CALIFORNIA'S HYDROGEN FUELING NETWORK STATUS AND CHALLENGES

June 10, 2016

For questions or comments, contact:
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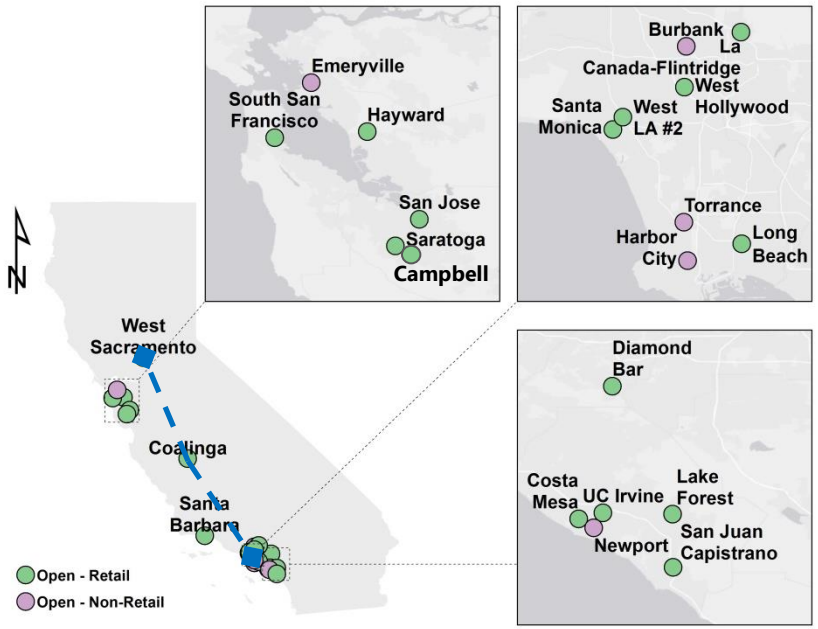
CURRENT NETWORK STATUS

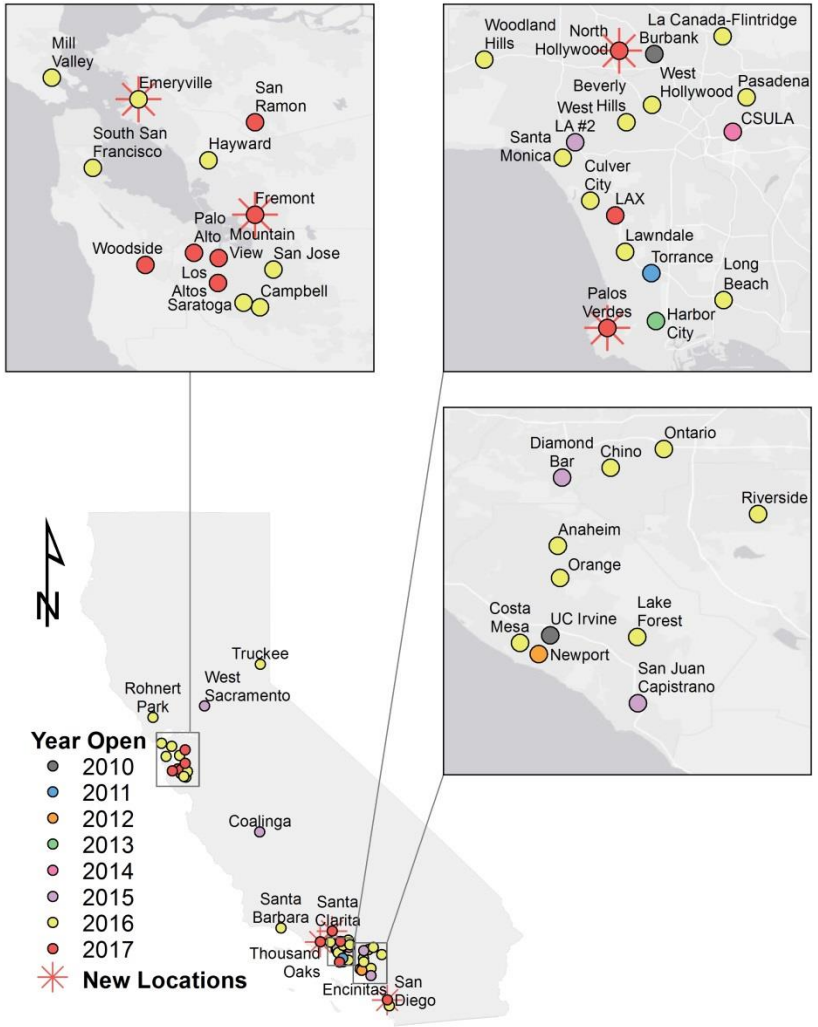
California's Hydrogen Network

24!

