CALIFORNIA HYDROGEN BUSINESS COUNCIL

California Hydrogen Business Council

The "*2016 Assessment of Time and Cost Needed to Attain 100 Hydrogen Refueling Stations in California*" AB 8 Joint Report

- A CHBC Webinar -

April 13, 2017

www.CaliforniaHydrogen.org

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Quick Notes

- Two Audio Options: Streaming Audio and Dial-In.
  - Streaming Audio/Computer Speakers (Default)
  - Dial-In: Use the Audio Panel (right side of screen) to see dial-in instructions. Call-in separately from your telephone.
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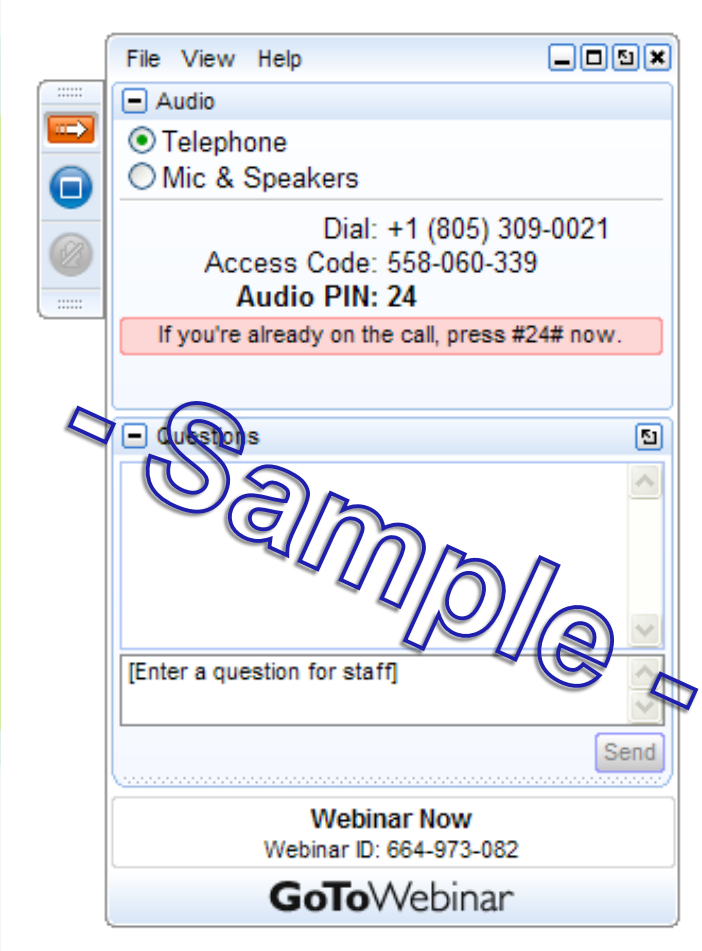
- The recording of the webinar and the slides will be available after the event. Registrants will be notified by email.



CALIFORNIA HYDROGEN BUSINESS COUNCIL

Webinar Speakers & Outline

- Welcome
- Overview & Report Highlights
- Discussion/Q&A

Our Members Include:

- Hydrogen producers and distributors
- Automotive companies
- Public transit systems and suppliers
- Fuel cell, electrolyzer, compressor and storage manufacturers
- Fueling station developers, engineers and consultants
- Municipal, state and federal agencies
- Component suppliers

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2017 Focus & Events

CHBC Advocacy

- Overall goal is inclusion of Hydrogen and Fuel Cells in transportation, energy and clean air decisions made in Sacramento & beyond

CHBC Market Sector Action Groups (SAGs):

- Hydrogen Energy Storage and Renewable Hydrogen
- Heavy Duty Transportation, Goods Movement, and Clean Ports
- Public Transportation
- Strategic Communications

CHBC Programs and Events

- Heavy Duty Trucking with Hydrogen and Fuel Cells – May 1 Workshop in Long Beach
- Roadmap to Renewable Hydrogen – Planned for May 10 Workshop in Irvine
- Private Financing of Hydrogen Refueling Stations
- Public Transit Powered by Fuel Cells
- Hydrogen and Fuel Cells in the Ports

Signature Event

- 2017 California Hydrogen and Fuel Cell Summit in September 25-27 (Sacramento)

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Overview of AB 8 Report and Report Highlights

