CALIFORNIA'S HYDROGEN FUELING NETWORK PROGRESS AND GROWTH TOWARDS H2@SCALE

November 8, 2017

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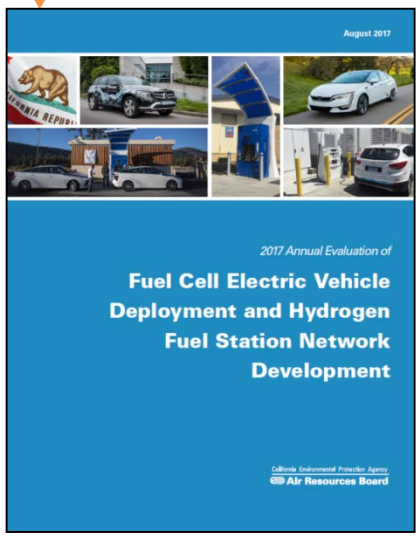
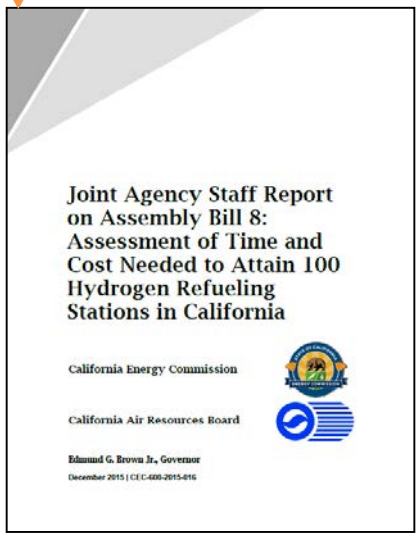
CALIFORNIA
AIR RESOURCES BOARD

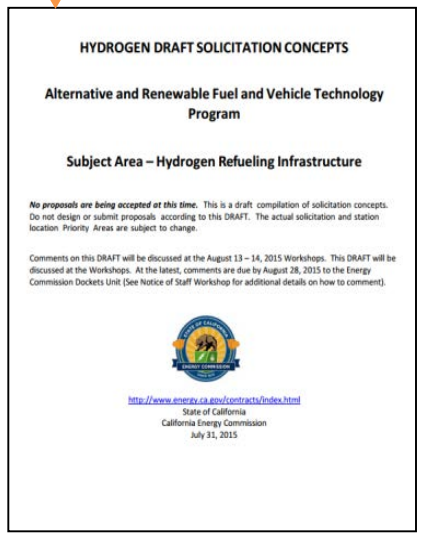
Overview of AB 8

- Signed by Governor Brown in 2013
- Extends ARFVTP established by AB118
- Allocates up to $20M annually for hydrogen infrastructure investment

- Reporting and analysis requirements lead to hydrogen fueling station funding
  - Status of stations and vehicles
  - Projections of vehicle placements
  - Identifying areas and performance requirements for new stations
  - Cost and time to 100 stations





