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# Retail Hydrogen Fueling Station Network Update

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# CaFCP Members



— 20 years of collaboration —





# By the Numbers

	Numbers as of April 1, 2020	Total
*FCEVs—Fuel cell cars sold and leased in US		8,285
FCEBs—Fuel cell buses in operation in California		42
Retail hydrogen stations open in California		41
Fuel cell buses in development in California		7
Fuel cell shuttles in development in California		4
**Retail hydrogen stations in development in California		18

\*Vehicle sales data from Baum and Associates. Sales data is based on car sales sold by a dealer to a retail or fleet customer. [FCEV Sales Data sheet](#)

FCEB Source: AC Transit, Orange County Transportation Authority (OCTA), SunLine Transit, UC Irvine

Hydrogen station source: Air Liquide, Air Products, GO-Biz, ITM Power, Iwatani, Shell, True Zero

\*\*Stations in development is based on CA Energy Commission funding announcements. The number may change.



# Retail Stations - Highlights

## Opened in Late 2019

- Oakland
- SF – 3rd Street
- SF – Harrison Street
- SF – Mission Street



## Limited Use Station

- Cal State LA



## Stations Offline

- West LA
- Ontario
- Riverside
- Newport Beach



## Among the ~18 slated to open in 2020

- Woodside
- Berkeley
- Sherman Oaks
- Campbell





# California Network Health

## New Station Growth, Increasing Capacity and Fuel Supply Resiliency

- Hydrogen fueling network disruptions (2019, 2020)
- California Energy Commission grant funding opportunity: GFO 19-HYD-02
  - Multiple fueling positions & higher capacities
  - Backup fuel agreements
- California Air Resources Board Low Carbon Fuel Standard (LCFS) for zero-emission vehicle infrastructure (HRI)
  - Up to 1200kg stations (6xs current capacity)
  - Oakland as first example (800kg)
- Local air district co-funding
  - Bay Area - \$5.0M
  - San Luis Obispo - \$0.25M
  - MSRC/South Coast - \$3.0M



