrain (including battery)

Discounted AT PZEV and PZEV Credits

2018+ MYs

- Credits awarded prior to 2018 MY for PZEVs and AT PZEVs
- Banked credits may be used for 2018 through 2025 MY compliance
- Banked credits discounted at the end of 2017 MY compliance

Volume Status	AT PZEV Accounts Discounted	PZEV Accounts Discounted
IVM	75%	75%
LVM	93.25%	75%

Advanced Technology Demonstration Program

2018+ MYs

- IVMs and LVMs only
- Credits awarded to ZEVs placed as prototypes
  Includes BEVxs
  - Excludes NEVs and TZEVs
- Vehicles do not need to be delivered for sale to earn credits
- Placed for at least 2 years, 50% of time in CA
- Limited to 25 vehicles per model per ZEV state per year

2018+ MYs

GHG-ZEV Over Compliance

- Credits awarded for over compliance with GHG fleet standard
- Manufacturers must apply **no later than December 31, 2016**
- Three conditions for eligibility
  - No outstanding ZEV compliance debts
  - No outstanding GHG program debts
  - Projected plans show over-compliance in 2018 - 2021 MYs by at least 2 gCO2/mile

2018+ MYs

GHG-ZEV Over Compliance

How are GHG-ZEV Over Compliance Credits earned?

- 2018 – 2021 MYs: calculate over compliance with GHG program requirements each year
- Must over comply by ≥ 2.0 gCO2/mile
- Credit calculation based on previous model year over compliance
  - Example: 2018 MY Over Compliance Credits based on the amount they have over complied with 2017 MY Fleet Average GHG Compliance Target

2018+ MYs

GHG-ZEV Over Compliance

How are GHG-ZEV Over Compliance Credits calculated?

US PC and LDT Sales

x

gCO2/mile below Manufacturer Fleet Average GHG Standard

Manufacturer Fleet Average GHG Standard

2018+ MYs

GHG-ZEV Over Compliance

Manufacturer Fleet Average GHG Standard

$$\sum \left[\left(\text{gCO}_2\text{/mile Target Value for each model} \right) \times \left(\text{\# of vehicles sold for each model} \right) \right] \Big/ \left(\text{Total production Volume (PC, LDT, and MDV)} \right)$$

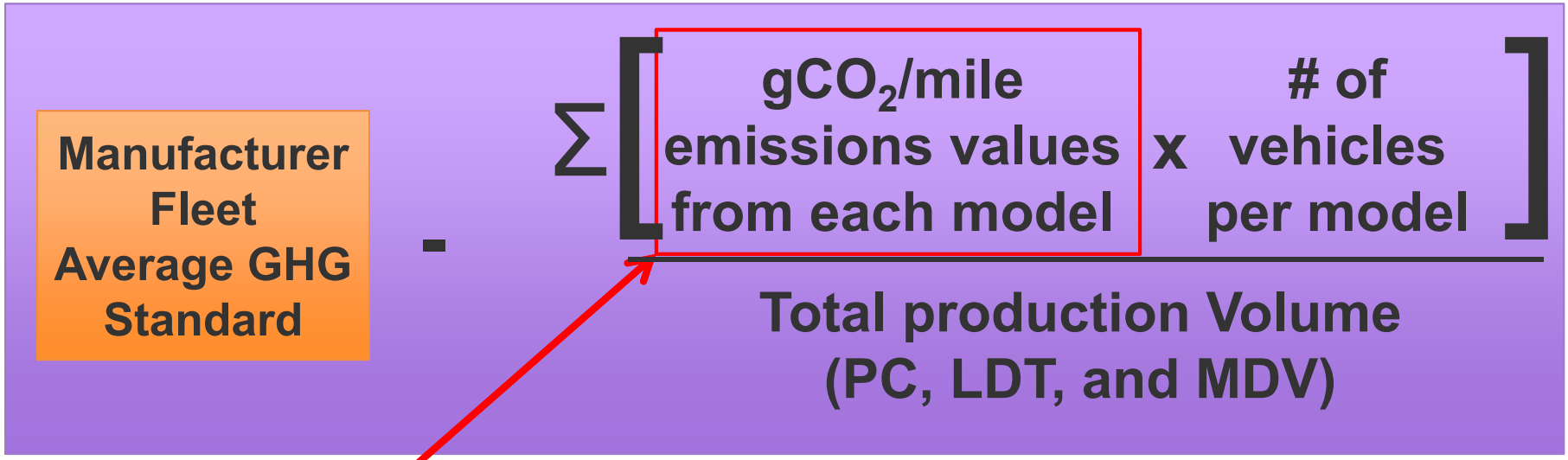
Target values based on unique model type (PC, LDT, or MDV) and vehicle footprint (CCR, Title 13, 1961.3)

- Must include ZEVs in calculation

2018+ MYs

GHG-ZEV Over Compliance

Over Compliance Calculation



$$\mathbf{gCO_2/mile = (0.55\ x\ City\ CO_2) + (0.45\ x\ Highway\ CO_2)}$$

- Where:
  - City CO2 is based on FTP test Cycle
  - Highway CO2 based on Highway Fuel Economy Test

