

LIGHT-DUTY HYDROGEN AND FCEV EFFORTS

2019 DOE FCTO Annual Merit Review

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Motivations

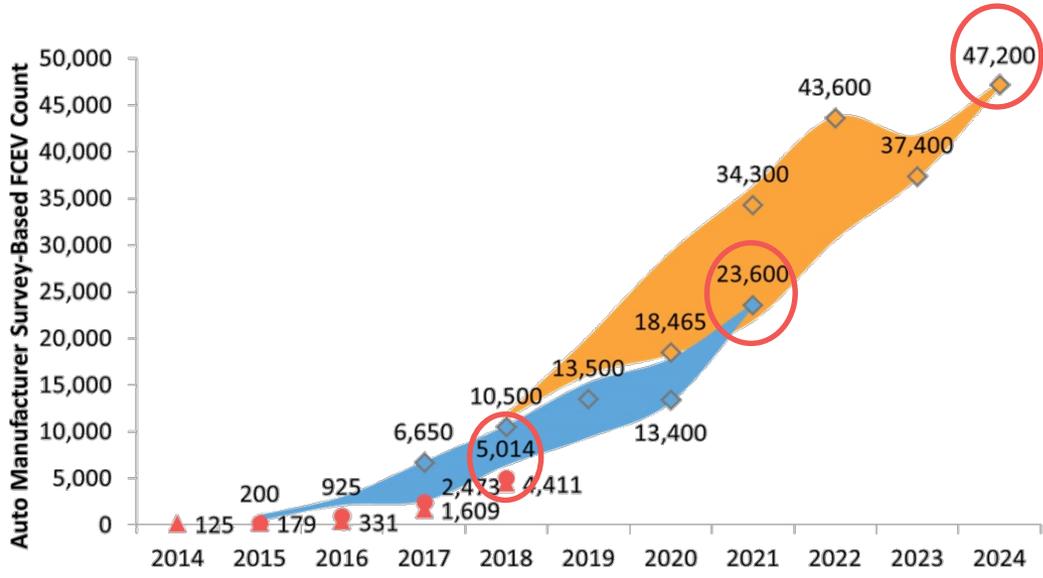
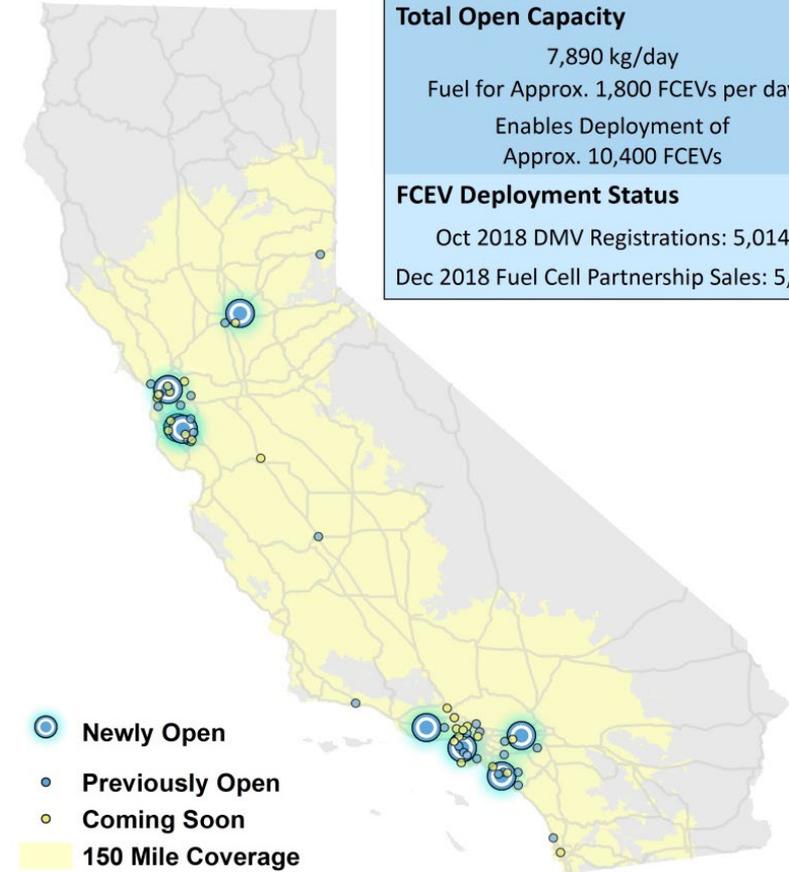
- Zero Emission Vehicles vital to addressing air quality & climate change
- Goal to enable industry to scale up a sustainable market
- MD/HDV and LDV Synergies
 - LDV: FC system economy of scale
 - MD/HDV: H2 fuel economy of scale



