



Toyota Mirai

Presentation to the Massachusetts ZEV Commission

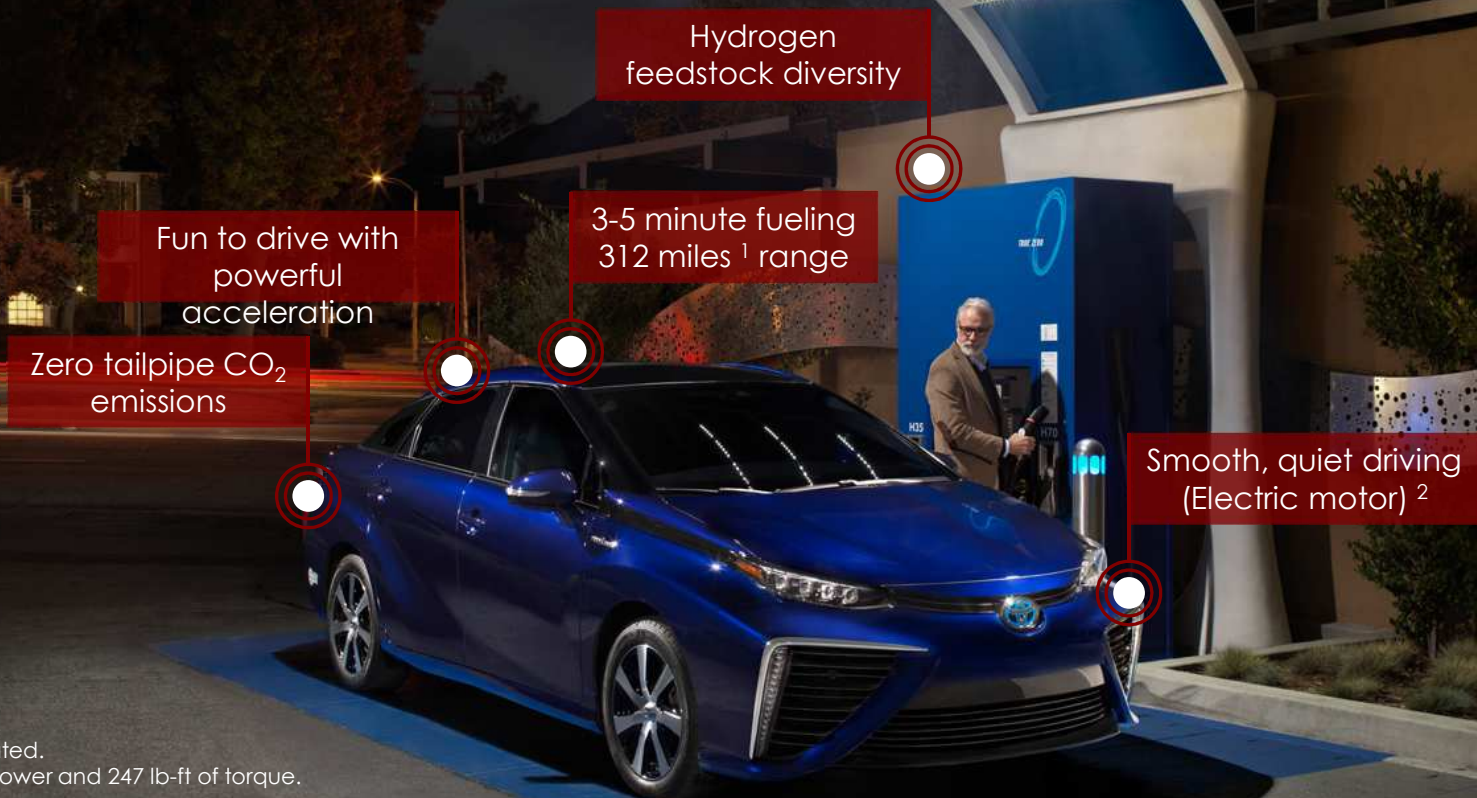
Edmond Young

June 26, 2018

Agenda

- FCEVs - Benefits to Massachusetts
- California Update
- Northeast Launch Update
- Future Hydrogen Society