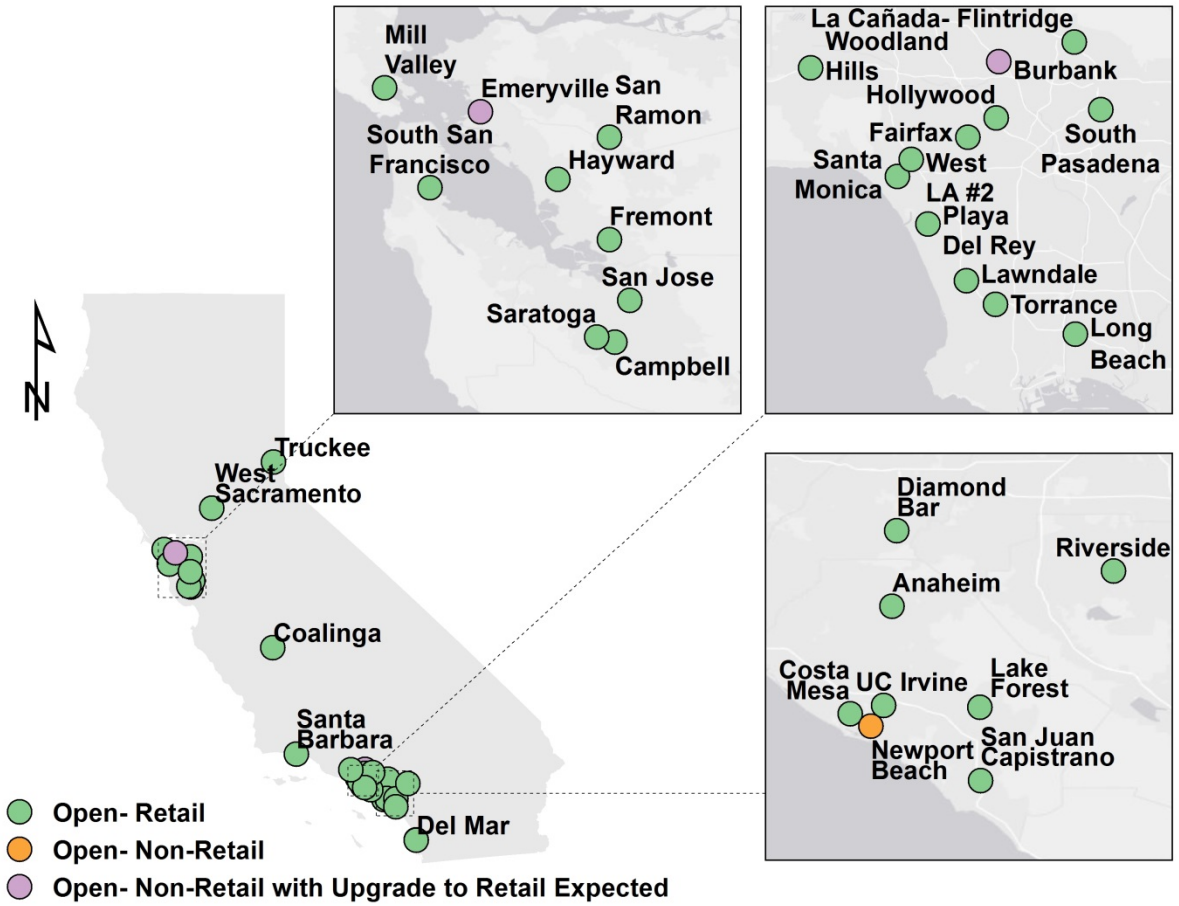


Background

Hydrogen fueling stations are needed ahead of FCEVs to enable market launch

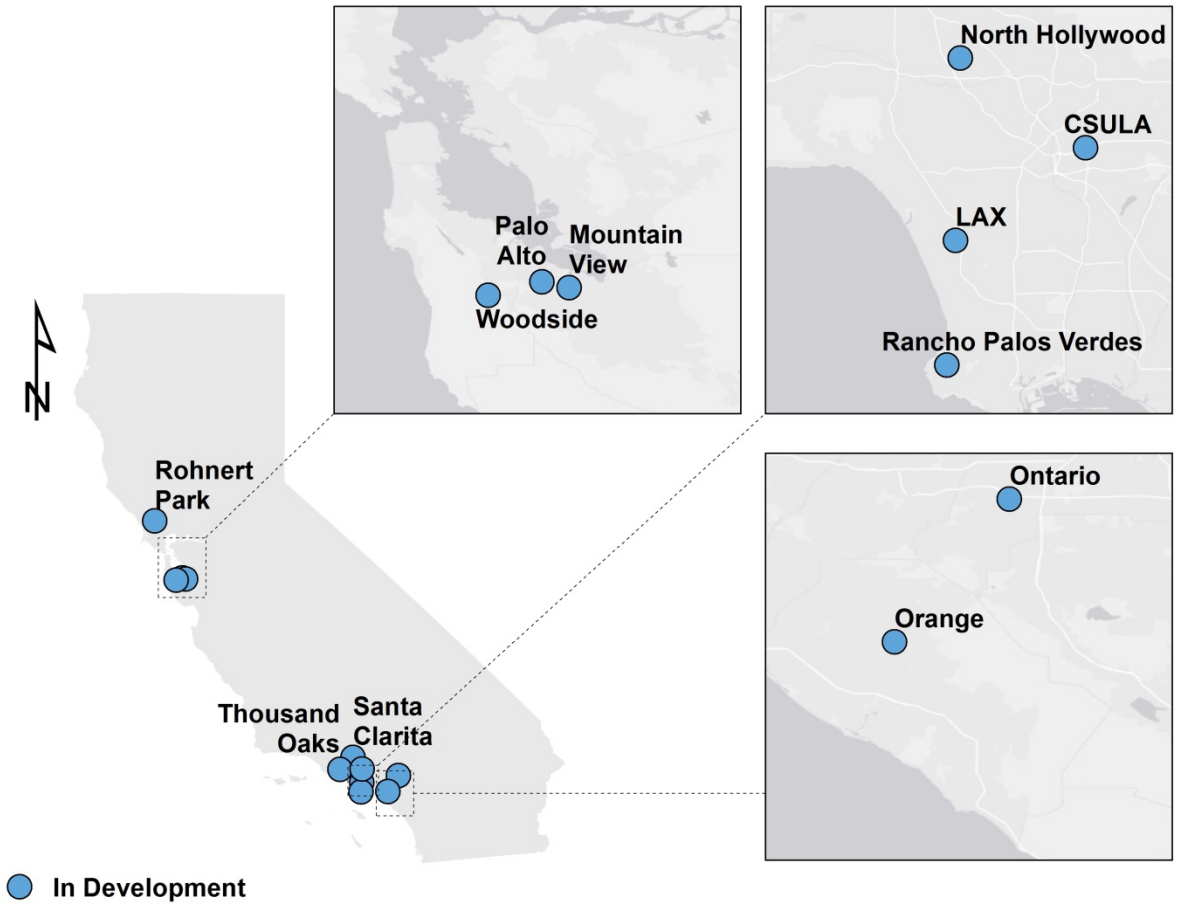
Current Hydrogen Fueling Network

California's hydrogen fueling network includes 31 Open-Retail stations, 2 Non-Retail stations currently being upgraded to Retail, and 1 Non-Retail station