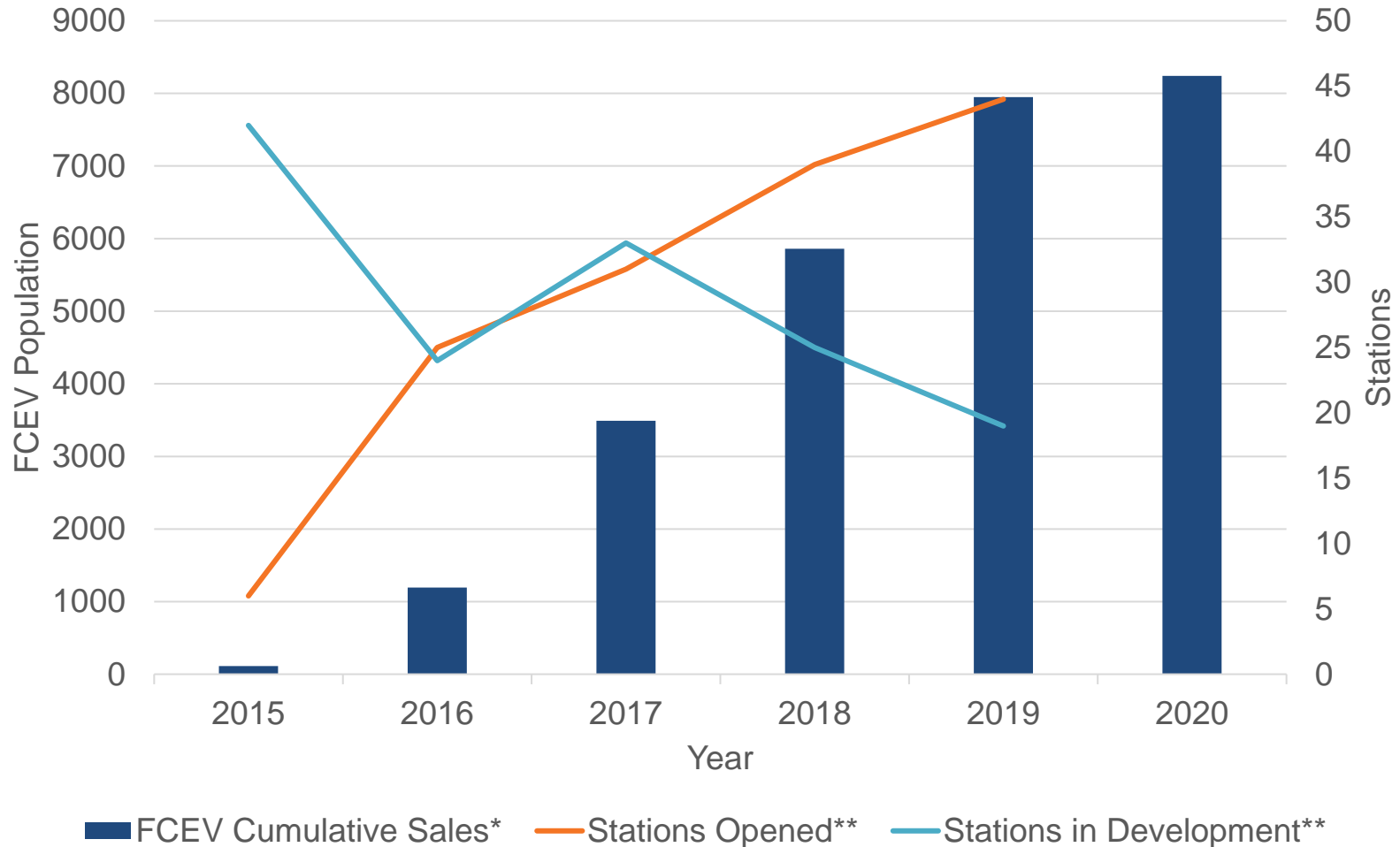
# COVID-19 Essential Businesses





# California H2 Station Network & FCEV Totals

## FCEV Cumulative Sales Compared with Retail Hydrogen Station Development



Source: \* HybridCars.com, Carsalesbase.com, OEMs

\*\*Governor's Office of Business and Economic Development





# Hydrogen Pathway – U.S.

## California

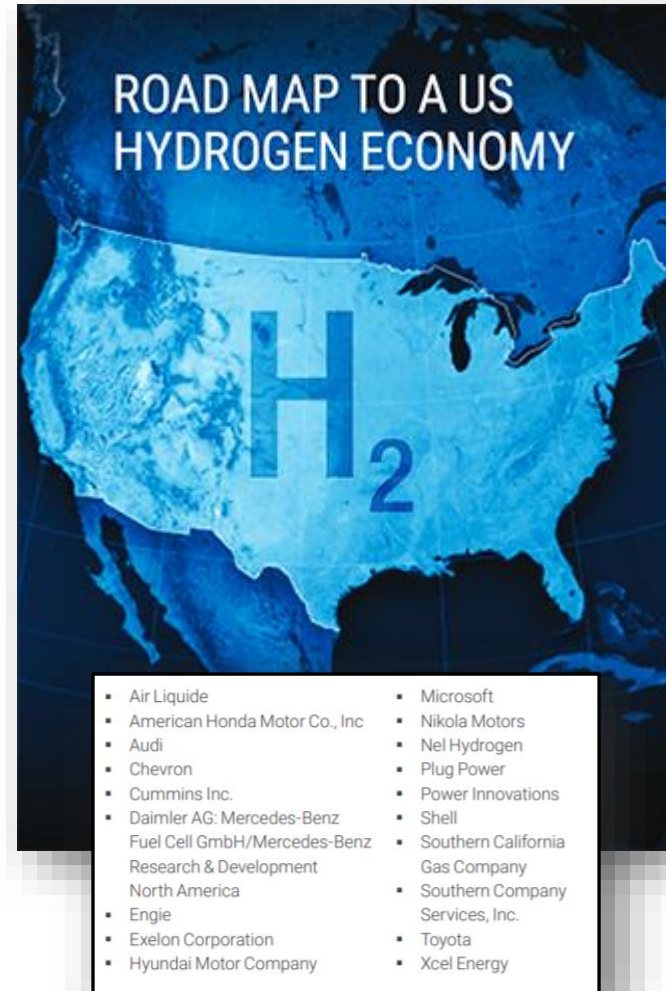
- 33% renewable H<sub>2</sub> fuel
  - 40% when qualifying for new LCFS infrastructure credit (HRI)
  - Legislation language being developed & discussed for 100% renewable fuel goal