Merits of Fuel Cell Technology



FCEVs – Benefits to Massachusetts

- Power & natural gas infrastructure
 - Does not require significant investment in power or natural gas infrastructure
- Real estate
 - A single H2 dispenser can support 300 cars
- Convenience stores
 - Provides current C-Store owners and gas station operators with an opportunity to participate in Massachusetts' clean energy transformation
- Value
 - Attractive lease ¹, \$15,000 of fuel ², and complementary maintenance
- Cold weather performance

Notes:

1. The Mirai is available for sale or Lease. Current lease offer of \$349 / month for 36 months with \$2,499 due at signing, plus applicable taxes.
2. \$15,000 or 3 years of complementary fuel, whichever comes first.
3. Complementary maintenance for 3 years.

Cold Weather Performance


- The Mirai fuel cell is designed to perform at temperatures down to
 - -22°F (-30°C)
- The fuel cell stack achieves full power in less than a minute
- “We had another snow storm Tuesday night and this morning the temperature was 3 degrees,” says Mark Schiller, Proton vice president of business development. “I went out to my Toyota FCHV-adv and brushed off a foot of snow before starting the car right up. No problem.”



Toyota Highlander FCEV

Providing ZEV Choices for Consumers

MA ZEV Mandate

- 2018  2025
4.5% → 22.0%
- Travel for ZEV credits related to battery electric drivetrains ended 12/31/2017

Consumers' Perspectives

- The introduction of new technologies present daunting challenges for consumers
- The purchase of a new vehicle represents a significant investment of both money and time
- The selection of a vehicle is intensely personal as consumers factor in branding, image, economics, vehicle utility (e.g., length of commute, unpredictable schedules,) vehicle durability and environmental benefits

Implications for ZEV

- For the ZEV mandate to succeed in the Commonwealth, zero emissions vehicles have to live up to consumers' expectations and meet its owner's needs
- Currently, two ZEV drivetrains are available to consumers
 - Battery electric
 - Fuel cell electric

Providing Choices for Consumers

- All consumers not the same
- To drive consumer adoption of ZEV in the Commonwealth, Toyota believes Massachusetts should provide consumers with options

Industry Interest in Fuel Cell Vehicles



Honda Clarity – for lease today



Hyundai Nexo – available soon



Toyota Mirai – for sale today



Mercedes GLC F-Cell - 2020

Others

GM (partnering with Honda) – 2020
AUDI (partnering with Hyundai & Ballard)



BMW i8 5 Series FC – 2020
(Partnering with Toyota)

California Update



- Toyota has sold over 3,500 Mirais
- Honda has sold over 1,100 Clarity FCEVs
- California is closing in on 5,000 FCEVs on the road
- Hydrogen fueling stations
 - 35 stations currently operating
 - ~ 40 stations by end of 2018
 - ~ 60 stations by end of 2019
 - 200 stations by 2025 ¹

Note:

1. Governor Edmund G. Brown Jr. Executive Order B-48-18. <https://www.gov.ca.gov/2018/01/26/governor-brown-takes-action-to-increase-zero-emission-vehicles-fund-new-climate-investments/>

Mirai Customers

- 90% - Use the car as their primary vehicle
- 53% - 40+ miles daily commute
- High satisfaction with the vehicle