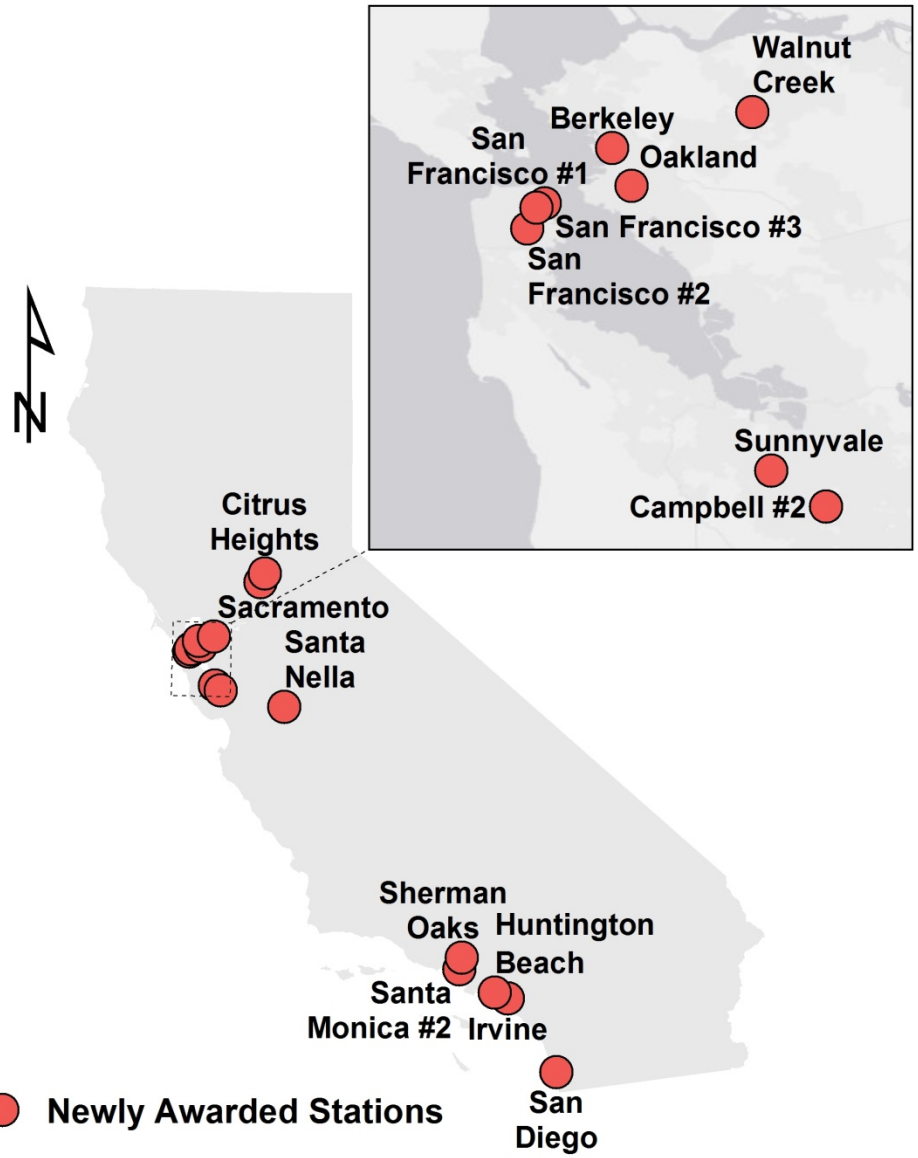
California's Under-Construction Network

An additional 12 stations from prior grant solicitations are currently in various phases of development



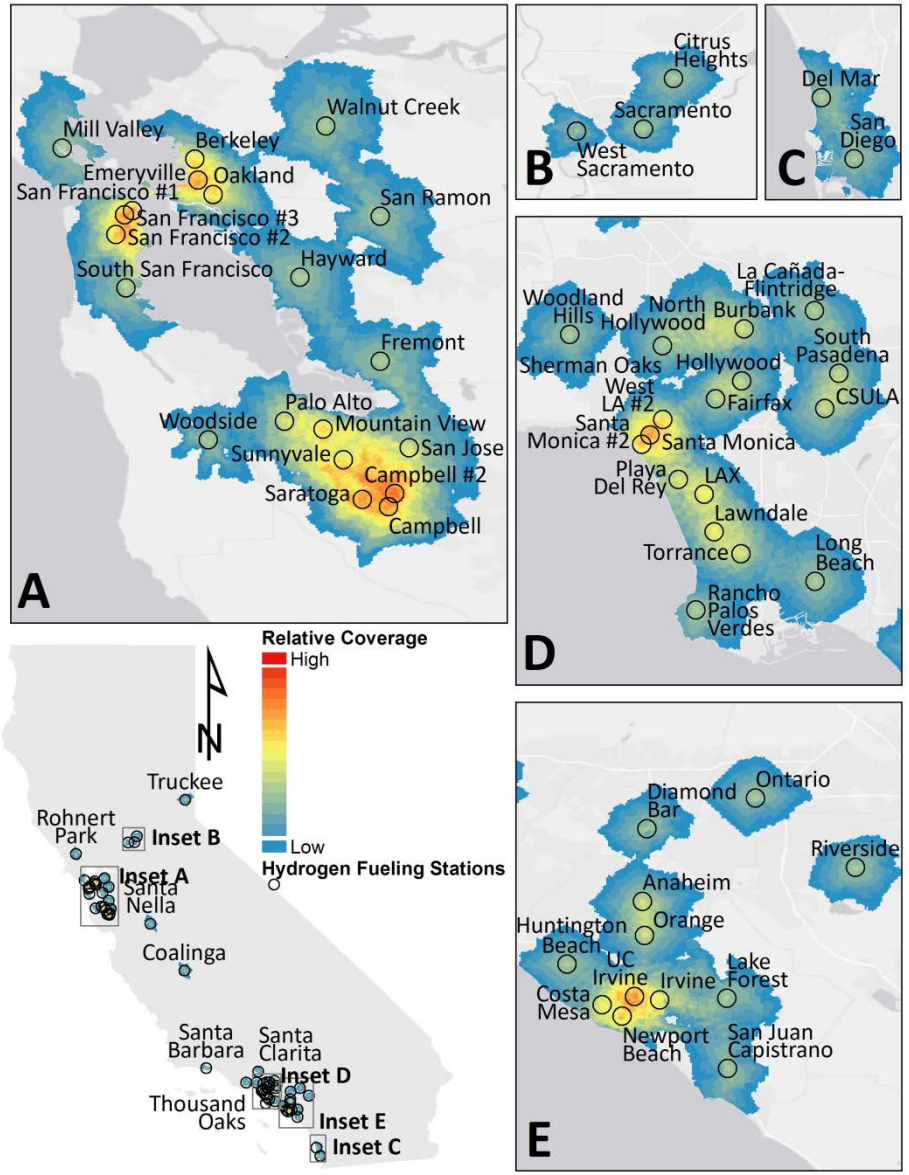
California Energy Commission Added 16 Stations Through GFO 15-605

New station awards through GFO 15-605 added 16 stations that have recently initiated development and are expected to be Open-Retail by 2019