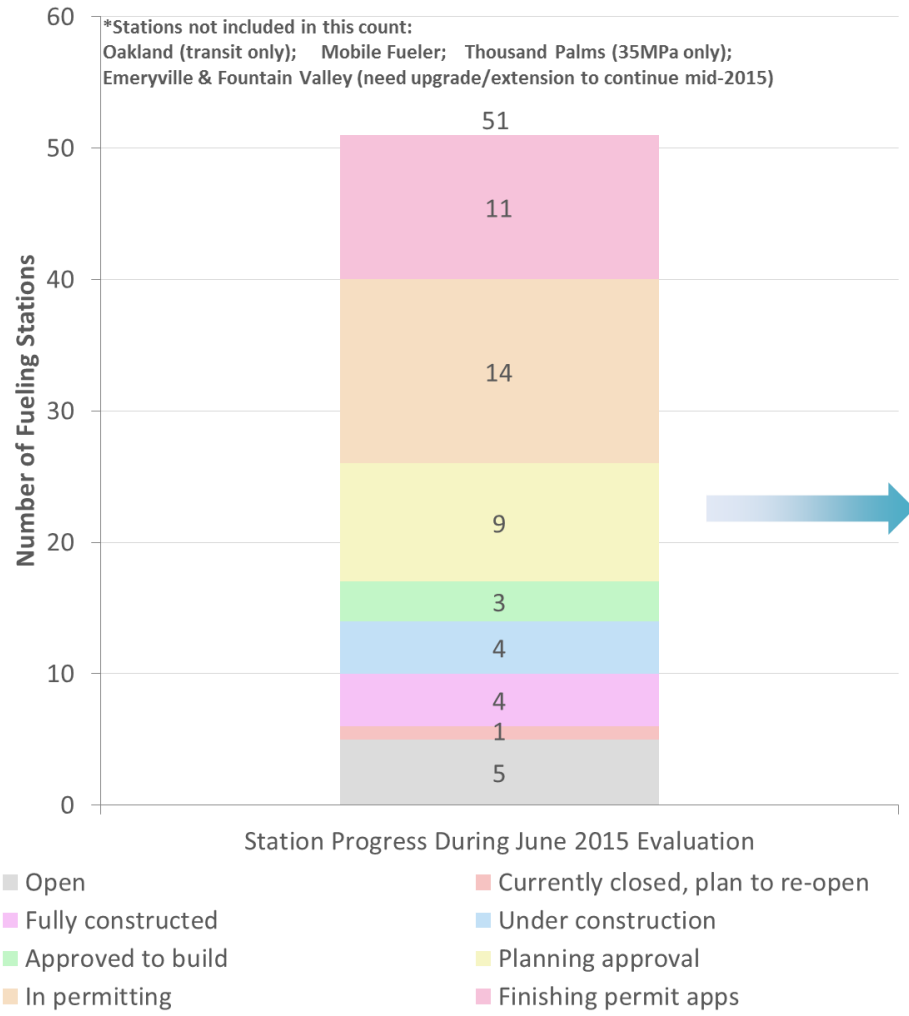
~~23~~ Open and Fueling Vehicles Today

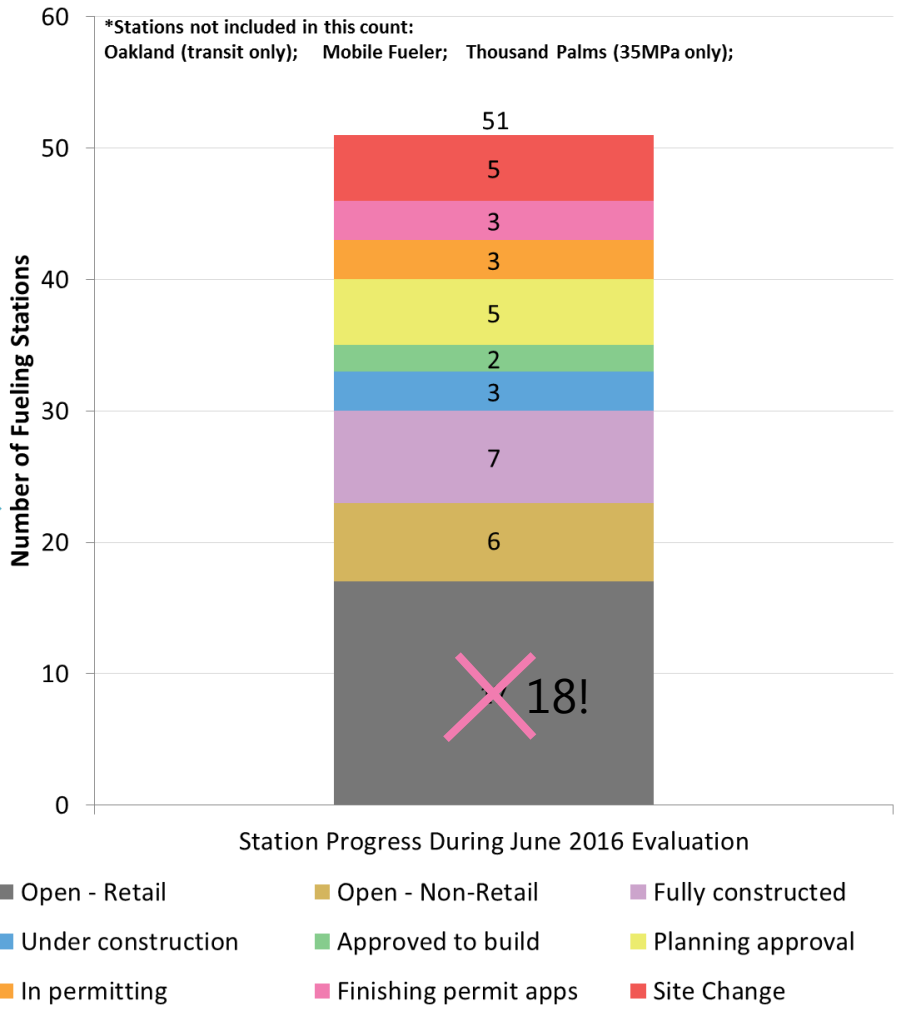


50 Funded and Planned by 2017