2018+ MYs

GHG-ZEV Over Compliance

GHG Emission Values for ZEVs

- BEVs

$$City/Highway\ CO_2 = (270\ gCO_2e/kWh)\ x\ E_{EV} - 0.25 * CO_{2\ target}$$

  - Where: $E_{EV}\ is\ measured\ from\ test\ cycle\ (SAE\ J1634)$

- FCEVs

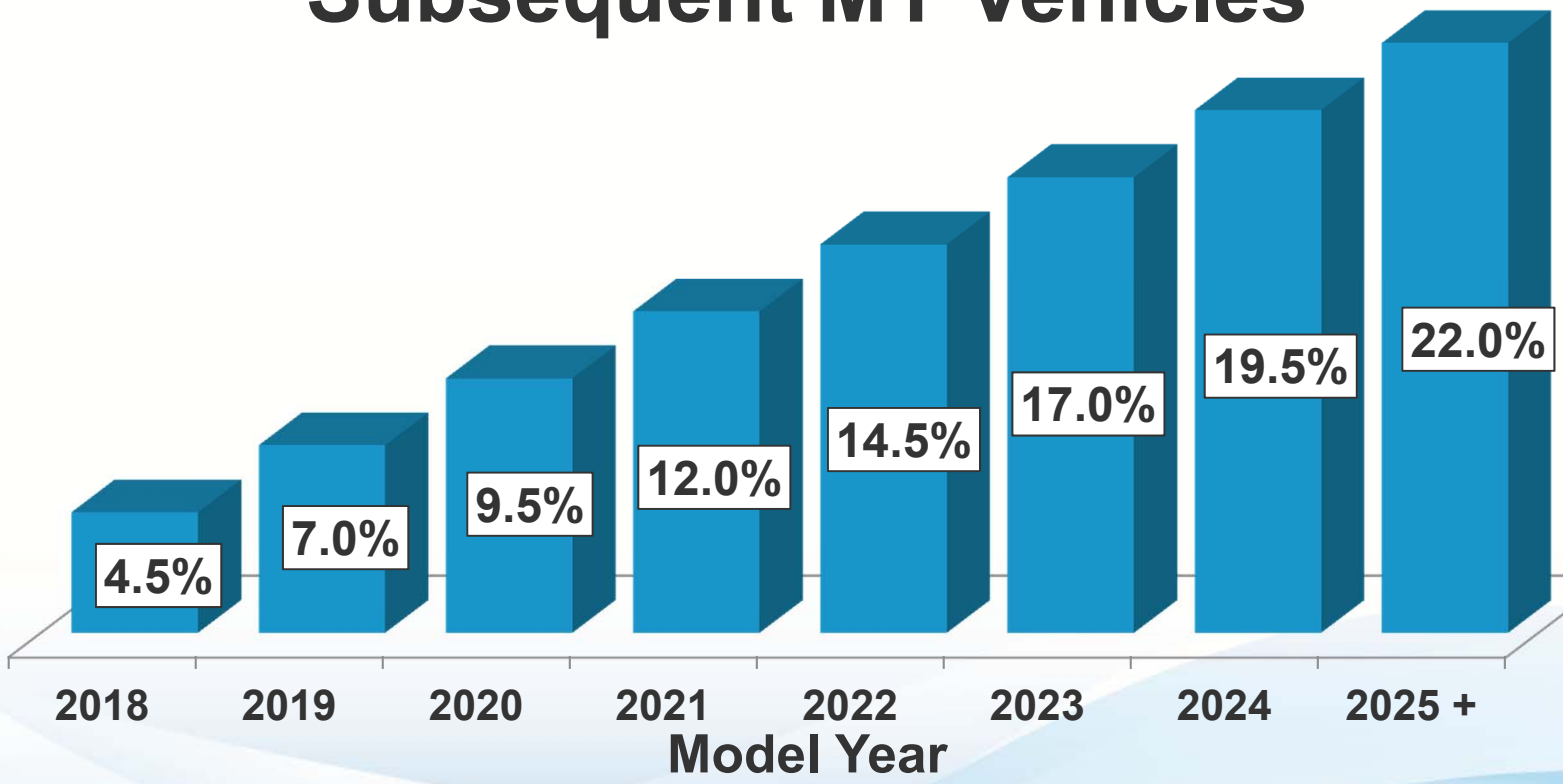
$$City/Highway\ CO_2 = (9132\ gCO_2e/kg\ H_2)\ x\ H_{FCV} - G_{upstream}$$

  - Where: $H_{FCV} = hydrogen\ consumption\ (SAE\ J2572)$

2018+ MYs

ZEV Requirement

Total ZEV Credit Percentage Requirement for 2018 and Subsequent MY Vehicles



Percentage ZEV Requirements: 1962.2(b)(2)