Miki Crowell & Jane Berner

Energy Commission Specialist II – Hydrogen Unit

California Energy Commission

2016 Joint Agency Staff Report on Assembly Bill 8

April 13, 2017

Jane Berner
Miki Crowell

California Energy Commission

Presentation Outline

- Background on Assembly Bill 8
- Summary of Joint Report contents
- Findings
  - Station development time and cost trends
  - Progress towards 100 station milestone
  - Station dispensing and utilization information
- Questions & Answers
- Feedback for next report

Assembly Bill 8 and the ARFVTP

Assembly Bill No. 8

CHAPTER 401

An act to amend Sections 41081, 44060.5, 44125, 44225, 44229, 44270.3, 44271, 44272, 44273, 44274, 44275, 44280, 44281, 44282, 44283, 44287, 44299.1, and 44299.2 of, to add and repeal Section 43018.9 of, and to repeal Section 44299 of, the Health and Safety Code, to amend Sections 42885 and 42889 of the Public Resources Code, and to amend Sections 9250.1, 9250.2, 9261.1, and 9853.6 of the Vehicle Code, relating to vehicular air pollution, and declaring the urgency thereof, to take effect immediately.

[Approved by Governor September 28, 2013. Filed with Secretary of State September 28, 2013.]

LEGISLATIVE COUNSEL'S DIGEST

AB 8, Perea. Alternative fuel and vehicle technologies: funding programs.

(1) Existing law establishes the Alternative and Renewable Fuel and Vehicle Technology Program, administered by the State Energy Resources Conservation and Development Commission, to provide to specified entities, upon appropriation by the Legislature, grants, loans, loan guarantees, revolving loans, or other appropriate measures, for the development and deployment of innovative technologies that would transform California's fuel and vehicle types to help attain the state's climate change goals. Existing law specifies that only certain projects or programs are eligible for funding, including block grants administered by public entities or not-for-profit technology entities for multiple projects, education and program promotion within California, and development of alternative and renewable fuel and vehicle technology centers. Existing law requires the commission to develop and adopt an investment plan to determine priorities and opportunities for the program. Existing law also creates the Air Quality Improvement Program, administered by the State Air Resources Board, to fund air quality improvement projects related to fuel and vehicle technologies.

This bill would provide that the state board has no authority to enforce any element of its existing clean fuels outlet regulation or other regulation that requires or has the effect of requiring any supplier, as defined, to construct, operate, or provide funding for the construction or operation of any publicly available hydrogen-fueling station. The bill would require the state board to aggregate and make available to the public, no later than June 30, 2014, and every year thereafter, the number of hydrogen-fueled vehicles that motor vehicle manufacturers project to be sold or leased over the next 3 years, as reported to the state board, and the number of hydrogen-fueled vehicles registered with the Department of Motor Vehicles through April 30. The bill would require the commission to allocate $20 million annually, as specified, until there are at least 100 publicly available hydrogen-fueling

Assembly Bill 8

(Perea, Chapter 401, Statues of 2013)

Extended Alternative and Renewable Fuel and Vehicle Technology Program (ARFVTP) funding through January 1, 2024 ($100 million per year)
(ARFVTP created by AB 118, 2007)

"… develop and deploy innovative technologies that transform California's fuel and vehicle types to help attain the state's climate change policies."
(Health and Safety Code Section 44272(a))

Directs Energy Commission to allocate up to $20 million annually for developing hydrogen refueling stations to reach 100 station milestone

AB 8 Reporting Requirements

Two Reports Required Annually

1. The “Annual Evaluation” prepared each summer by the California Air Resources Board (ARB) that estimates fuel cell electric vehicle (FCEV) deployment in future years, evaluates the geographic areas where stations are needed, and recommends technical and performance specifications.
2. The “Joint Report” or “Annual Assessment” prepared by the Energy Commission and ARB each winter.