Current Development Status

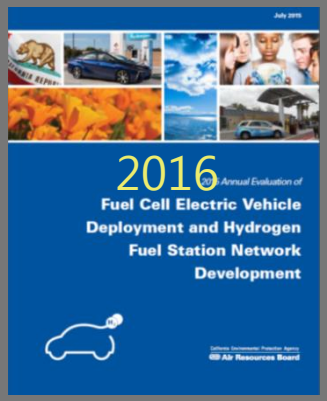


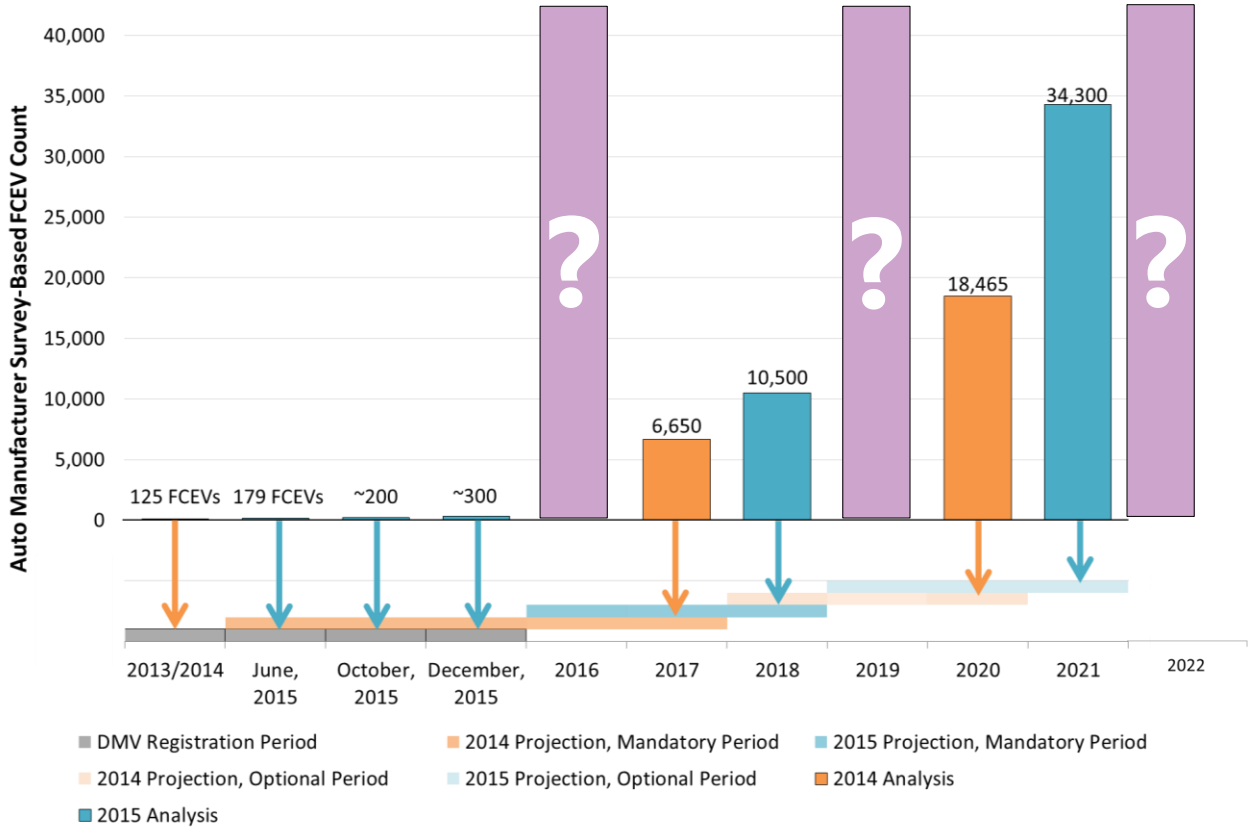


*Includes Fountain Valley as