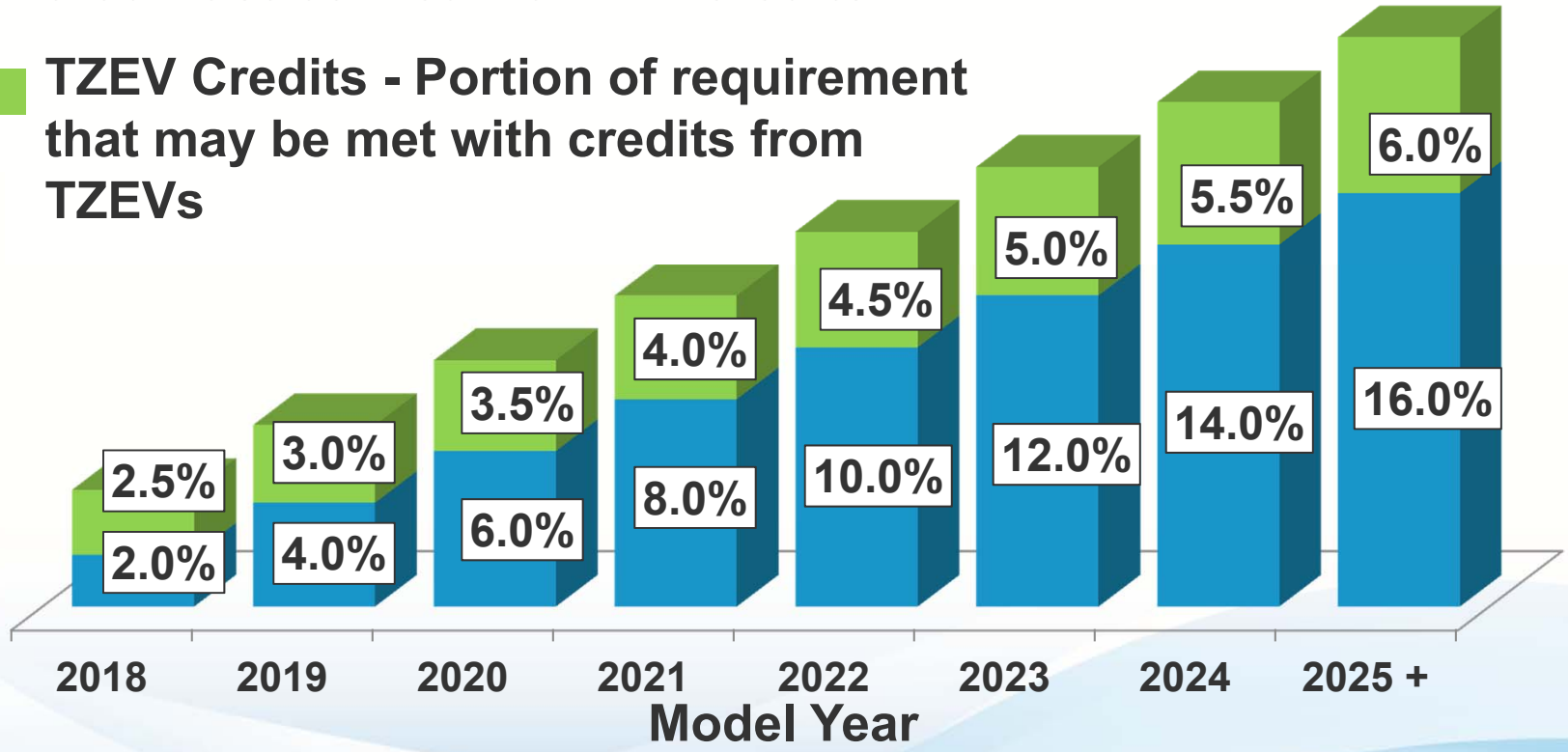
2018+ MYs

ZEV Requirement

ZEV Percentage Requirements for LVMs

Minimum ZEV Floor - Portion of ZEV requirement that must be met with ZEV credits

TZEV Credits - Portion of requirement that may be met with credits from TZEVs



Percentage ZEV Requirements: 1962.2(b)(2)

2018+ MYs

ZEV Requirement

Example: LVM Model Year 2018 Compliance

Average Production Volume = 100,000

Total ZEV Requirement = 4.5%

- **TZEV = 2.5%**
- **Up to 2500 credits from TZEVs**
- **Minimum ZEV Floor = 2.0%**
- **2000 ZEV credits**

Vehicles Produced

TZEV that earns 0.8 credits per vehicle

ZEV that earns 4 credits per vehicle

Number of Vehicles Produced

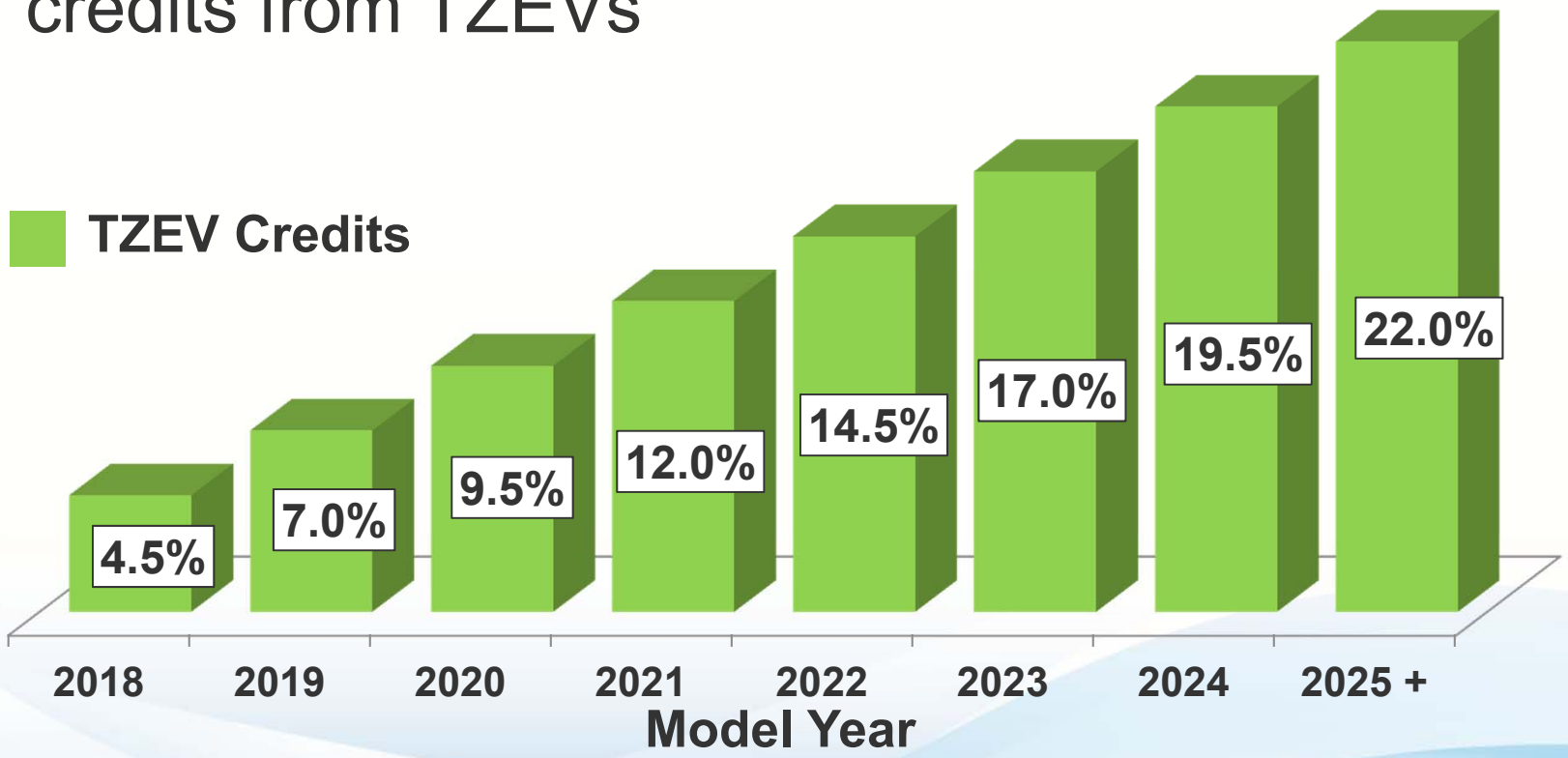
- **Up to 3125 TZEVs**
- **and**
- **At least 500 ZEVs**