## Projects in and near CA, for CA

- Air Liquide, NV (fuel)
- Intermountain, UT (LADWP) (power)
- Air Products plant purchases in CA

## United States

- U.S. Hydrogen Road Map
- New actors recognize the role of hydrogen





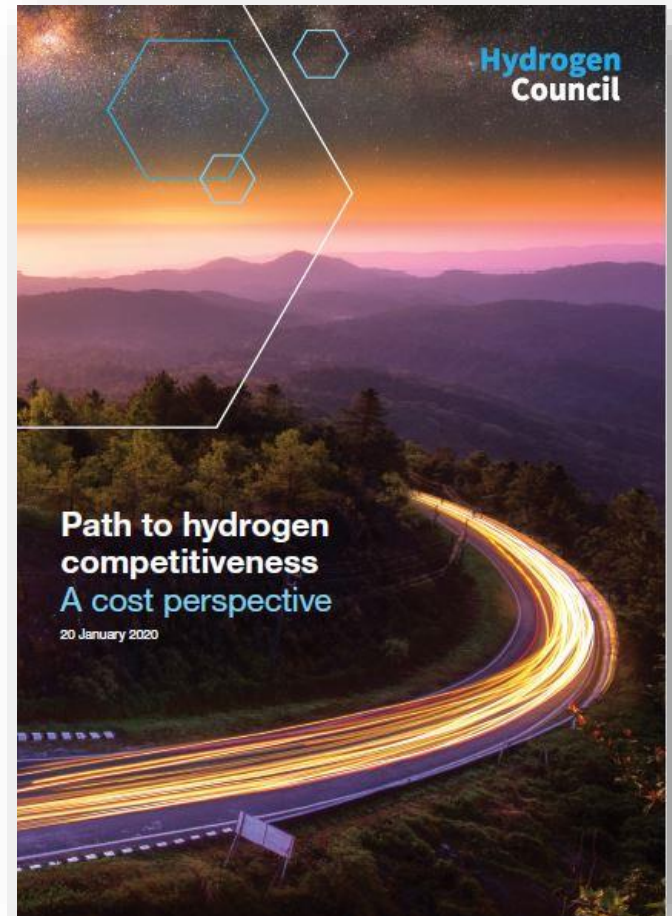
# Hydrogen Pathway - Global

## Global Activity

- Hydrogen Council Report - 50% reduction in H2 solutions costs in many applications
- Bloomberg New Energy Fund analysis – cost H2 from renewables “is likely to plummet in the coming decades”; and
- “Hydrogen-Fueled Climate Goals Need Radical Carbon Price Hike”

