Retail Hydrogen Fueling Station Network Update

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CaFCP Members

— 20 years of collaboration —
California H2 stations in 2020, 2025 and 2030

100

BY 2020
Funded


200

BY 2025
Planned

hydrogen stations by 2025, pursuant to the Governor’s 2018 ZEV infrastructure Proposal.

1000

BY 2030
Envisioned

hydrogen stations by 2030 with favorable market conditions and state policies pursuant to the CAFCP 2030 vision. Will support 1,000,000 fuel cell electric vehicles.

Governor’s goal of 5,000,000 zero-emission vehicles by 2030.
# By the Numbers

<table>
<thead>
<tr>
<th>Description</th>
<th>Numbers as of April 1, 2020</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>*FCEVs—Fuel cell cars sold and leased in US</td>
<td></td>
<td>8,285</td>
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<tr>
<td>FCEBs—Fuel cell buses in operation in California</td>
<td></td>
<td>42</td>
</tr>
<tr>
<td>Retail hydrogen stations open in California</td>
<td></td>
<td>41</td>
</tr>
<tr>
<td>Fuel cell buses in development in California</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>Fuel cell shuttles in development in California</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>**Retail hydrogen stations in development in California</td>
<td></td>
<td>18</td>
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</tbody>
</table>

*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

H₂ STATIONS OPEN DURING SHELTER-IN-PLACE ESSENTIAL BUSINESS

M.CAFCP.ORG
Hydrogen Pathway – U.S.

California
- 33% renewable H2 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  |  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

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

Rhode Island
New Jersey
New York
Connecticut
Massachusetts
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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- H2 stations list - [https://cafcp.org/sites/default/files/h2_station_list.pdf](https://cafcp.org/sites/default/files/h2_station_list.pdf)
- U.S. Hydrogen Road Map (full report) - [https://cafcp.org/sites/default/files/Road%2BMap%2Bto%2BUSA%2BHydrogen%2BEconomy%2BFull%2BReport.pdf](https://cafcp.org/sites/default/files/Road%2BMap%2Bto%2BUSA%2BHydrogen%2BEconomy%2BFull%2BReport.pdf)
- Hydrogen Council-Path to hydrogen competitiveness A cost perspective (full study) - [https://cafcp.org/sites/default/files/Path-to-Hydrogen-Competitiveness_Full-Study-1.pdf](https://cafcp.org/sites/default/files/Path-to-Hydrogen-Competitiveness_Full-Study-1.pdf)
- British Columbia Hydrogen Study (executive summary) - [https://www2.gov.bc.ca/assets/gov/government/ministries-organizations/zen-bcbn-hydrogen-study-final-v6_executivesummary.pdf](https://www2.gov.bc.ca/assets/gov/government/ministries-organizations/zen-bcbn-hydrogen-study-final-v6_executivesummary.pdf)
- 100-bus project: [https://cafcp.org/sites/default/files/100-Bus_8page_v4a_SINGLE_PAGE.2019-08-06.pdf](https://cafcp.org/sites/default/files/100-Bus_8page_v4a_SINGLE_PAGE.2019-08-06.pdf)
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- CaFCP Resources – [www.cafcp.org/resources](http://www.cafcp.org/resources)