The 2016 Joint Report is the focus of this presentation. The full title is the “*Joint Agency Staff Report on Assembly Bill 8: 2016 Assessment of Time and Cost Needed to Attain 100 Hydrogen Refueling Stations in California”* and is found here: http://www.energy.ca.gov/2017publications/CEC-600-2017-002/CEC-600-2017-002.pdf

AB 8 Joint Agency Report

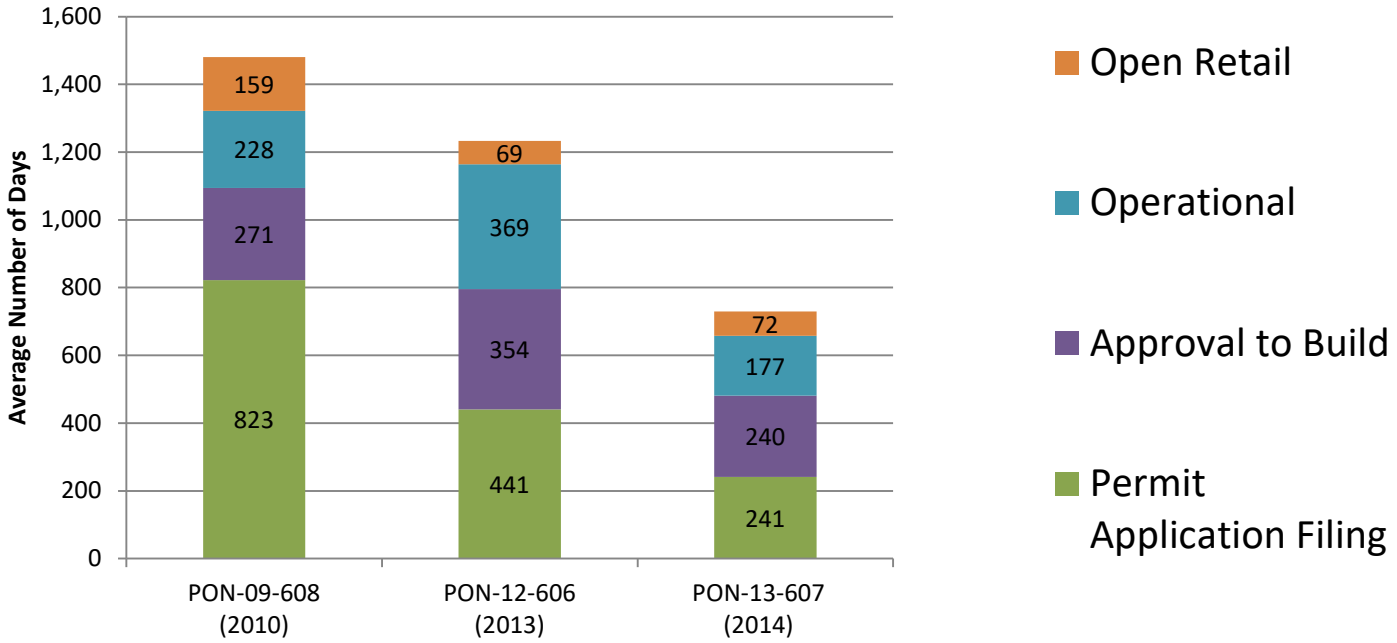
- Evaluates progress toward establishing the hydrogen refueling station network in California
- Reports on the coverage and capacity of the refueling station network
- Considers the rate of FCEV deployment and the corresponding amount of fuel needed to support demand
- Evaluates the length of time required to permit and construct stations
- Determines if ARFVTP funding remains necessary to reach the 100 station milestone

Questions Answered by the Joint Report

- How many hydrogen refueling stations are open to the public?
  - 25 as of December 2016, 19 of which opened in 2016
- How many stations have been funded?
  - 50 stations
    - 48 ARFVTP funded stations
    - 2 non-ARFVTP funded stations
- How much hydrogen fueling capacity do the 50 stations have in total?
  - 9,380 kg/day of hydrogen
    - Enough to satisfy projected FCEV demand for hydrogen until 2019