## Growing interest and focus: consultancies, universities, etc.

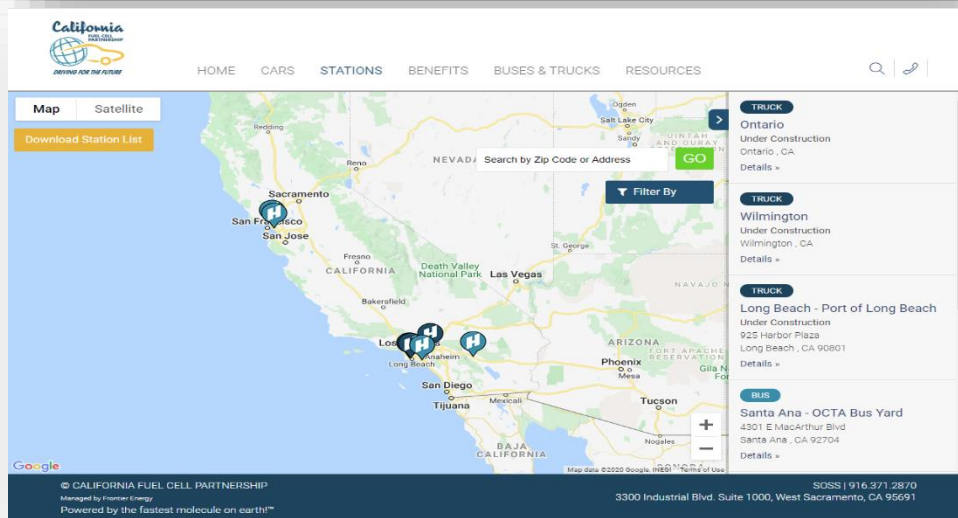
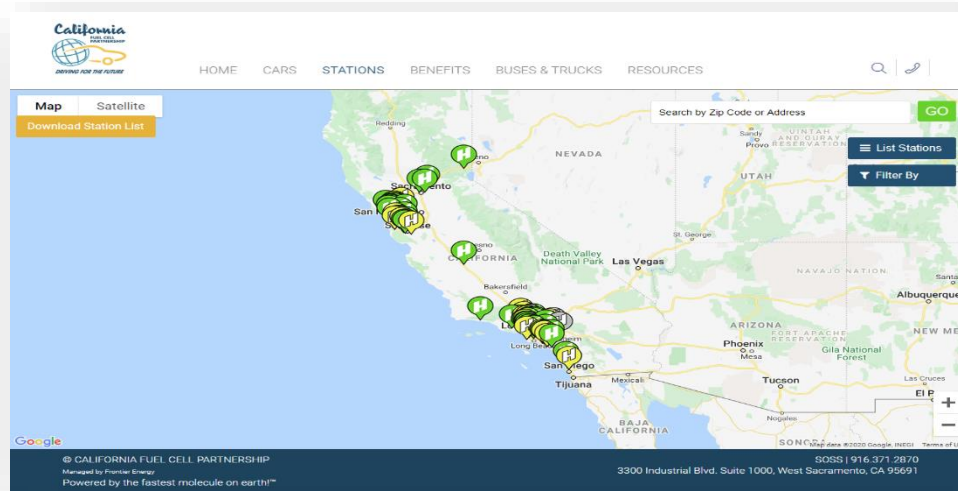
- McKinsey & Company, Deloitte, Wood Mackenzie, etc.
- Stanford Precourt Institute for Energy (U.S.), Queensland University of Technology (Australia)



*“To date, 18 governments, whose economies account for 70 per cent of global GDP, have developed detailed strategies for deploying hydrogen energy solutions.”*