California's Light-Duty FCEV Progress

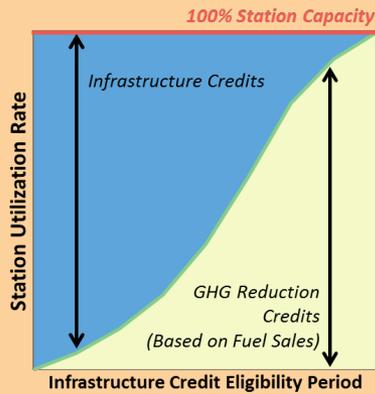
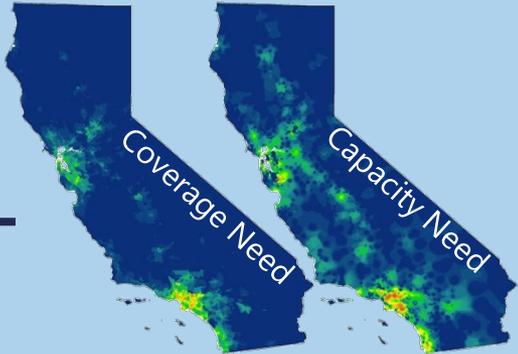
2018 Year in Review

Network Summary	
Number of Stations	39 Open + 25 Coming Soon
Total Open Capacity	7,890 kg/day Fuel for Approx. 1,800 FCEVs per day Enables Deployment of Approx. 10,400 FCEVs
FCEV Deployment Status	Oct 2018 DMV Registrations: 5,014 Dec 2018 Fuel Cell Partnership Sales: 5,658



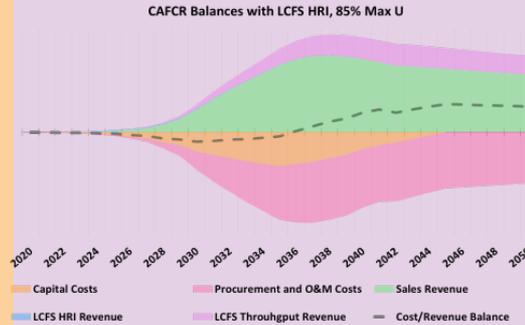
- Range of Mandatory Period Data
- Range of Optional Period Data
- ◆ Reported Mandatory Period Estimates
- ◆ Reported Optional Period Estimates
- ▲ April Registrations
- October Registrations