Questions Answered by the Joint Report

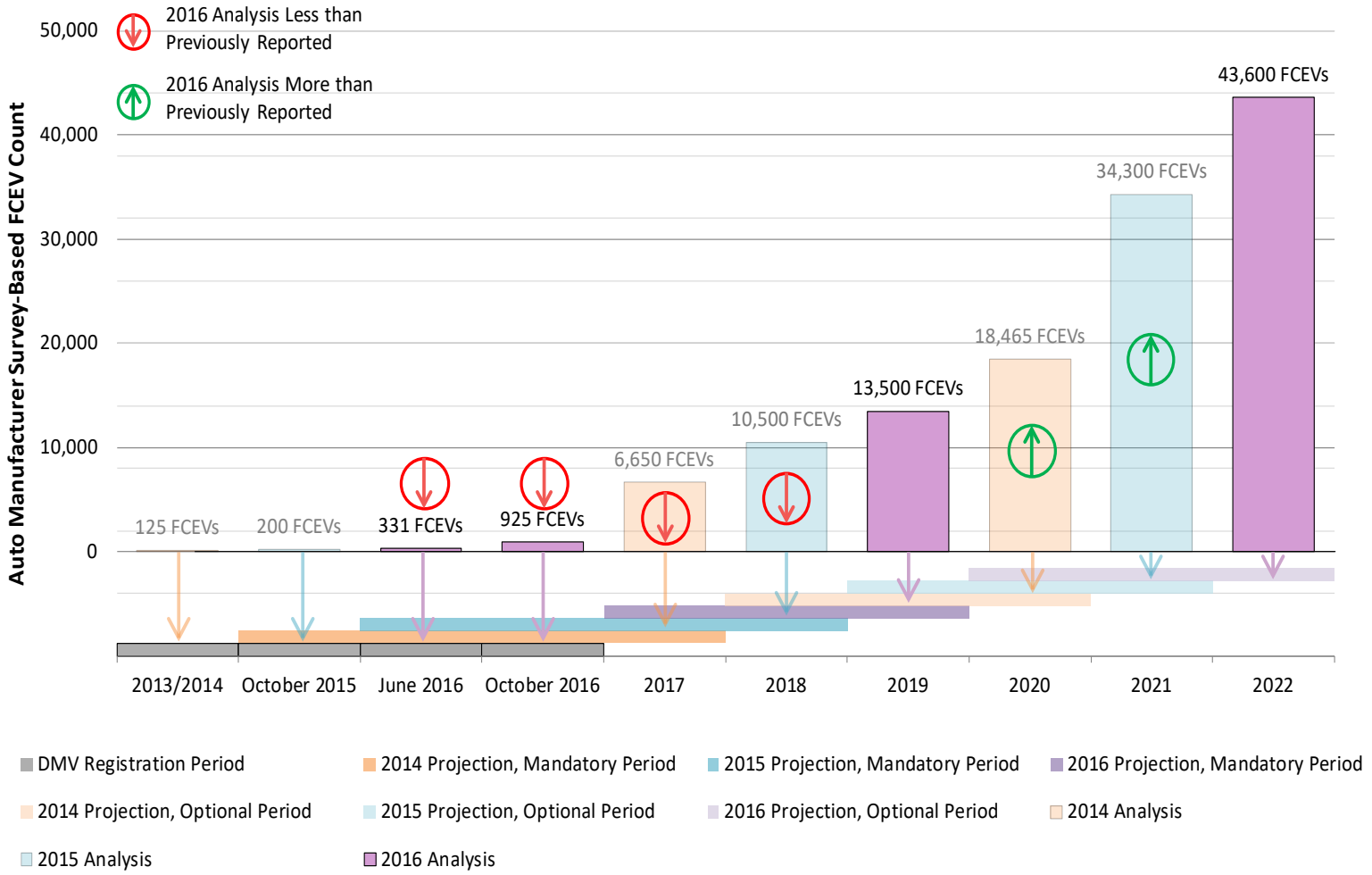
- How much does it cost to build a station?
  - Station all-in cost is around $2 - $3 million
- How long does it take to build a station?
  - About 2 years, reduced from over 4 years