** Rated 9 or 10 on a scale of 10*

Lessons from California

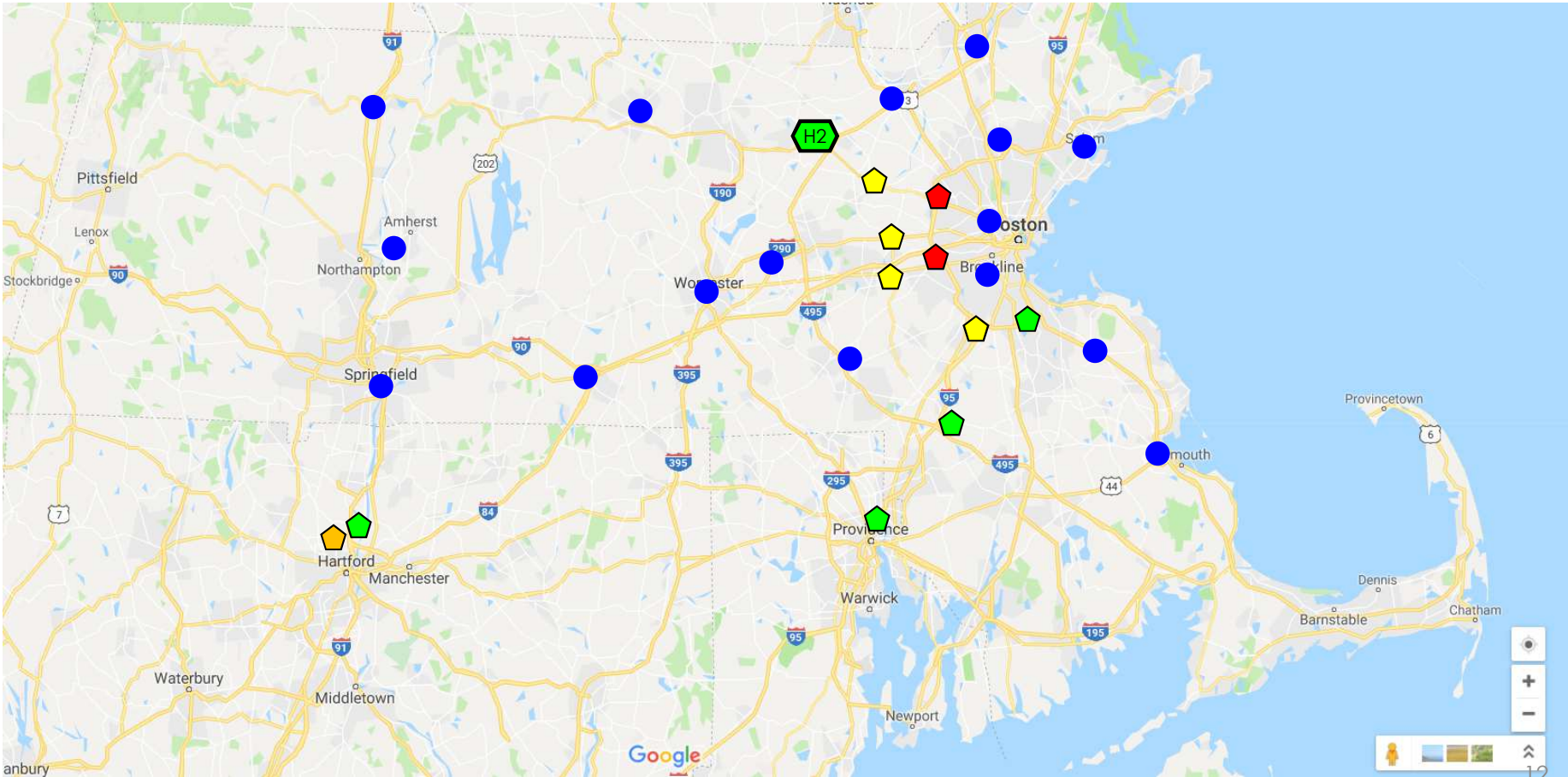
- Lessons from California guide our infrastructure and vehicle launch approach in the Northeast
- Education & awareness: State governments, AHJs, civic leaders, first responders, media, consumers (this is why we are here!)
- Infrastructure: Station redundancy (within close proximity of one another) and reliability are critical for the adoption of a new technology

Northeast Launch – Boston

- Boston is the focal point for Toyota's northeast launch
- We are partnering with Air Liquide to develop hydrogen fueling stations in the Northeast, from Massachusetts to New Jersey
- Station density and redundancy are critical
- Looking to launch with 6 stations in the greater Boston area, and then densify
 - Braintree
 - Mansfield
 - Lexington ¹
 - Newton ¹
 - Providence, RI
 - Hartford, CT

Note:
1. Lexington and Newton leases are under review by MassDOT.