# CaFCP Station Map & SOSS



<http://cafcp.org/stationmap>

California FUEL CELL PARTNERSHIP LOGIN | SIGN UP

## Station Status

● Online ▲ Limited ■ Offline ? Unknown

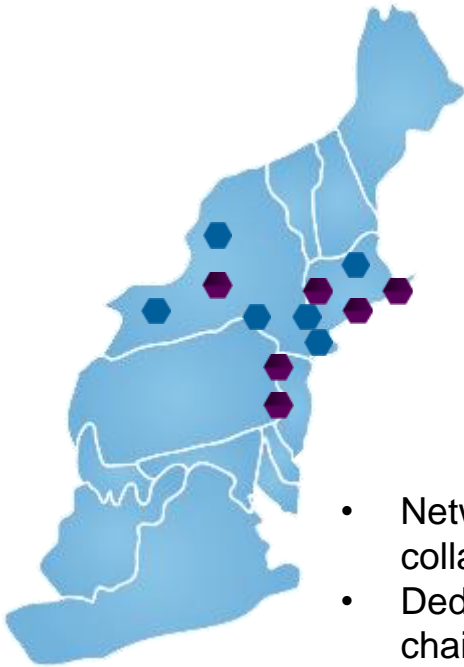
Open Retail Stations	H70	H35	
Anaheim	●		Air Liquide
Campbell	●	●	TRUE ZERO
Citrus Heights (New)	●		Shell
Costa Mesa	●	■	TRUE ZERO
Del Mar	●	●	TRUE ZERO
Diamond Bar	■	■	AIR PRODUCTS E-CO <sub>2</sub>
Emeryville	■	■	MESSER Clean Air Life
Fairfax-LA	●	●	AIR PRODUCTS E-CO <sub>2</sub>
<b>i</b> Fremont	■	■	TRUE ZERO
Harris Ranch	●	●	TRUE ZERO
Hayward	●	●	TRUE ZERO
Hollywood	●	●	TRUE ZERO

<http://m.cafcp.org>



# Northeast update

- Four stations complete/commissioned, on standby.
  - Other stations on standby pending Massachusetts tunnel approval; awaiting Boston approval
- Renewable hydrogen fuel from Quebec
  - 20mw, hydro-power project
  - Largest electrolyzer project to date
  - In partnership with Hydrogenics



Rhode Island



New Jersey



New York



Connecticut



Massachusetts

- Network of 12 stations in collaboration with Toyota
- Dedicated hydrogen supply chain provided by Air Liquide





# Pacific Northwest and North American West Coast

- WA to adopt the CA ZEV mandate, similar to OR and BC
- Increasingly aligning policies on ZEVs and alt fuels
- Budding station network in Vancouver, BC and growing station network in CA
- ZEV infrastructure funding from Natural Resources Canada and CA Energy Commission
- CaFCP 2030 vision for CA
- CA Hydrogen Study & Road Map for passenger vehicle station network
- Opportunities for renewable hydrogen production, group vehicle purchasing, etc.





# Heavy Duty: Bus & Truck

*Light duty needs heavy duty; heavy duty needs light duty*

## Fuel Cell Electric Trucks

- Demo projects
  - 3 HD H2 stations
  - 1-2 temporary fuelers
- Advanced Clean Trucks rule
  - Draft sales & fleet 2024
- CARB & CEC HD ZEV funds
  - Incl. HD H2 infra

## Fuel Cell Electric Buses (>300mi)

- Innovative Clean Transit rule
  - Adopted and 2020 timeline
- 2018: 25-bus order <\$1.2M/bus
- AC Transit, OCTA & SunLine
  - Up to 30 & 50-bus hydrogen station capacity
- FCEB Road Map 2019
- TBD: 100-bus order: <\$900k/bus







# References

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- Low Carbon Fuel Standard Zev infrastructure crediting - <https://ww2.arb.ca.gov/resources/documents/lcfs-zev-infrastructure-crediting>
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- Los Angeles Department of Water and Power - <https://www.utilitydive.com/news/natural-gas-plant-replacing-los-angeles-coal-power-to-be-100-hydrogen-by-2/568918/>
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- British Columbia Hydrogen Study (executive summary) - [https://www2.gov.bc.ca/assets/gov/government/ministries-organizations/zen-bc-bn-hydrogen-study-final-v6\\_executivesummary.pdf](https://www2.gov.bc.ca/assets/gov/government/ministries-organizations/zen-bc-bn-hydrogen-study-final-v6_executivesummary.pdf)
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- CaFCP Station Map – [www.cafcp.org/stationmap](http://www.cafcp.org/stationmap)
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