Questions Answered by the Joint Report

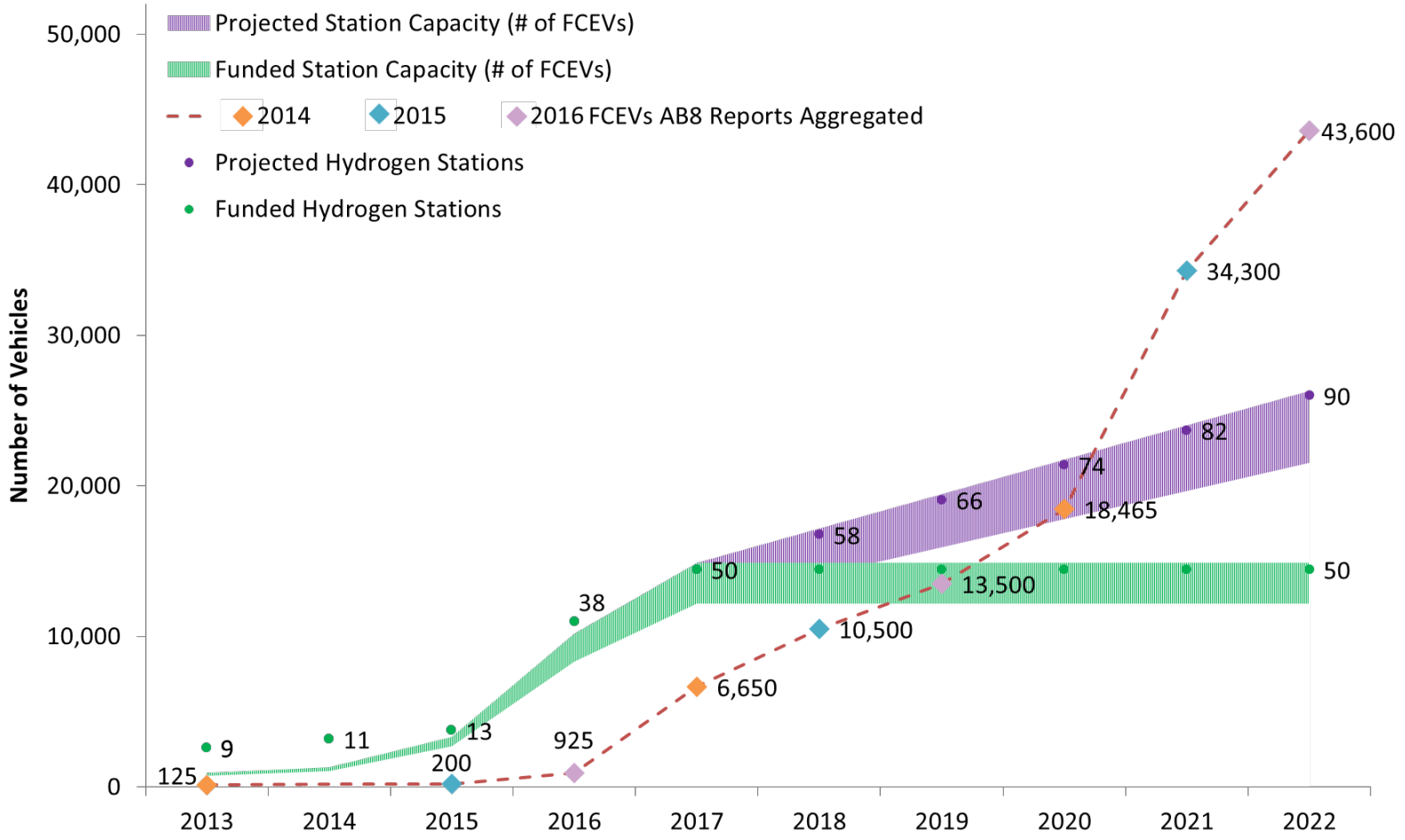
- What will it take to get us to 100 stations?
  - Energy Commission has spent about $100 million already
  - Estimate an additional $125 million is needed to reach the 100-station milestone, for a total investment of $225 million
  - Estimate completion in 2024

FCEV Count and Projections for California



Source: ARB

Station Network Projections



Source: ARB

Capacity Projections

- Expecting a potential fuel shortfall around 2020-2021 if station size and deployment rate remains the same (current average size = 180 kilograms per day)

	2017	2018	2019	2020	2021	2022
Quantity of Open Retail Stations	50	58	66	74	82	90
Total Nameplate Capacity (kg/day)	9,380	10,820	12,260	13,700	15,140	16,580
FCEV Fuel Demand (kg/day)	4,400	7,200	9,200	12,800	23,700	30,300