Hydrogen Program Portfolio



Fuel Incentives

Network-Building Cash Flows

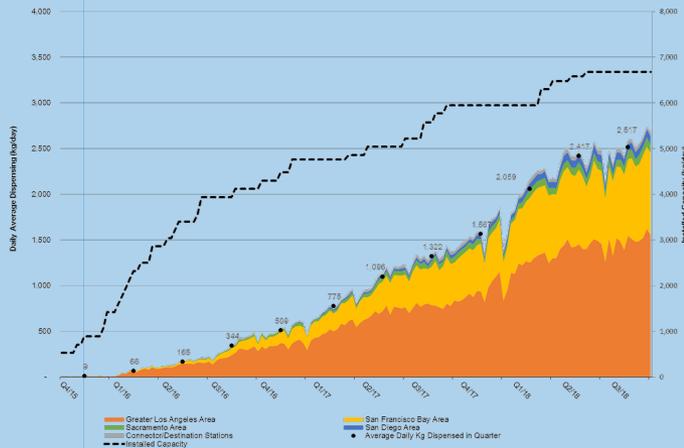


Economic Evaluations

Profitable Station Metrics



Hydrogen Procurement Cost



Network Funding, Analysis, and Reporting

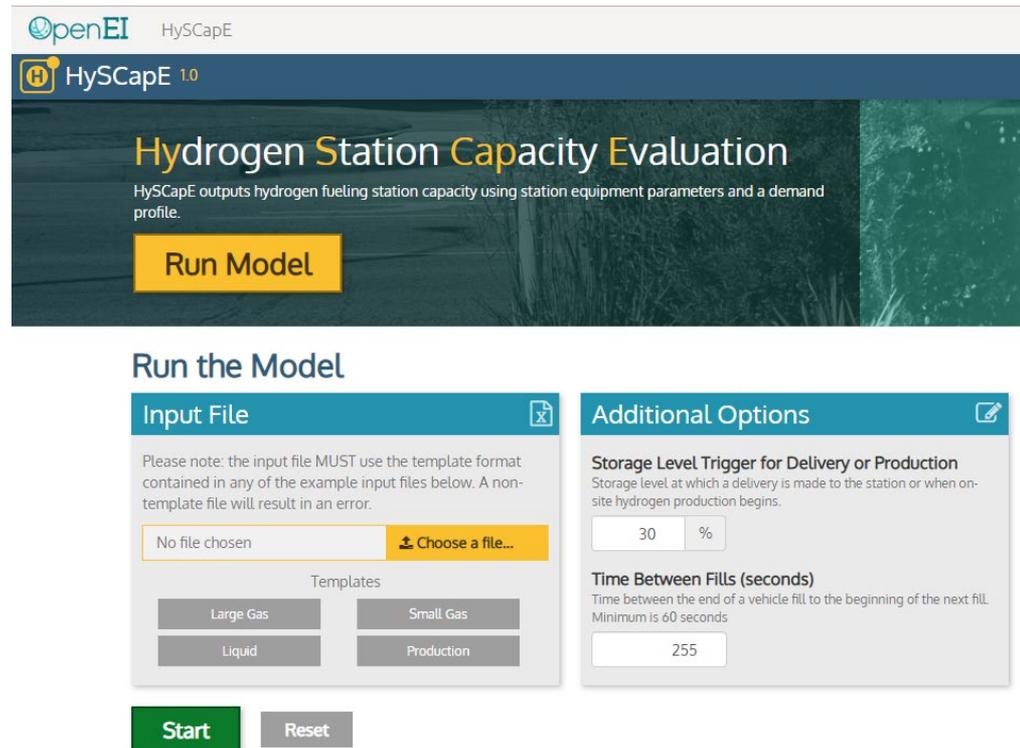
Station Evaluation



- Evaluate dispensing according to SAE J2601 and ANSI/CSA HGV 4.3
- CARB lead on implementation
 - Testing, Analysis, Review
- Shaping future SAE standards
- Inform future standardization & verification of industry-led testing
- Partners: DOE, NREL, SNL, Powertech, DMS, CaFCP, Energy Commission, SCAQMD



- First-of-its-kind tool to provide a “standard ruler” to evaluate station capacity based on limited set of equipment specifications
- Used in Low Carbon Fuel Standard infrastructure credit evaluations and future Energy Commission grant program
- Developed in partnership with NREL, Energy Commission, and CARB with public and industry review



The screenshot displays the HySCapE 1.0 web interface. At the top, the OpenEI logo and 'HySCapE' text are visible. Below this, the 'HySCapE 1.0' logo is shown next to a 'Run Model' button. The main heading is 'Hydrogen Station Capacity Evaluation', followed by a brief description: 'HySCapE outputs hydrogen fueling station capacity using station equipment parameters and a demand profile.' Below this is another 'Run Model' button.

The 'Run the Model' section is divided into two main panels:

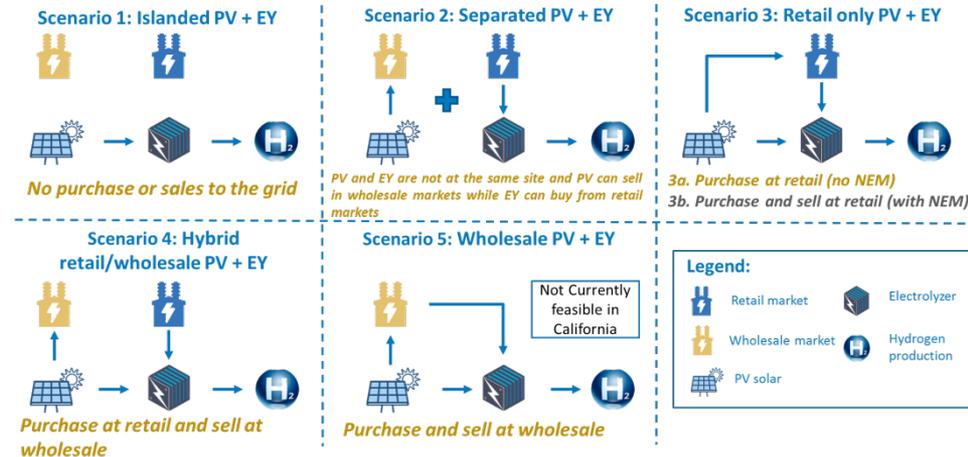
- Input File:** Contains a text box with 'No file chosen' and a 'Choose a file...' button. Below this are four template buttons: 'Large Gas', 'Small Gas', 'Liquid', and 'Production'. A note states: 'Please note: the input file MUST use the template format contained in any of the example input files below. A non-template file will result in an error.'
- Additional Options:** Contains two settings:
 - Storage Level Trigger for Delivery or Production:** A text box with '30' and a '%' symbol. Description: 'Storage level at which a delivery is made to the station or when on-site hydrogen production begins.'
 - Time Between Fills (seconds):** A text box with '255'. Description: 'Time between the end of a vehicle fill to the beginning of the next fill. Minimum is 60 seconds.'