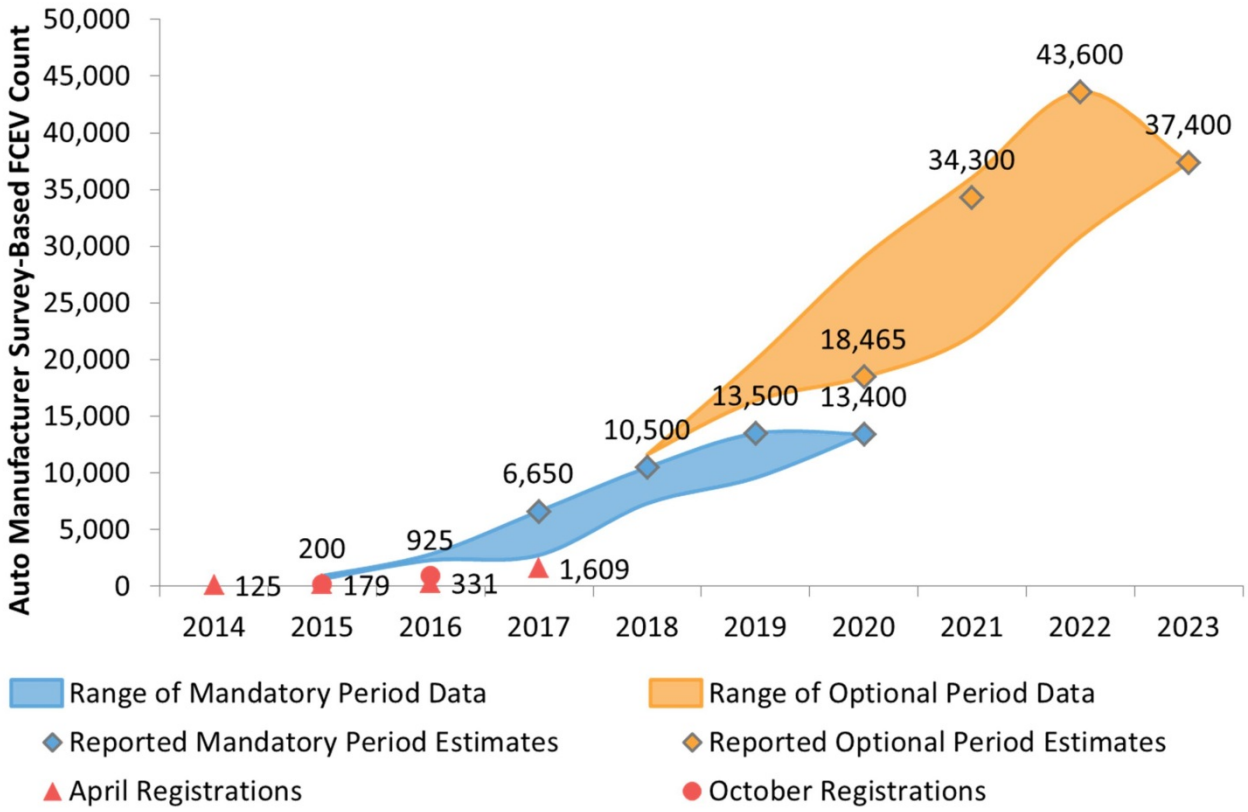
California's Funded Network Coverage

The 62 total stations throughout the state are helping to launch the FCEV market and will continue to expand the opportunities for growth and expansion



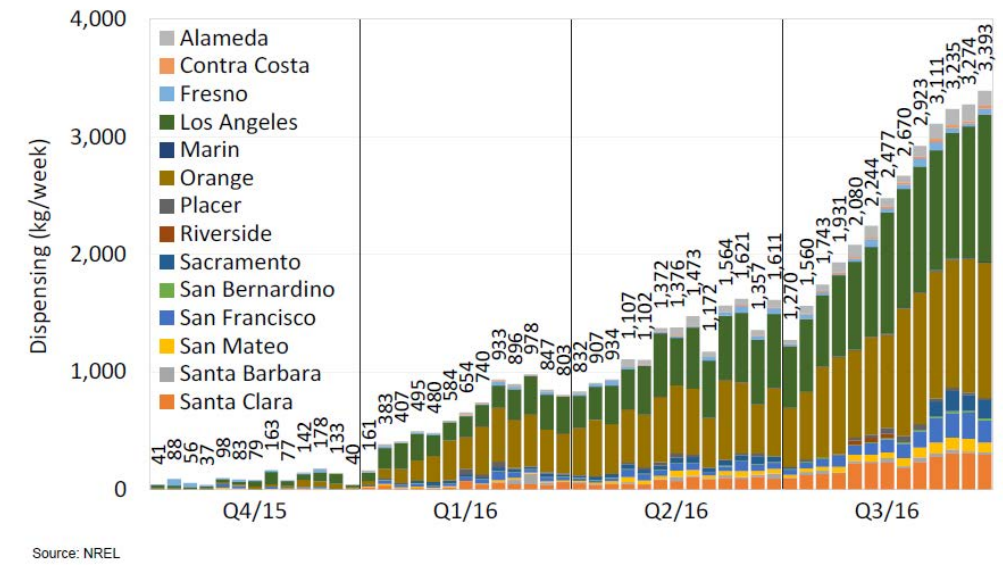
Projected FCEV Deployment

Auto manufacturers indicates 10,000s of vehicles in early 2020s. FCEV deployment delays have occurred and are tied to prolonged infrastructure development. Feedback has emphasized acceleration is possible with coordinated acceleration in station deployment.

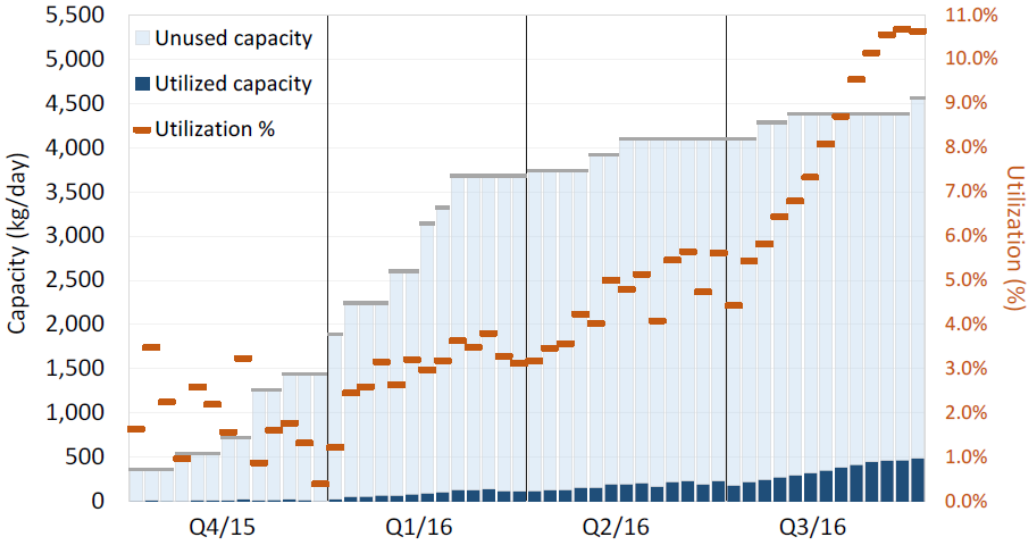


Station Utilization is Already Growing Rapidly

Available station capacity has been steadily growing, but hydrogen fueling throughput has been growing faster. Overall utilization is swiftly rising, and some stations have reported instances of running out of fuel or needing to order additional deliveries.