Source: ARB

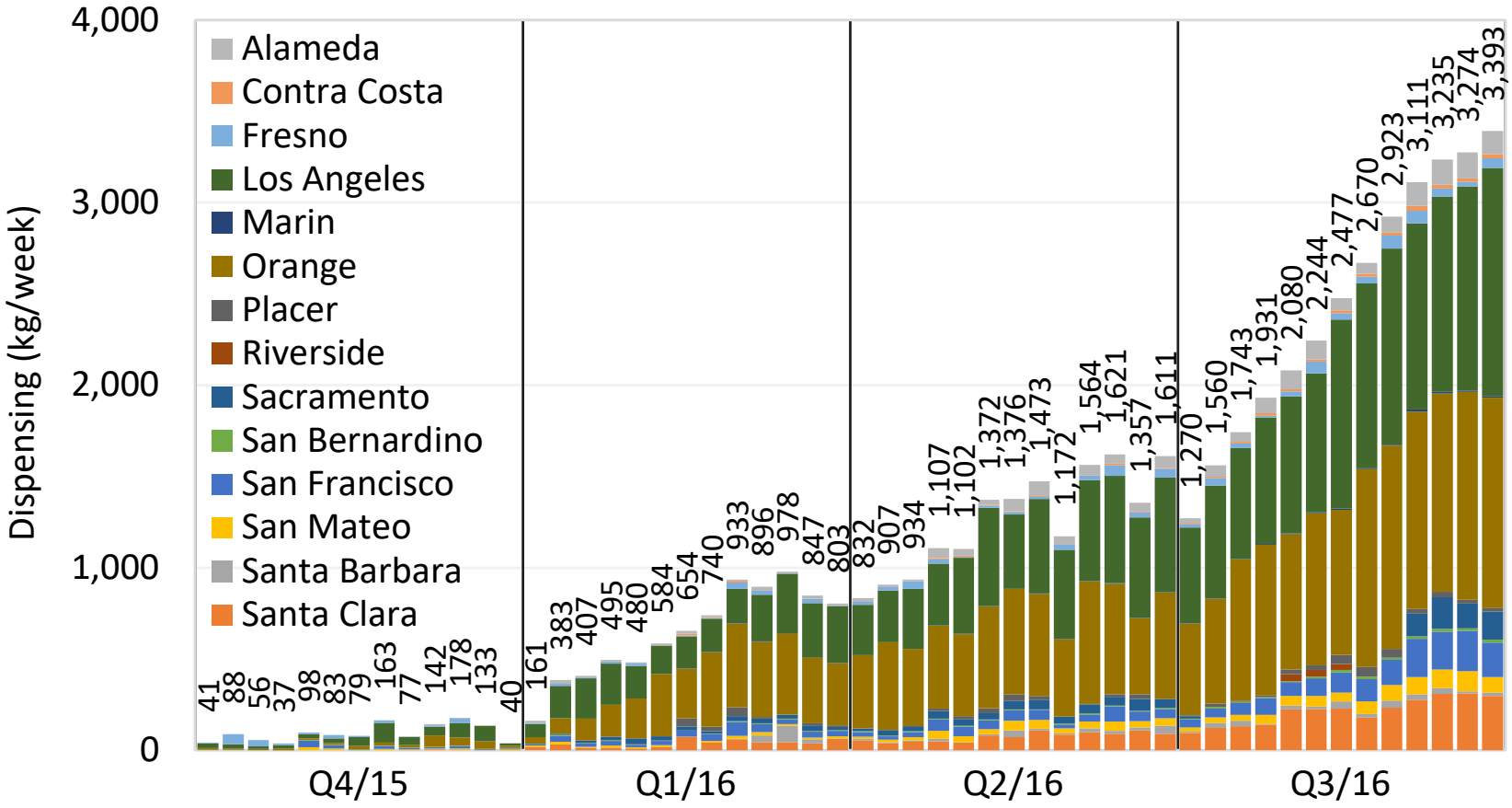
Self-Sufficiency Framework

- Goal: to identify when the private sector will find compelling financial opportunities to develop hydrogen infrastructure without public financial support
- In other words, when will California's hydrogen refueling stations be self-sufficient?
- Expect the project to last two years for the first set of business analyses, with iterations and refinement beyond that
- Will be engaging a variety of stakeholders to understand their value propositions