At the bottom of the 'Run the Model' section are 'Start' and 'Reset' buttons.

H₂@Scale CRADA

Optimizing an Integrated Solar-Electrolysis System

- Exploring system design and operation implications on the business case for solar-sourced hydrogen in California
- Partners: PG&E, DOE, NREL, CARB, GO-Biz

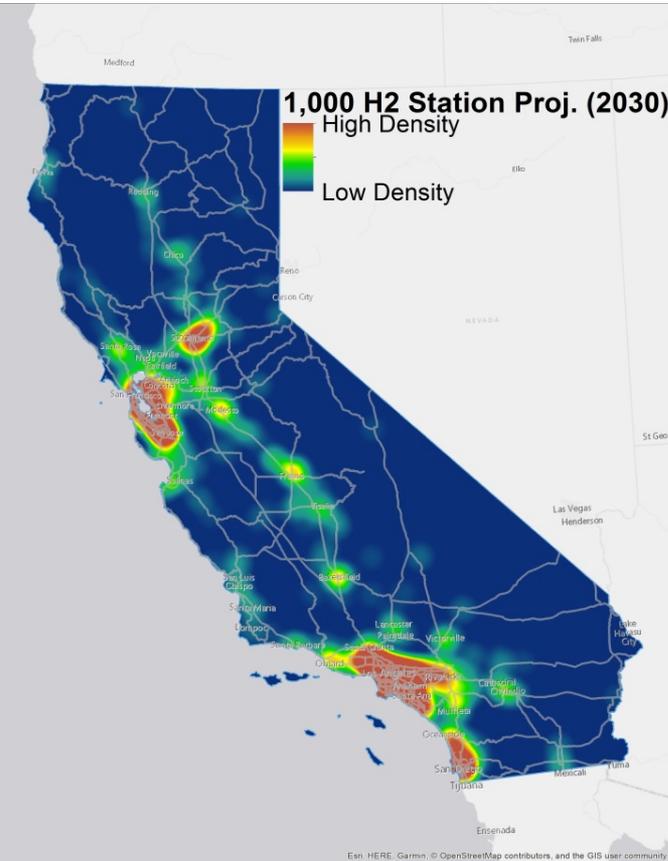


California Hydrogen Research Consortium

- Addressing several early-market infrastructure development and analysis needs
- Partners: NREL, DOE, CARB, Energy Commission, GO-Biz, SCAQMD
- Poster H2041 (April 30, 6:30PM)

Task	Description
Data Collection & Analysis	Perform analysis and aggregation of station performance, operation, and maintenance data.
Medium/Heavy-Duty Fueling	Perform analysis and reporting of retail and experimental fueling data to inform fueling-method decision makers and fueling system design.
H ₂ Contaminant Detector	Complete verification of in-line hydrogen quality detectors prior to validation at retail hydrogen stations.
Nozzle Freeze-Lock Evaluation	Create an environmentally controlled test setup for identifying conditions leading to nozzle freeze-lock and for verifying solutions. This task will be implemented upon industry budget and DOE approval to begin work.
CA Hydrogen Integration	Identify the top priorities for data share and experimental scenarios to integrate hydrogen into California's energy management strategies.
Technical Assistance	National laboratory technical experts will be available for California infrastructure development, deployment, and operation.