Citation

2018+ MYs

ZEV Requirement

IVMs may meet entire ZEV percentage requirements with credits from TZEVs



2018+ MYs

Rules on Credit Use

General Rules

- ZEV credits produced in excess of a manufacturer's requirements may be "banked" for future use
- Credits earned from all types of vehicles may be traded or sold to any other party
  - No, we do not know how much a credit costs
  - Traded credits can be used the same way earned credits can
- Not applicable to GHG-ZEV Over Compliance Credits

2018+ MYs

GHG-ZEV Over Compliance

Use of GHG-ZEV Over Compliance Credits

- Must be used for MY earned
- Must be removed from manufacturer's GHG compliance bank
- Cap on overall requirement as well as ZEV specific requirement

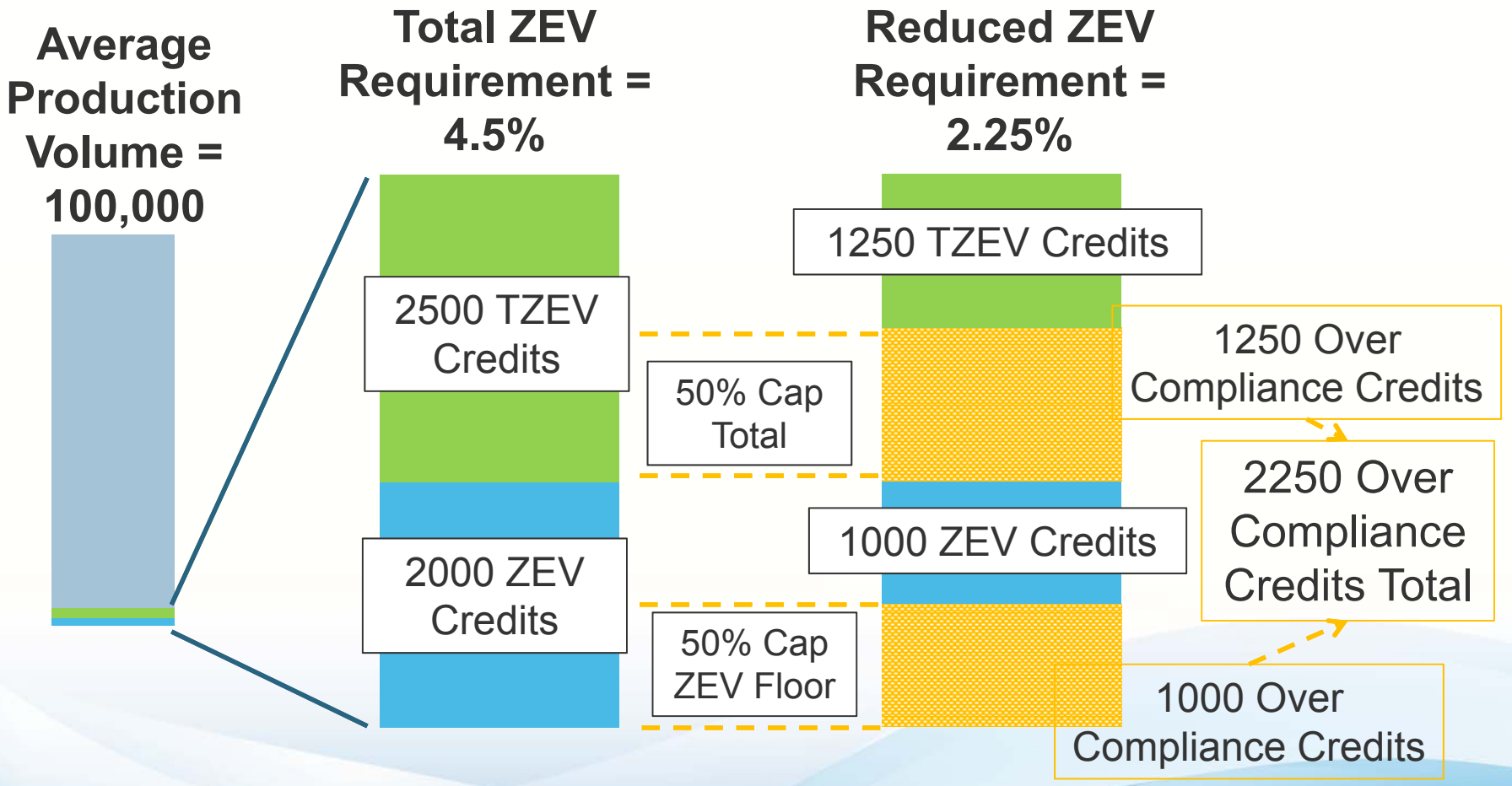
2018	2019	2020	2021
50%	50%	40%	30%

- Cannot be traded to another manufacturer

2018+ MYs

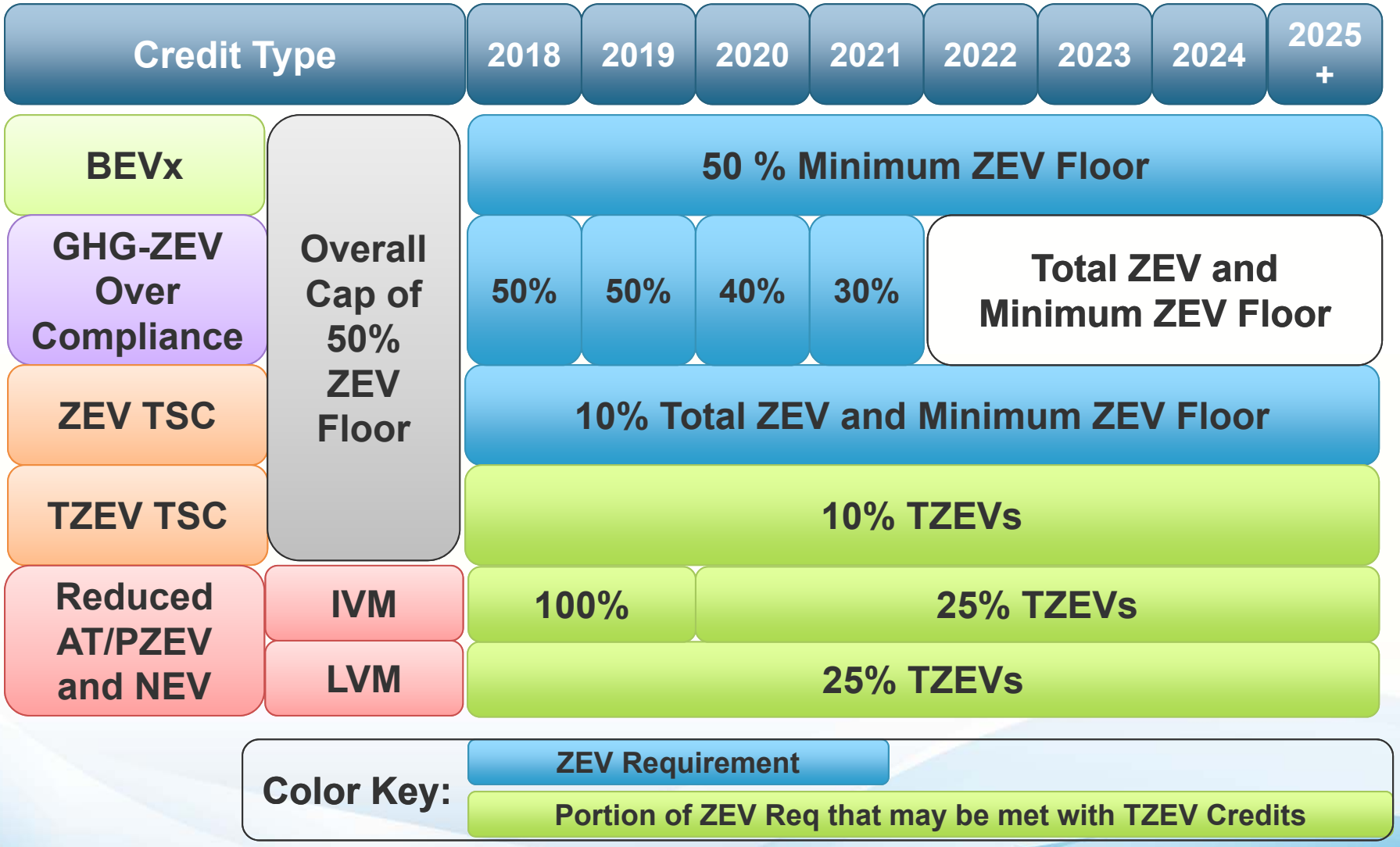
GHG-ZEV Over Compliance

Example: Model Year 2018 LVM Compliance



2018+ MYs

Rules on Credit Use



2018+ MYs

Travel Provision

- *"Counting Specified ZEVs Placed in a Section 177 State and in California"*
- Credits earned in one state may also be earned in every state at a proportional value
  - Only FCEV allowed to "travel" 2018 and beyond
- Credits cannot "travel" more than once
- Credits travel at Proportional Value
  - Ratio of S177 State sales to CA sales

2018+ MYs

Travel Provision

How "Travel" Provision Works

(4 credits per vehicle)

Example 1: Credits Travel from California

x 1000 vehicles =

4000 credits

Example 2: Credits Travel from State B

x 1000 vehicles =

4000 credits

STATE	CA	STATE A	STATE B	STATE C
PRODUCTION VOLUME	100,000	75,000	50,000	25,000
PROPORTIONAL VALUE	100%	75%	50%	25%
CREDITS AFTER TRAVEL	4000	3000	2000	1000

Credits from California remain

Credits from State B reduced

Counting ZEVs Placed in S177 States and CA: 1962.2(d)(5)(E)1.