Open- Non-Retail, which is not expected to continue beyond 2016

FCEV Deployment

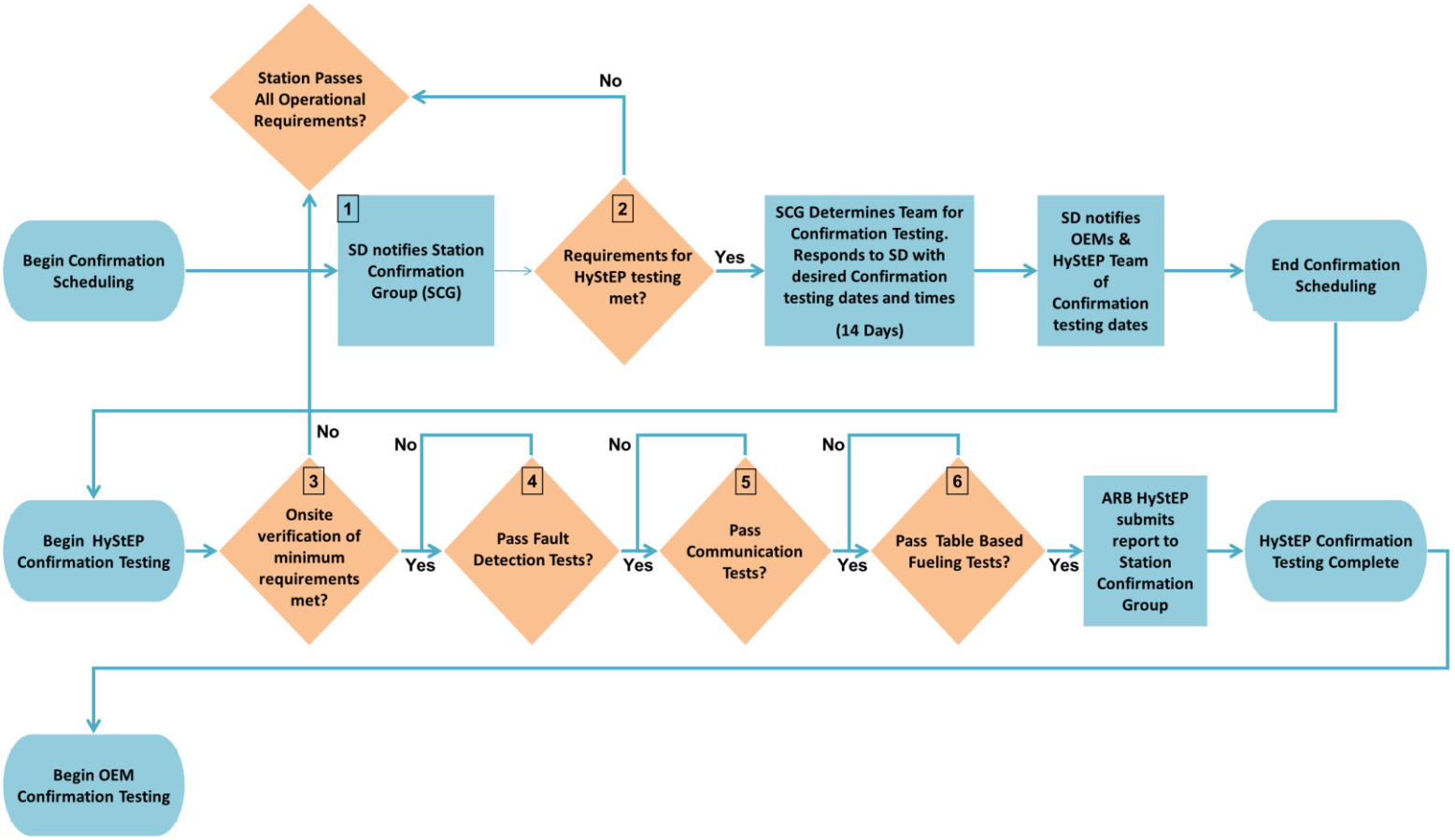
June 2016 AB 8 Report Coming Soon!