Paths Forward



H₂

Benefits by the Numbers
SOURCE | CARR & SCAQMD, 2016

BY 2030

1,000 STATIONS
+ **1,000,000 CARS** =

693.5 million gallons
per year of gasoline displaced

2.7 million metric tons
per year GHG avoided*

3,900 metric tons
per year NO_x avoided

97% of disadvantaged communities within the station network coverage

*with today's energy mix of 33 percent renewable hydrogen

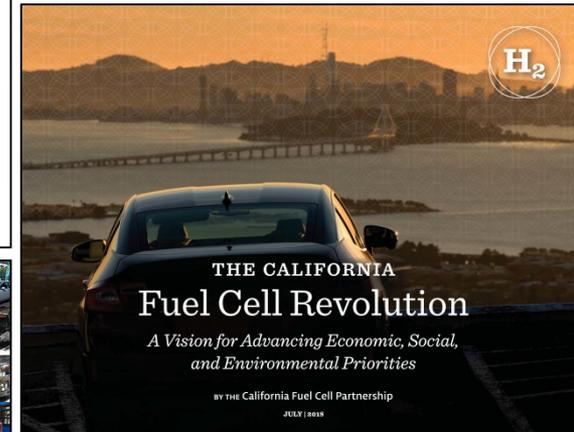
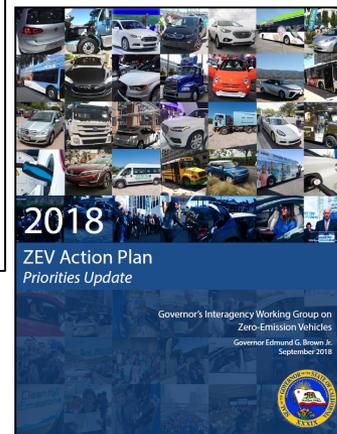
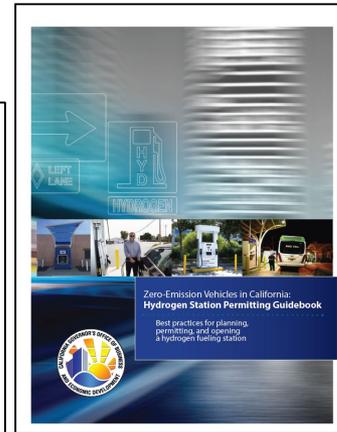
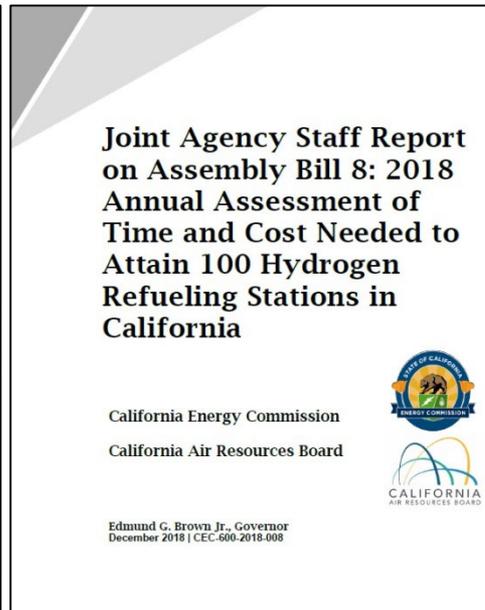
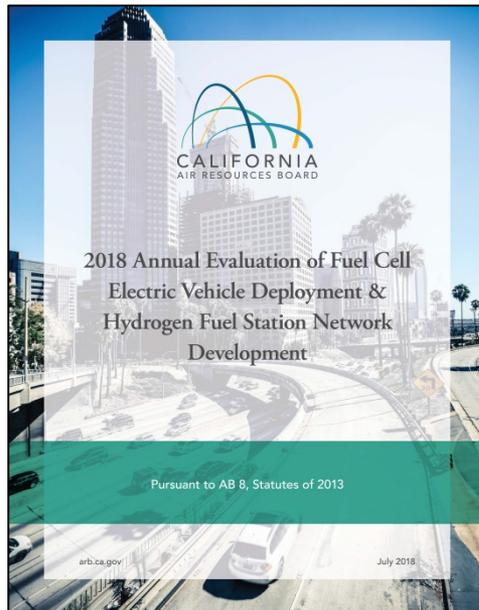


Resources

www.arb.ca.gov/hydrogen

www.energy.ca.gov/transportation/report_ab8.html

www.businessportal.ca.gov/zero-emission-vehicle-program/zev-resources/



www.cafcp.org

www.business.ca.gov/ZEV-Action-Plan