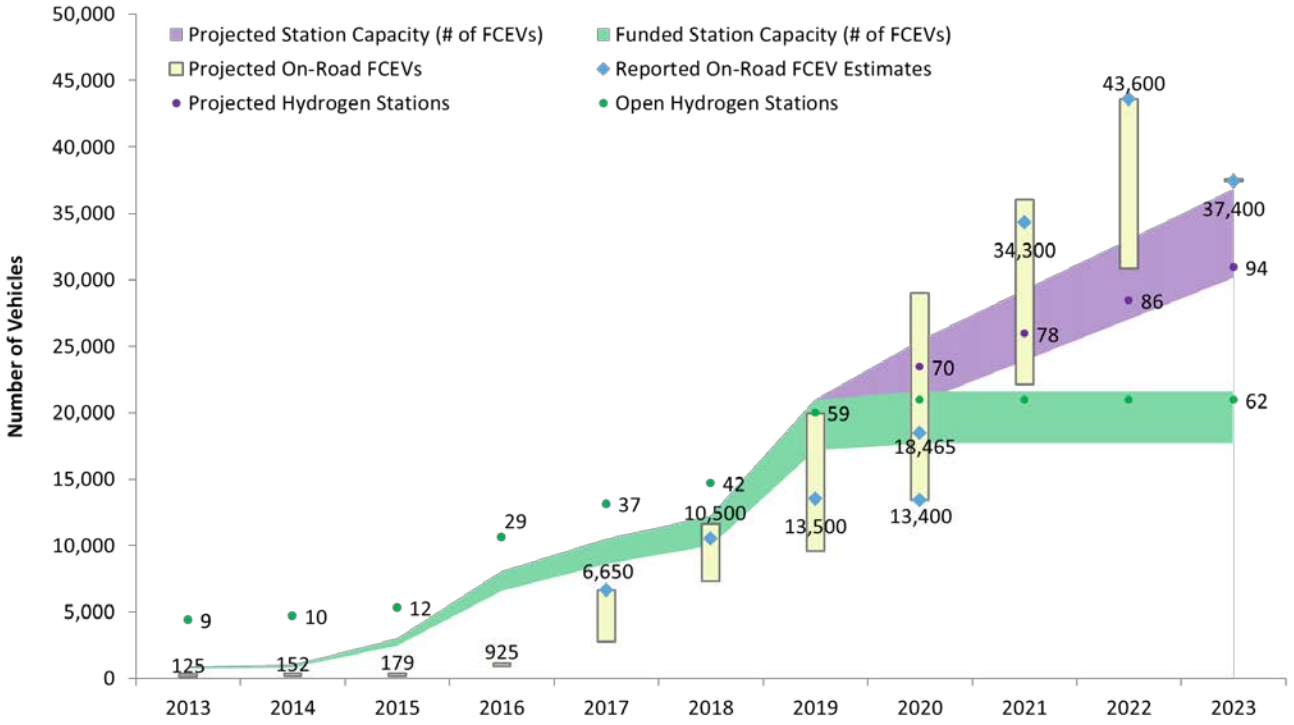
Source: NREL



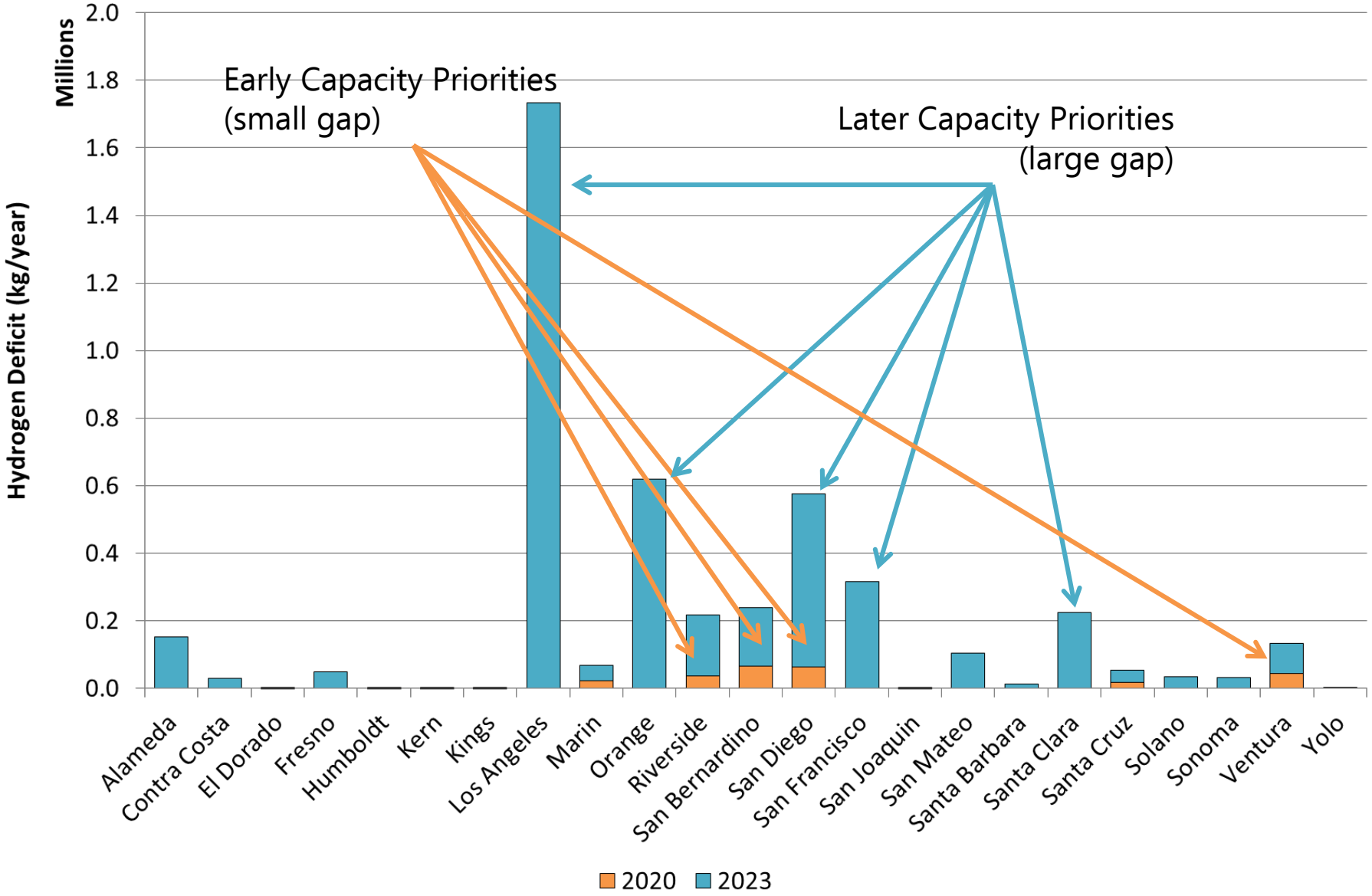
Source: NREL

Potential Gap in Hydrogen Fueling Capacity

Long-term FCEV deployment plans continue to indicate a need for dispensing capacity beyond business-as-usual development.

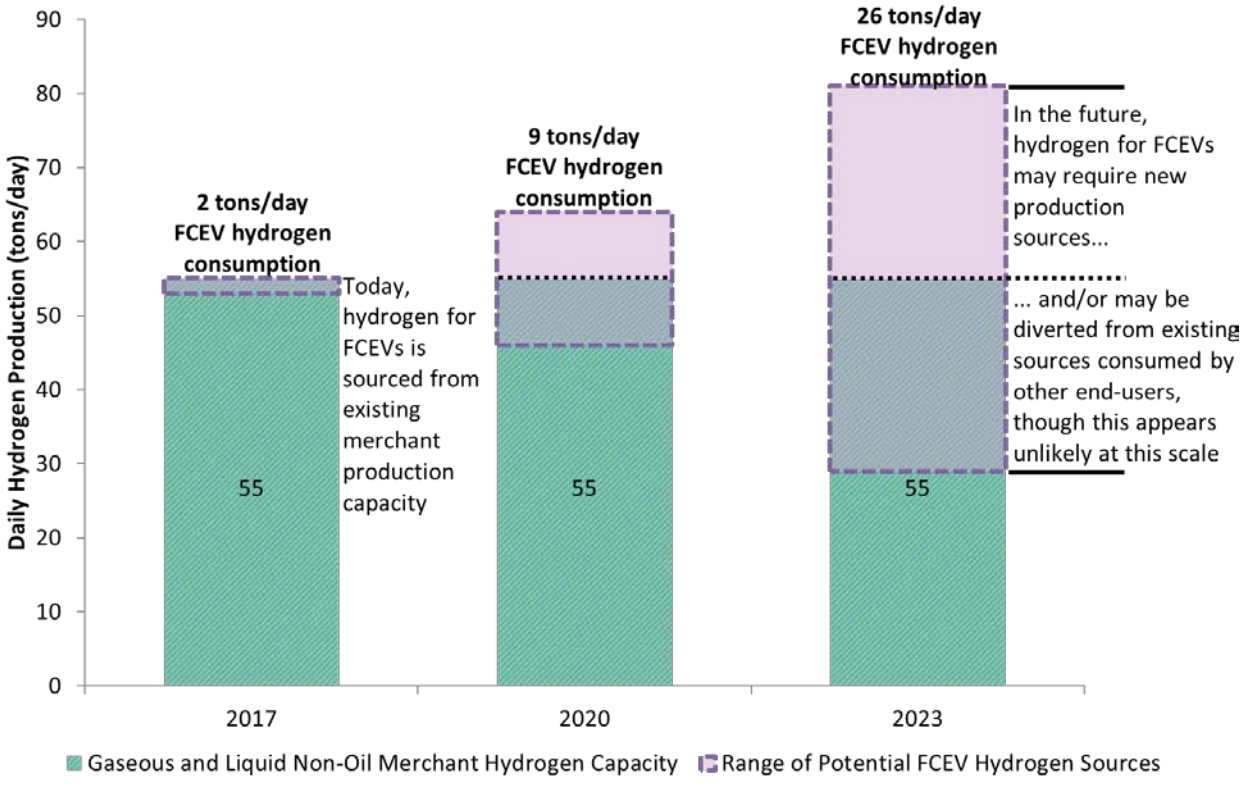


Regional Capacity Gaps Occur Sooner



In-State Hydrogen Production Gap

Fueling capacity has so far been the focus of California's program. Renewable and conventional hydrogen production capacity in California are rapidly becoming a similar priority. It is unclear where the necessary volumes will be sourced, especially for renewable hydrogen.



