Retail Hydrogen Fueling Station Network Update

Ben Xiong, Keith Malone, Dave Park

9/1/2020
CaFCP Members

- Air Liquide
- AngloAmerican
- CALOR
- CALIFORNIA AIR RESOURCES BOARD
- CALIFORNIA ENERGY COMMISSION
- NIKOLA MOTOR COMPANY
- NISSAN GROUP OF NORTH AMERICA
- TOYOTA
- ANE
- BAE SYSTEMS
- BALLARD
- BAY AREA AIR QUALITY MANAGEMENT DISTRICT
- cdFA
- CEERT
- CTE
- COMDATA
- CSA GROUP
- FASTECH
- FE FUEL
- HYDROGENICS
- HEXAGON
- look, inc.
- National Fuel Cell Research Center
- NSC
- nel
- NEW FLYER OF AMERICA
- NORTH AMERICA SMART ENERGY WEEK
- NREL
- PDC MACHINERY
- Plug Power
- Sandia National Laboratories
- Sempoa Energy utility
- Sempra Energy utility
- Southern California Gas Company
- SunLine
- Tatsuno
- TOYOTA TSUSHO AMERICA, INC.
- U.S. DEPARTMENT OF ENERGY
- U.C. DAVIS
- ITS
California H2 stations in 2020, 2025 and 2030

**BY 2020**
Funded
- **Light Duty**

100 hydrogen stations by **2020**. Funded by Assembly Bill 8 (2013).

**BY 2025**
Planned
- **Light Duty**

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

**BY 2030**
Envisioned
- **Light, Medium and Heavy**

1000 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>Numbers as of August 1, 2020</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>*FCEVs—Fuel cell cars sold and leased in US</td>
<td>8,475</td>
</tr>
<tr>
<td>FCEBs—Fuel cell buses in operation in California</td>
<td>48</td>
</tr>
<tr>
<td>***Hydrogen stations available in California</td>
<td>42</td>
</tr>
<tr>
<td>Fuel cell buses in development in California</td>
<td>7</td>
</tr>
<tr>
<td>Fuel cell shuttles in development in California</td>
<td>4</td>
</tr>
<tr>
<td>**Retail hydrogen stations in development in California</td>
<td>15</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](https://cafcp.org/by_the_numbers)

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 stations planned for light-duty hydrogen fuel cell vehicles following applicable standards. See below for a listing of California funded stations.

***Open for retail and available to light-duty hydrogen fuel cell vehicles following applicable standards. A listing of California funded stations can be found [here](https://cafcp.org/by_the_numbers).
Cars cars cars cars cars!

Hyperion XP-1
• Prototype
• 1,016-mile range
• 0 to 60 mph in 2.2 seconds
• Fueling in 5 minutes
• 300 units available
Retail Hydrogen Stations & Network Health

Opened in Q2 2020
- Fountain Valley

In commissioning
- Berkeley
- Mission Hills
- Sunnyvale
- Campbell
- Sherman Oaks
- Woodside

Stations currently unavailable
- Ontario
- Riverside
- Newport Beach

Stations removed
- Burbank
- Santa Clarita

H2 stations list - https://cafcp.org/sites/default/files/h2_station_list.pdf
An Expanding Hydrogen Station Network

- California Energy Commission hydrogen station developmental grants (GFO 19-HYD-04)
- California Air Resources Board LCFS
- Private investment inquiries
- GoBiz Permitting Guidebook, 2020 edition

Source: Governor’s Office of Business and Economic Development
Hydrogen & Fuel Cell Activity – U.S.

Microsoft
• U.S. Hydrogen Road Map contributor
• Record of 48 hours powering data center servers

“We very much see ourselves as a catalyst in this whole hydrogen economy.”