Potential Station Locations



Source: © 2017 UCI Advanced Power and Energy Program & Toyota

Northeast Launch – Status

- Boston launch was planned for 2H 2018
- Lessons from California: Air Liquide and Toyota are progressing with additional station location options in and around the Boston area to create a dense station network
- Toyota is working with MassDOT to ensure that FCEVs can freely move about the Commonwealth, especially through the tunnels in Boston

The Future of H2 – Beyond Light Duty

Fork Lifts



Buses



Project Portal - Toyota Heavy Duty Truck



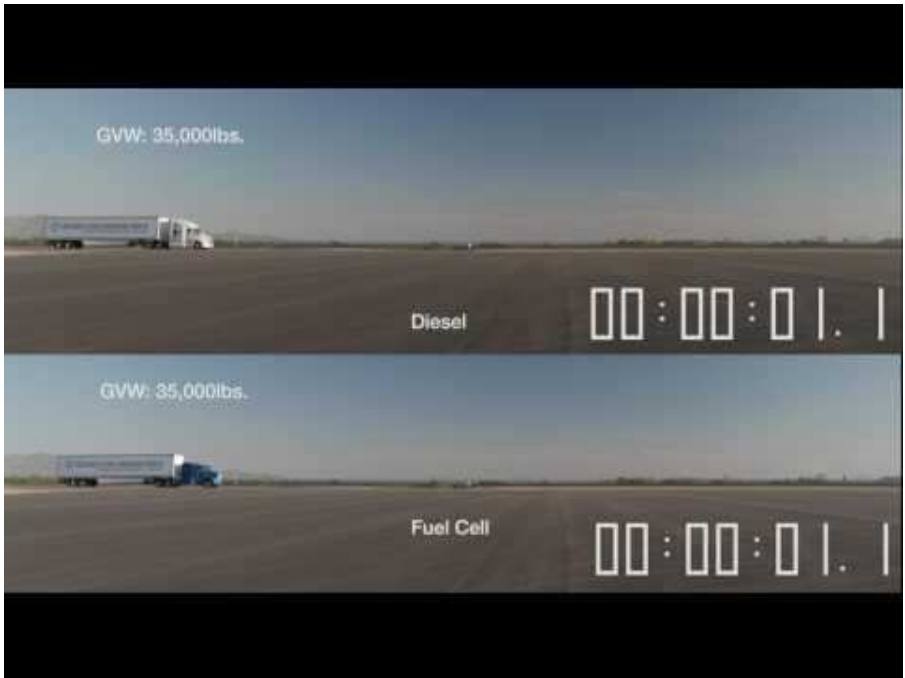
Tri-Gen at the Port of Long Beach



Project Portal – Toyota Heavy Duty Truck

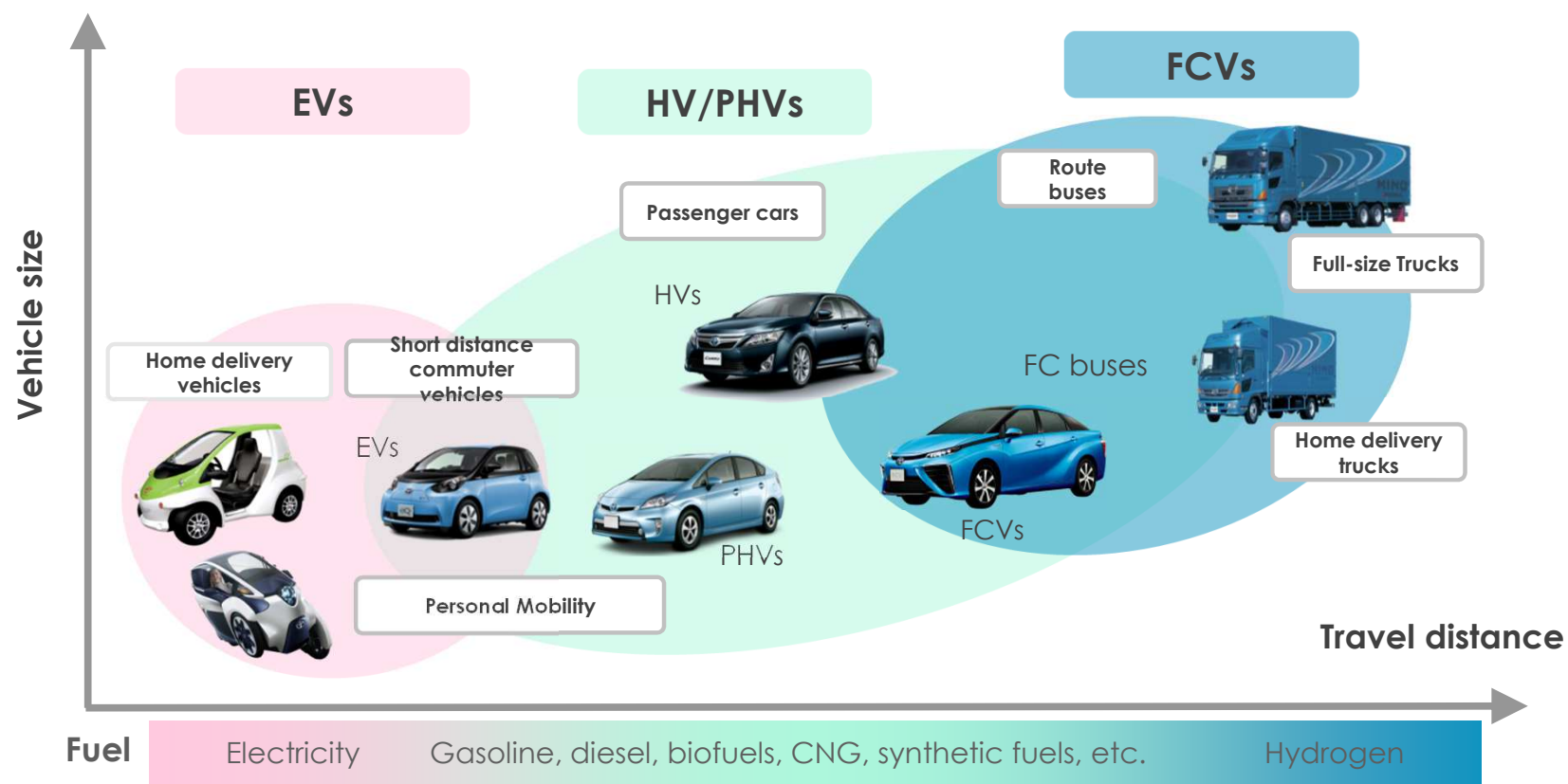
- Two Mirai fuel cell stacks
- 670 horsepower
- 1,325 pound feet of torque
- 12 kWh battery
- Class 8 load operations – 80,000 lbs combined weight capacity
- Estimated driving range 200+ miles per fill, under normal drayage operation
- Running drayage routes in Southern California