Through 2017 MY

Optional S177 State Compliance Path

2018+ MYs

- Encourages manufactures to produce additional ZEVs in the S177 States prior to 2018
- Requirements
  - Additional ZEV Requirement in each S177 state

Model Years	Additional S177 State ZEV Requirements
2016	0.75%
2017	1.50%

  - Must be met with “Fresh” (untraveled) ZEV credits
  - Must be met by June 30, 2018

Through 2017 MY

Optional S177 State Compliance Path

2018+ MYs

Advantage of Optional S177 Compliance Path

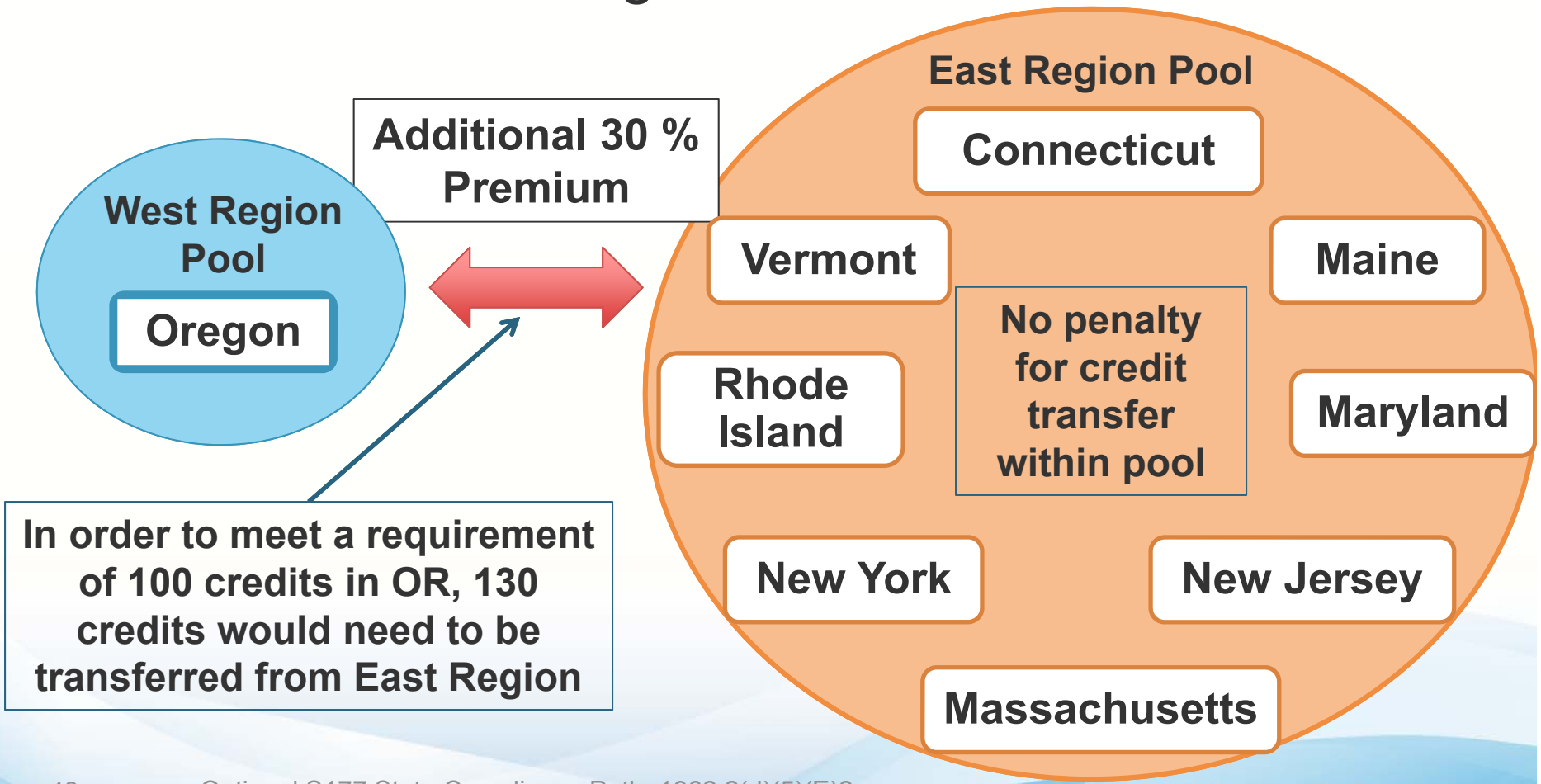
- Reduction in portion of requirement that may be met with TZEVs in 2015 – 2018 MYs
- Reduced ZEV requirement in 2018 – 2020 MYs
- Allowed to "pool" 2012 and subsequent MY ZEV and TZEV credits
  - ZEV Credits 2016 – 2021 compliance years
  - TZEV Credits 2015 – 2021 compliance years
- Allows manufacturers to place vehicles in areas of high demand within a geographic region