HyStEP Update

- Device validated at Santa Barbara and Diamond Bar stations
- Developing process to integrate with auto manufacturer process and review data

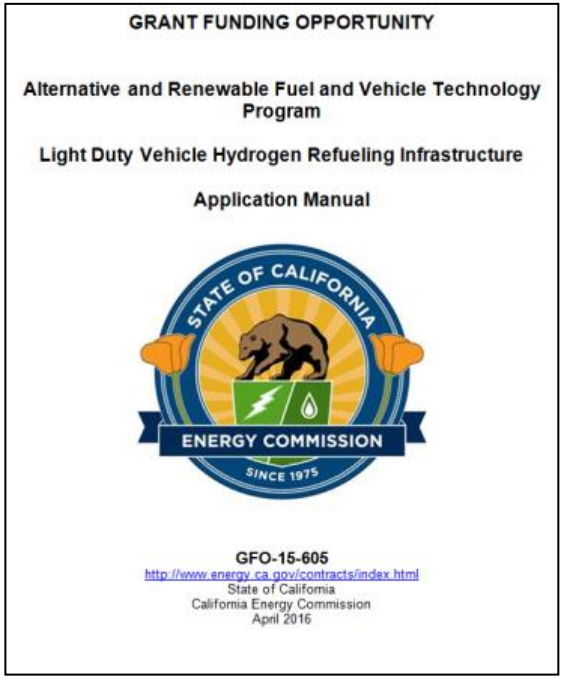


Metrology

- CDFA DMS expanded accuracy classes have allowed commercial sale of hydrogen in California
  - 4 dispenser designs have been type certified to the 5% accuracy class
    - Bennett
    - Equilon
    - Quantum
    - CSULA
- FirstElement has become a Registered Service Agent
  - Can complete acceptance testing of dispensers already type-approved by DMS
  - Additional testing entity potentially enables quicker station commissioning times

Funding: CEC GFO-15-605

- CEC's new Grant Funding Opportunity incentivizes stations in areas identified as high priority by ARB through CHIT



- Increased minimum station capacity
- Stresses retail experience and fast development
- Recent addendum increases total funding available to $33M