*Production capacity data provided by Pacific Northwest National Laboratory

In-State Hydrogen Production

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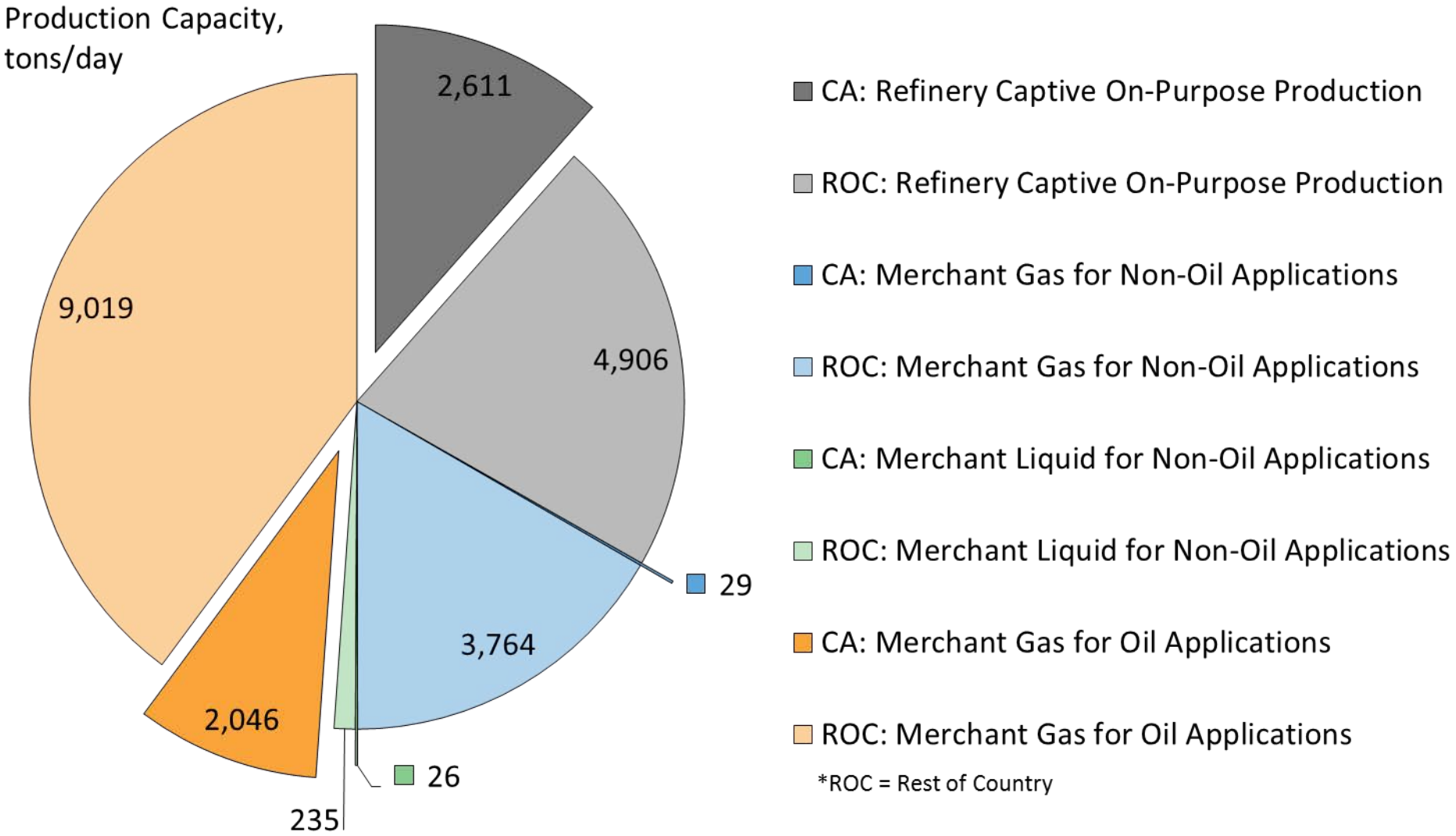
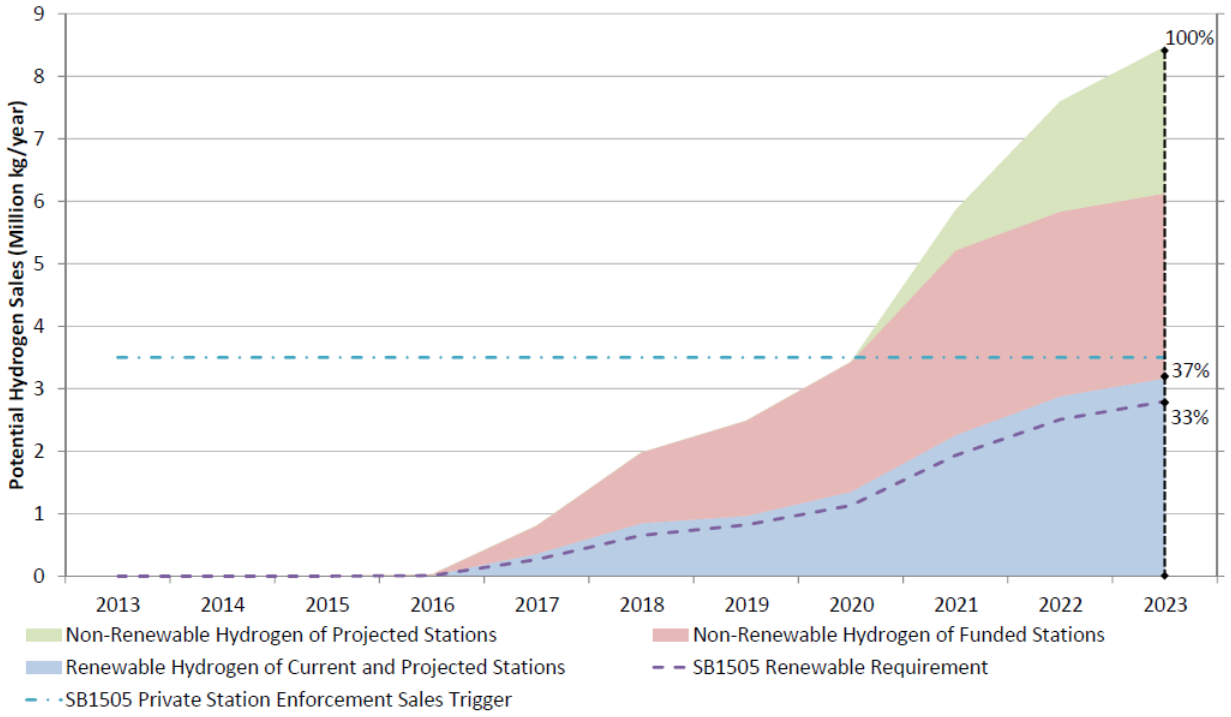