Through 2017 MY

2018+ MYs

Optional S177 State Compliance Path

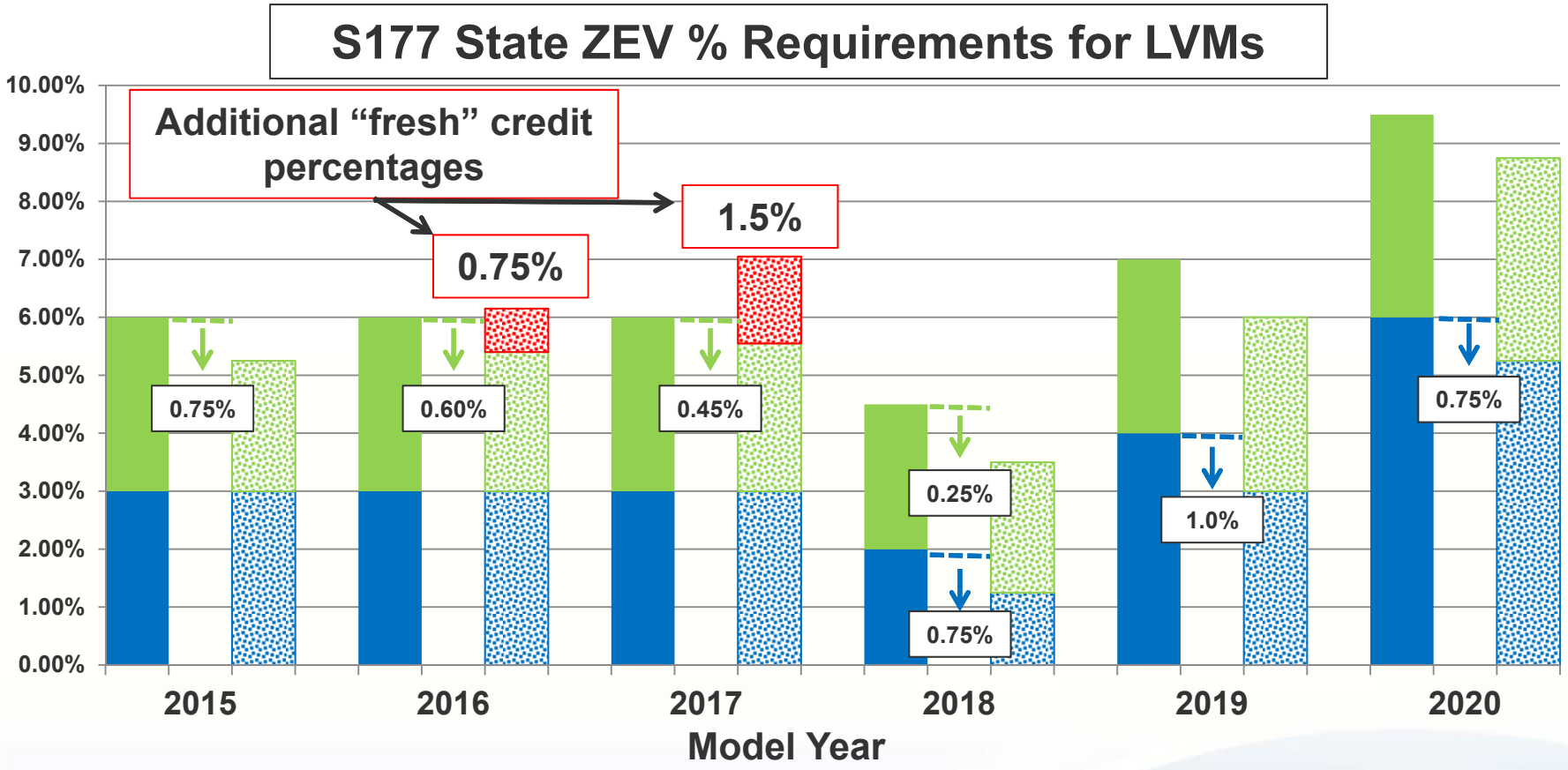
Regional Pools



Through 2017 MY

Optional S177 State Compliance Path

2018+ MYs



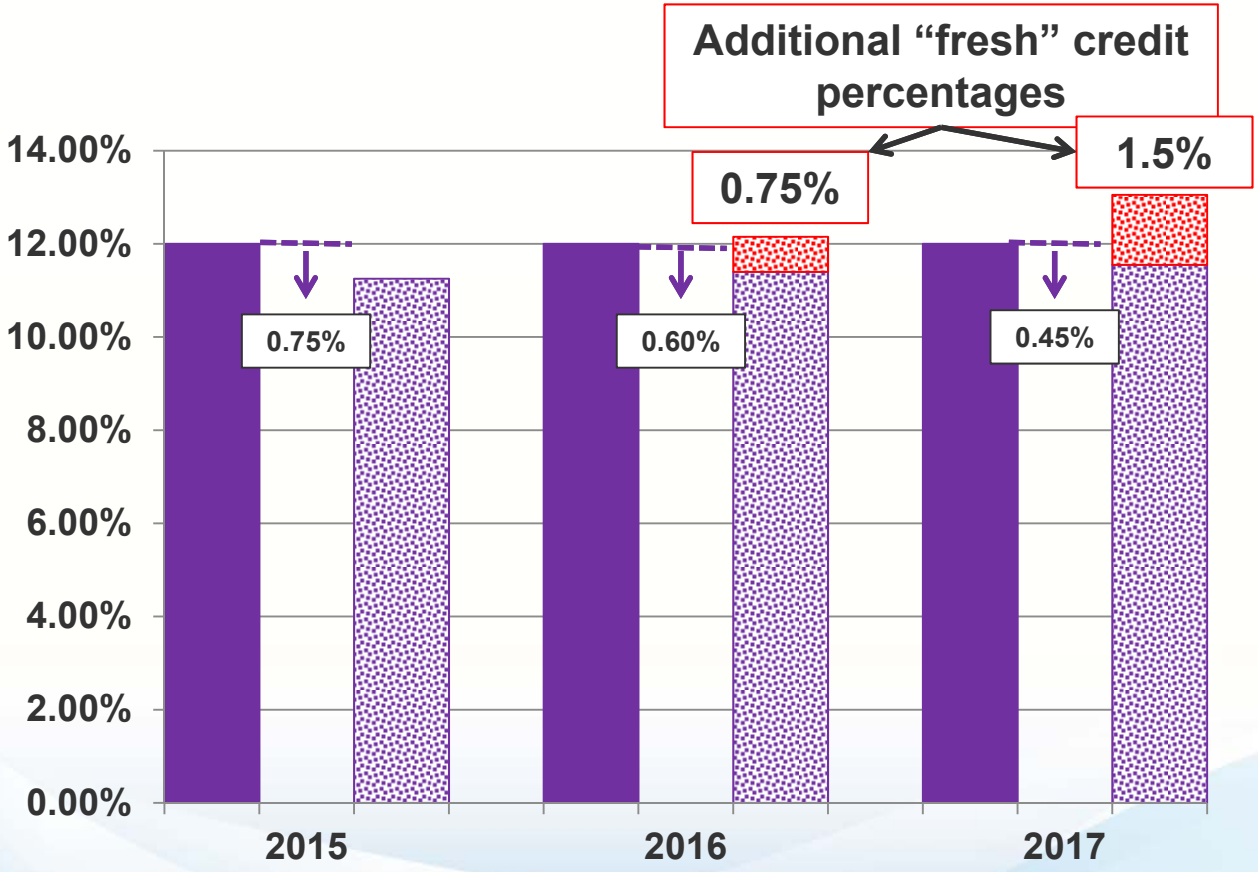
Optional S177 State Compliance Path: 1962.2(d)(5)(E)2.