Funding: LCFS

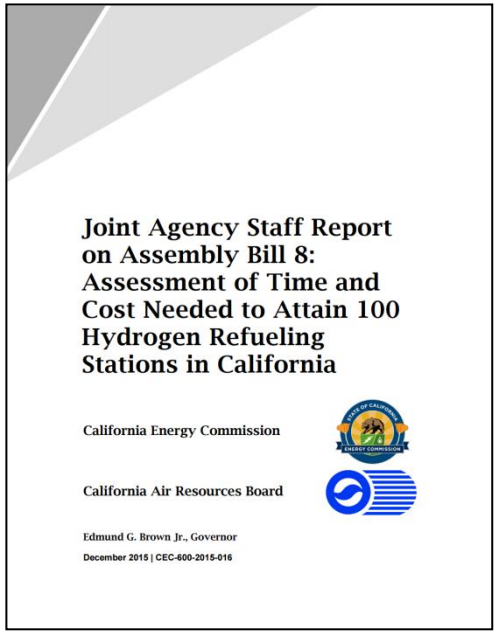
- LCFS staff updating existing H2 pathways in program
  - Suggesting regulation revision to prefer station operator receives credit
  - Suggesting regulation revision to include H2 production using RECs in compliance with Green Tariff Shared Renewable Program
- LCFS staff provisionally approved 4 new hydrogen production pathways; 3 zero or negative carbon intensity
- AC Transit first active participant generating credits through hydrogen production
- Credit value could be important factor in station viability

			Assumed Value per Credit: $100
Fuel Pathway	**Applicant**	**Carbon Intensity (gCO2/MJ)**	**LCFS Value ($/kg)**
HYGN009	LyTen	29.84	$2.30
HYGN006	AC Transit	0	$2.66
HYGN011	Fuel Cell Energy	-0.82	$2.67
HYGN008	LyTen	-46.91	$3.22

CHALLENGES

Station Development Challenges

- Development issues:
  - Loss of original site (11 stations)
  - Contract negotiations (9 stations)
  - Permitting slows the development process (6 stations)
  - Utility coordination complicates development scheduling (3 stations)
  - Local distrust or resistance (2 stations)



- New Station Performance
  - Equipment reliability and dispenser "debugging" often necessary
  - Improved customer communication: Soft Open Status on SOSS

Station Reliability

- Compressor, cooling system, point-of-sale, and dispenser issues have impacted initial customer experience
  - Stations unavailable
  - Partial fills
  - Multiple fill attempts
  - Incorrect billing/receipts
  - Non-uniform filling process
- Require technical solutions for improved system integration, component manufacturing and design
- Common design principles and industry standards for customer-facing components

Ensuring Positive Customer Experiences

California Fuel Cell Partnership — Driving for the future

Station Status

Public Retail Stations	H70	H35
Costa Mesa (Soft Opening)	●	●
Diamond Bar	●	●
Fairfax-LA (Soft Opening)	●	●
Harris Ranch	●	●
Hayward (Soft Opening)	●	●
La Canada Flintridge (Soft Opening)	●	●
Lake Forest (Soft Opening)	●	●
Long Beach (Soft Opening)	●	●
San Jose (Soft Opening)	●	●

Station Testing and Validation

- Fueling performance
  - Capitalizing on the successful validation and ongoing auto OEM acceptance of HyStEP can help speed station opening process
  - California has identified a need for a station performance certification program and ARB staff working to develop

California FUEL CELL PARTNERSHIP

DRIVING FOR THE FUTURE

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Automotive Fuel Cell Cooperation
Daimler
GM
Honda
Hyundai
Nissan
Toyota
Volkswagen

Cal/EPA Air Resources Board
California Energy Commission
Office of Governor Edmund G. Brown Jr.
South Coast AQMD
U.S. Department of Energy
U.S. Environmental Protection Agency

Air Liquide
BAE Systems
Ballard Power Systems
FirstElement Fuel, Inc.
H2 Logic
Hydrogenics
HydrogeNXT
ITM Power
Linde North America, Inc.
Southern California Gas Company

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CA Dept of Food and Agriculture
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CALSTART
CEERT
CTE
Energy Independence Now
NREL
Sandia National Laboratories
SunLine Transit Agency
University of California, Berkeley
UC Irvine-NFCRC
UC Davis-ITS

May 27, 2016

Re: HyStEP Phase II Deployment

Dear Air Resources Board and HyStEP Stakeholder Partners,

The automaker members of the California Fuel Cell Partnership (CaFCP), known as the OEM Advisory Group (OEMs), submit the following letter in full support of the California Air Resources Board (CARB) led deployment of the Hydrogen Station Equipment Performance (HyStEP) device for final testing toward fueling protocol validation of retail hydrogen refueling stations in California.