UC Irvine Road Map for Renewable Hydrogen Production
• Renewable hydrogen sector can reach self-sustainability by mid-to late 2020s

GTI, EPRI and 18 utilities, including SoCalGas, SCE and Los Angeles DWP.
Hydrogen & Fuel Cell Activity - Global

Europe
- German H2 Strategy
  - South Korean investment response
- European H2 Strategy
- Increase in H2 chatter on European utilities earnings calls, from Q1 to Q2

Hydrogen gains airtime during Q2 utility results calls

<table>
<thead>
<tr>
<th>Executive</th>
<th>Analyst</th>
<th>Q1 Call</th>
<th>Q2 Call</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.ON SE</td>
<td>0</td>
<td>0</td>
<td>17</td>
</tr>
<tr>
<td>Enel Spa</td>
<td>0</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Engie SA</td>
<td>1</td>
<td>0</td>
<td>8</td>
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<tr>
<td>InEOS SA</td>
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<tr>
<td>Narengy Energy Group SA</td>
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<td>9</td>
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<tr>
<td>Ørsted A/S</td>
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<tr>
<td>Statoil SpA</td>
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<tr>
<td>Uniper SE</td>
<td>2</td>
<td>0</td>
<td>75</td>
</tr>
</tbody>
</table>

“Economic recovery measures should support large scale initiatives that can accelerate cost competitiveness of hydrogen”

- Hydrogen Council

Headlines...
- As China moves to dominate the EV industry, Britain frets about energy security
- Britain lacks a clear hydrogen strategy
CaFCP Station Map & SOSS

http://cafcp.org/stationmap  |  http://m.cafcp.org
SOSS Refresh

- Hourglass on homepage
- “REFRESH” on detailed page
- More information popup

Station Status

<table>
<thead>
<tr>
<th>Open Retail Stations</th>
<th>H70</th>
<th>H35</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anaheim</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Campbell</td>
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<tr>
<td>Citrus Heights</td>
<td></td>
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<tr>
<td>Costa Mesa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Del Mar</td>
<td></td>
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</tbody>
</table>

Costa Mesa

H35 Status: REFRESH
H35 Inventory: 121 KG
H70 Status: REFRESH
H70 Inventory: 112 KG

Last Updated: Tuesday, 7/14/2020, 1:33 PM
*H35 = 35 MPa or 5,000 PSI
*H70 = 70 MPa or 10,000 PSI

Refresh

The station is accessible and operational but is recharging its [dispensable/high pressure] inventory. Ability to fuel is delayed. There will be a wait before you can fill.
Heavy Duty: Bus & Truck

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

**Fuel Cell Electric Trucks**

- Advanced Clean Truck rule
- Fueling infrastructure projects
  - 3 heavy duty H2 stations
  - Ontario, Wilmington and Port of Long Beach
  - 1-2 temporary fuelers
- CARB & CEC Heavy Duty ZEV funds
  - Include heavy duty infrastructure
The Other Electric Bus

Advanced Clean Transit regulation
• Transit buses on zero-emission pathway
• First wave of Zero Emission Bus Rollout Plans submitted

CTE Guidebook for Deploying Zero-Emission Transit Buses

Foothill Transit cost comparison of BEBs and FCEBs
References

- **KEY DOCUMENTS**
  - California Fuel Cell Revolution - [https://cafcp.org/sites/default/files/CAFCR.pdf](https://cafcp.org/sites/default/files/CAFCR.pdf)
  - U.S. Hydrogen Road Map (full report) - [https://cafcp.org/sites/default/files/Road%2BMap%2Bto%2BUS%2BH2Economy%2BFund%2BNew%2BClimate%2Binvestments.pdf](https://cafcp.org/sites/default/files/Road%2BMap%2Bto%2BUS%2BH2Economy%2BFund%2BNew%2BClimate%2binvestments.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)
  - Zero Emission Bus Rollout Plans in California – [www.cafcp.org/resources](http://www.cafcp.org/resources): key word is rollout
  - Hydrogen Station Permitting Guidebook - [https://www.businessportal.ca.gov/zero-emission-vehicle-program/zev-resources/](https://www.businessportal.ca.gov/zero-emission-vehicle-program/zev-resources/)

- **CAFCP PAGES**
  - Station Map – [www.cafcp.org/stationmap](http://www.cafcp.org/stationmap)
  - SOSS – [http://m.cafcp.org](http://m.cafcp.org)
  - Resources – [www.cafcp.org/resources](http://www.cafcp.org/resources)
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