Heavy Duty Fuel Cell Truck – Drag Race

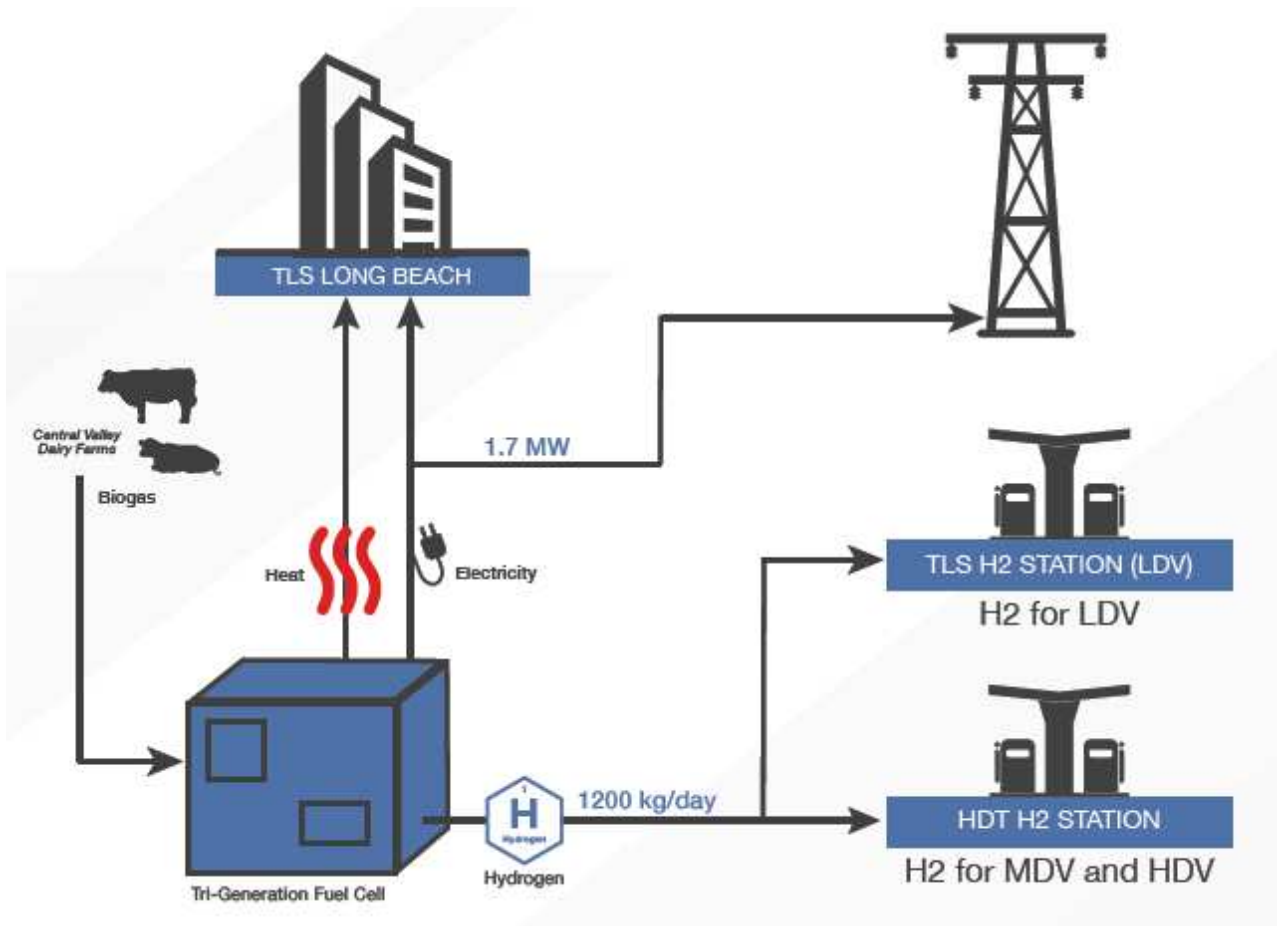


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Toyota Global Portfolio Approach



Tri-Gen Facility at Toyota Logistics Services



- TLS Long Beach location
- Online by 2020
- Bio-gas feedstock / 100% renewable
- Tri-Gen Production
 - 1.7 MW of electricity
 - 1,200 kg of H2 / day
 - Heat

Questions?



Appendix

MA Vehicles Sold in 2017

Vehicle Type	Model Year 2017
Light Trucks	224,013
Passenger Cars	105,860
Total	329,873

ZEV Credit Percentage Requirement

Model Year	ZEV Credit Percentage Requirement
2018	4.5%
2019	7.0%
2020	9.5%
2021	12.0%
2022	14.5%
2023	17.0%
2024	19.5%
2025+	22.0%