The OEM Advisory Group recognizes the critical need to test, validate and open stations to meet the vehicle targets identified in the joint CEC/CARB AB 8 report published in December 2015. The OEMs have been engaged from the beginning of CARB's HyStEP implementation through the performance of OEM fuel cell vehicle/HyStEP back-to-back validation fills. Having analyzed the HyStEP/vehicle data, the OEMs are now confident with the data quality and encourage the State to deploy HyStEP as part of the Phase II plan, in order to verify and validate the testing and review process.

The OEMs look forward to HyStEP establishing the process for interface confirmation, supporting the future goal of formal third party certification, and the expansion and commercialization of hydrogen refueling infrastructure.

Sincerely,

American Honda Motor Company, Inc.
General Motors LLC
Hyundai-Kia America Technical Center, Inc.
Mercedes-Benz Research & Development North America, Inc.
Nissan Technical Center North America
Toyota Motor Engineering & Manufacturing North America, Inc.
Volkswagen Group of America, Inc.

cc: SCAQMD, DOE, CDFA DMS, CEC

The California Fuel Cell Partnership is a collaboration in which several companies and government entities are independent participants. It is not a joint venture, legal partnership or unincorporated association.

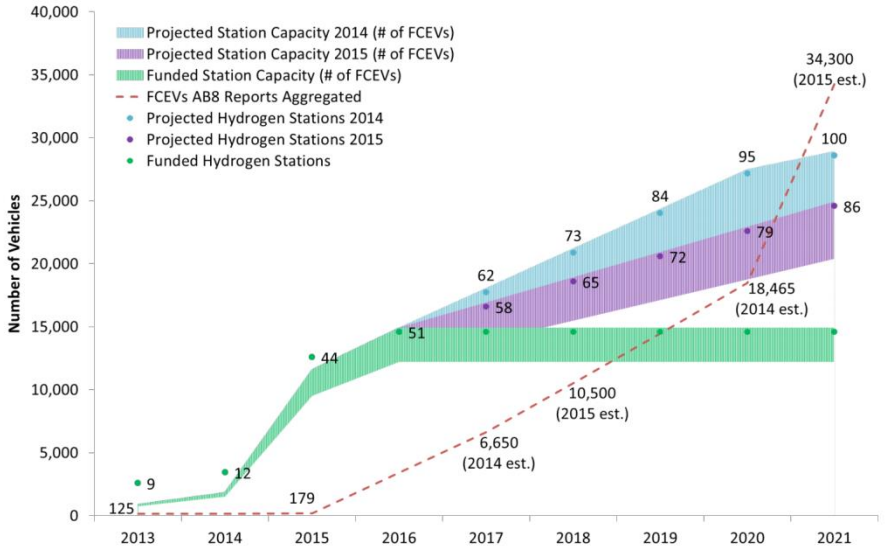
- Contaminant Detection
  - In-line, real-time detecting device is needed immediately; would rely on detection of "canary species" that indicate degraded fuel quality and allow interruption of fueling service
  - ARB working with DOE and National Labs on proposal; look forward to being able to field test and deploy in the near future

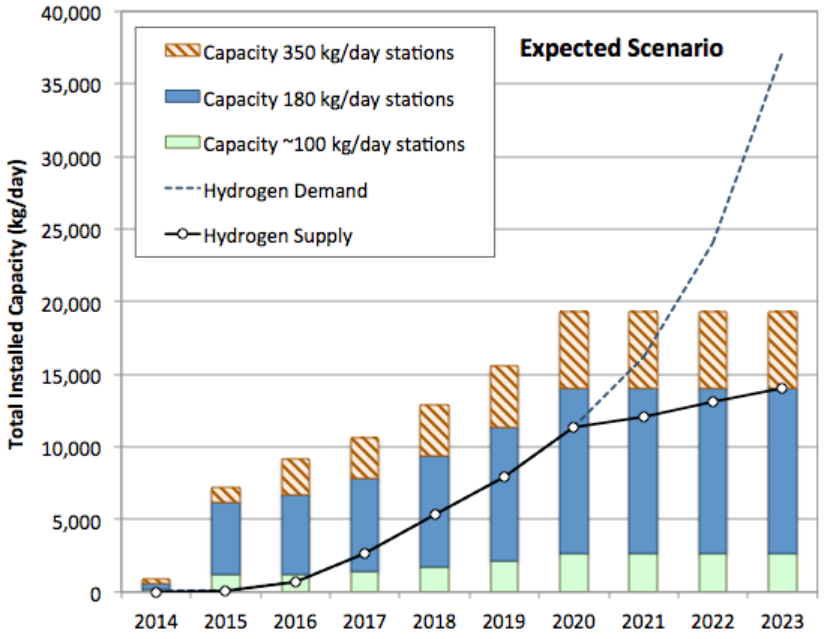
Infrastructure at Scale w/ Private Investment