Through 2017 MY

Optional S177 State Compliance Path

2018+ MYs

S177 State ZEV % Requirements for IVM



- Prior to 2018 MY - IVMs could meet entire ZEV % Requirement with credits from PZEVs

PZEV Credits

PZEV Credits– Optional S177 State Compliance

Optional S177 State Compliance Path

2018+ MYs

Additional Flexibility for IVMs 2018 and beyond

- Must choose the Optional S177 State Compliance Path by September 1, 2016
- IVMs can start "pooling" 2012 and subsequent MY ZEV and TZEV credits in MY 2018
- Additional "Fresh" ZEV Requirement 2 years prior to

Model Years	Additional Section 177 State ZEV Requirements
2 model years prior to LVM transition	**0.75%**
1 model year prior to LVM transition	**1.50%**

- Not eligible for reduced credit percentages

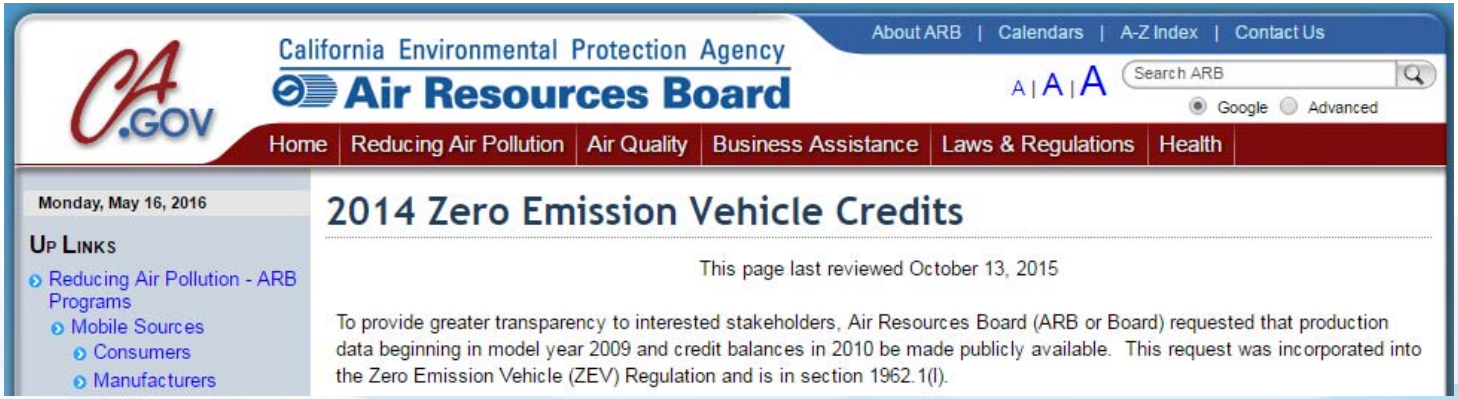
Demonstration of Compliance

- Manufacturers must submit **all ZEV production data by May 1** of the calendar year following the compliance model year
  - Oregon – Data due September 1
- Supplemental data may be submitted through September 1
  - Vehicles delivered/placed April 1 and June 30
  - CT, ME, and RI do not have supplemental reporting period, all data due May 1
- Compliance data submitted via the online reporting tool (ZEV-CRDT System)

2018+ MYs

Demonstration of Compliance

- Production data, credit balances, and credit transfer information published annually
- Released early October following the end of each compliance year
  - CT, ME and RI publish data in early June
- Data available on the ZEV Program Page
  - arb.ca.gov/msprog/zevprog/zevprog.htm



2018+ MYs

Penalties

Requirement to make up ZEV Deficit

- Must make up a deficit by the next model year
  - IVMs may request up to three consecutive model years to make up a deficit
    - Subject to ARB Executive Officer approval
  - LVMs may only use ZEV credits
  - IVMs may use ZEV and TZEV credits
- If the manufacturer still fails to comply, the manufacturer is subject to financial penalties outlined in HSC 43211

2018+ MYs

Penalties

Health and Safety Code 43211

- $5,000 penalty per vehicle not produced
- 1 ZEV credit = lowest amount of credit that can be earned by a pure ZEV
- 1 ZEV credit = 1 vehicle
- Therefore, $5,000 penalty per each ZEV credit not produced
  - Penalty is additional to credits owed

2018+ MYs

Thank You

- Thank you for participating in the 2016 ZEV Tutorial