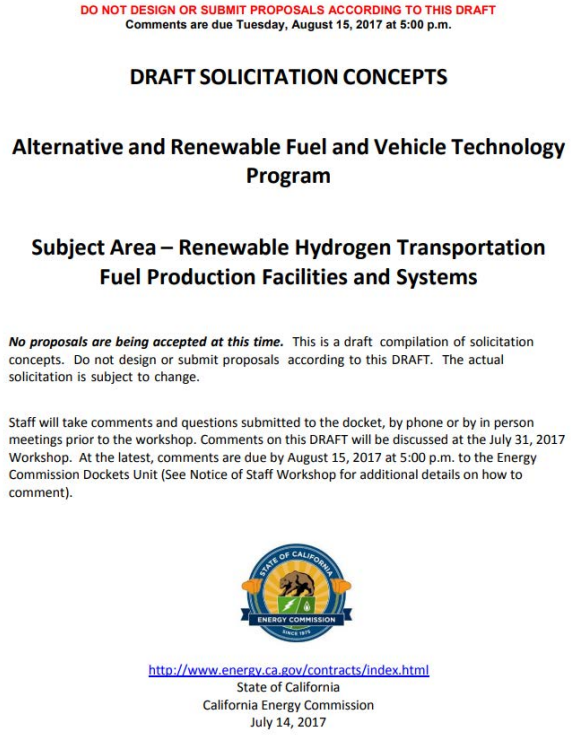
Renewable Hydrogen Requirements

All California co-funded stations must be at least 33% renewable. By 2020, existing law would trigger requirement on all stations regardless of funding. Feedback from industry indicates a strong market desire for renewable, low- or no-carbon hydrogen.



California's First Steps

The California Energy Commission is currently developing grant solicitation concepts for a renewable hydrogen production facility



DO NOT DESIGN OR SUBMIT PROPOSALS ACCORDING TO THIS DRAFT
Comments are due Tuesday, August 15, 2017 at 5:00 p.m.

DRAFT SOLICITATION CONCEPTS

Alternative and Renewable Fuel and Vehicle Technology Program

Subject Area – Renewable Hydrogen Transportation Fuel Production Facilities and Systems

No proposals are being accepted at this time. This is a draft compilation of solicitation concepts. Do not design or submit proposals according to this DRAFT. The actual solicitation is subject to change.

Staff will take comments and questions submitted to the docket, by phone or by in person meetings prior to the workshop. Comments on this DRAFT will be discussed at the July 31, 2017 Workshop. At the latest, comments are due by August 15, 2017 at 5:00 p.m. to the Energy Commission Dockets Unit (See Notice of Staff Workshop for additional details on how to comment).

http://www.energy.ca.gov/contracts/index.html
State of California
California Energy Commission
July 14, 2017

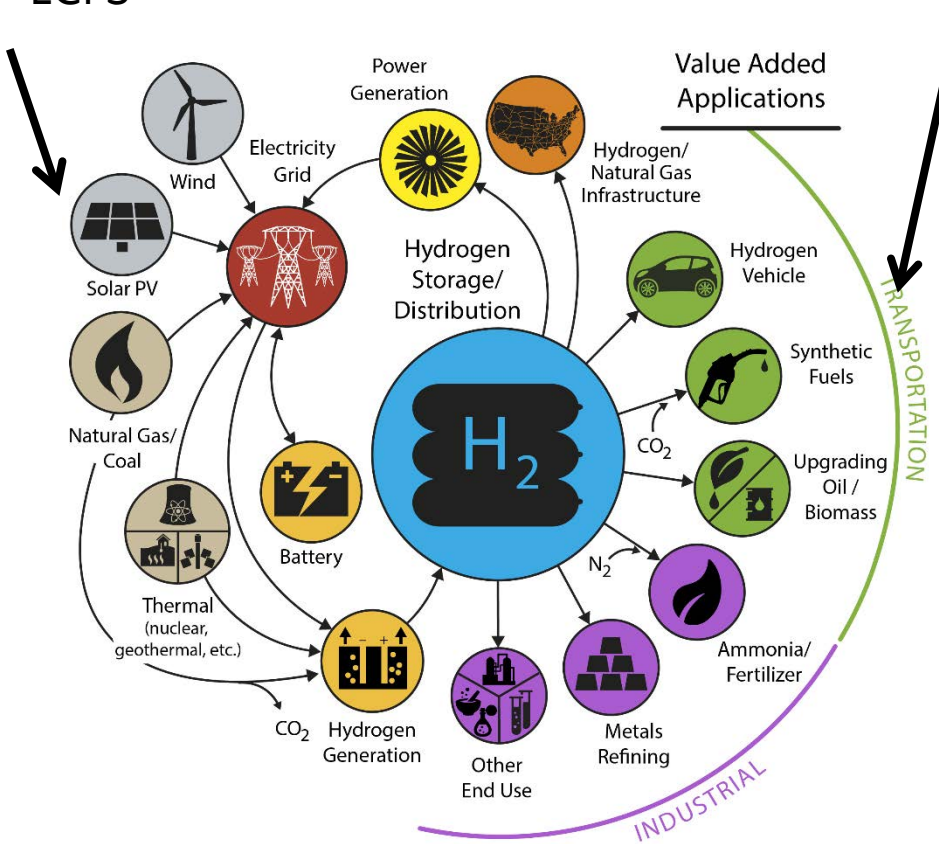
Current Concepts (subject to change by release):

- At least $2M available, up to 75% of total project cost
- At least 1,000 kg/day capacity
- 100% Renewable
- California presence
- Intended to serve light-duty vehicle fueling needs
- Technology neutral
- Demonstrated equipment for at least 6 months
- Off-take arrangements must be determined prior to application

Going Further

2017 has marked a transition in California's FCEV and hydrogen markets from pre-commercial to early commercial phase. Emphasis will now increasingly be focused on rapid expansion and scale. H2@Scale concepts are central to the path forward.

- Renewable and low- to zero–C energy requirements
  - SB1505
  - RPS
  - LCFS
- Vehicle emissions requirements
  - ZEV Regulation
  - AB 8
  - Sustainable Freight Action Plan
  - Ports Clean Air Action Plan



FOR MORE INFORMATION:

https://www.arb.ca.gov/hydrogen

http://www.energy.ca.gov/2017publications/CEC-600-2017-002/CEC-600-2017-002.pdf

http://www.energy.ca.gov/altfuels/2017-HYD-01/documents/

https://www.nrel.gov/docs/fy17osti/67384.pdf

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