- June and December reports, considering various scenarios and with different analysis methods, identify a need for station financing to break from business-as-usual

- California's AB 8 funds alone will be insufficient to meet the on-road FCEV demand around 2020 with business-as-usual assumptions

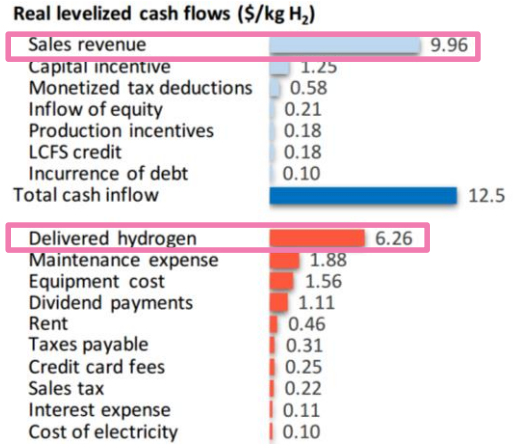
Figure ES4: Need for Continued Station Investments and Increased Average Capacity to Support Future FCEV Fleet, Given Business as Usual Assumptions in State Incentive Programs

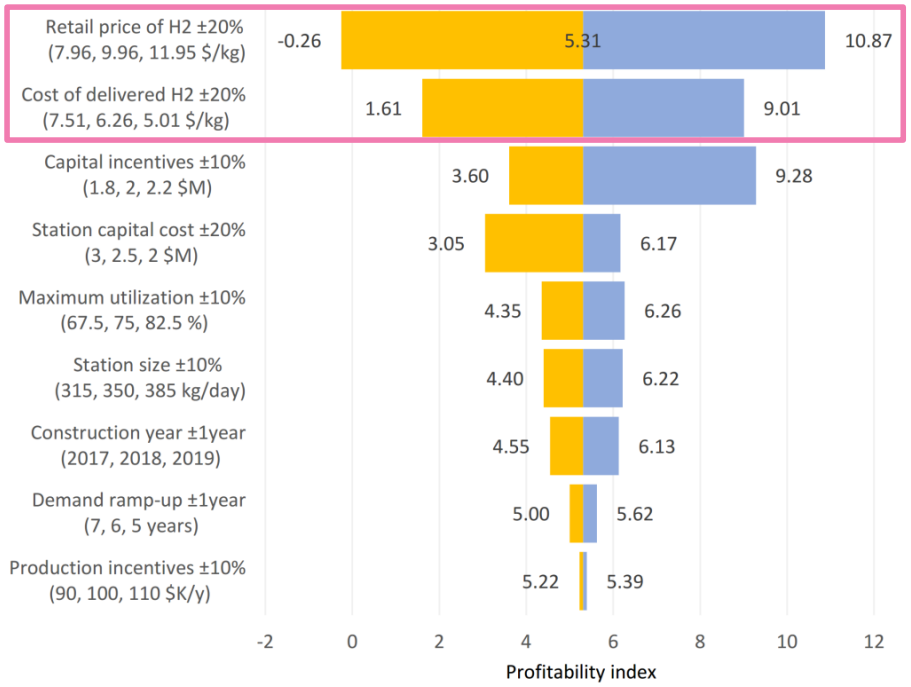




Outstanding Question: Production and Supply Chain

- Cost of hydrogen to the station operator and at the pump are primary concern for long-term viability of FCEVs
- ARB currently investigating the supply chain of hydrogen production in California to identify opportunities and challenges in reducing the cost of hydrogen and increasing renewable content
- Medium and heavy duty projects looking for opportunity to co-locate light duty fueling to reduce dispensed hydrogen cost across sectors.





QUESTIONS