Quarterly Statistics

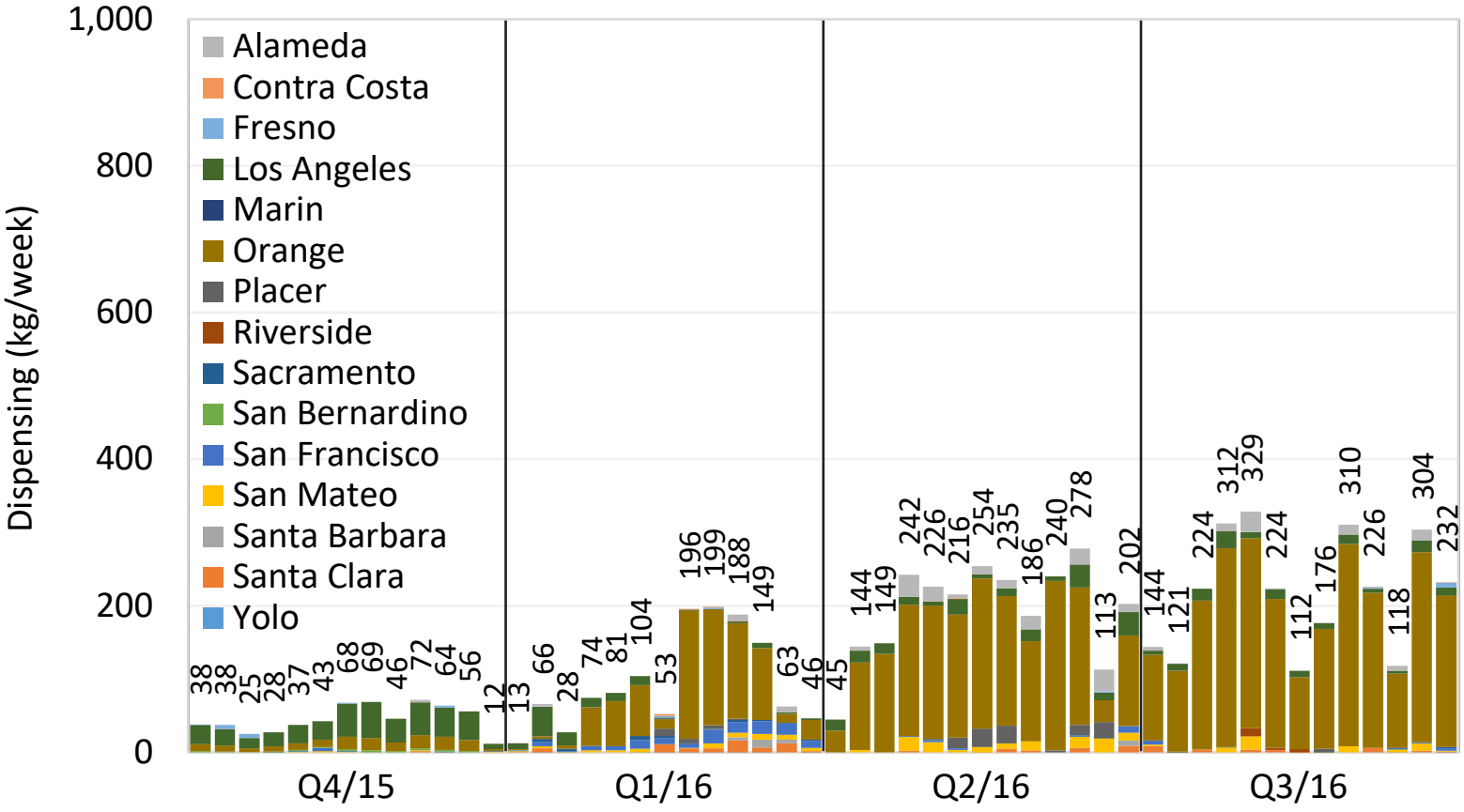
Quarterly statistics	Q4/15	Q1/16	Q2/16	Q3/16	Annual average or total
Average daily kilograms dispensed	13	92	181	351	159
% change over previous quarter		↑ +589%	↑ +96%	↑ +94%	
Average utilization (%)	1.8%	3.0%	4.5%	8.0%	4.3%
% change over previous quarter		↑ +62%	↑ +52%	↑ +78%	
Average unused capacity (kg/day)	831	2,883	3,781	3,985	2,870
% change over previous quarter		↑ +247%	↑ +31%	↑ +5%	
Total number of fuelings	504	3,240	5,732	11,408	79,541
% change over previous quarter		↑ +543%	↑ +77%	↑ +99%	
Average fueling quantity (kg)	2.43	2.58	2.87	2.82	2.67
% change over previous quarter		↑ +6%	↑ +11%	↓ -1%	
Total hydrogen dispensed (kg)	1,224	8,351	16,428	32,215	58,639
% change over previous quarter		↑ +582%	↑ +97%	↑ +96%	
Maximum price of H70 ($/kg)	$ 17.68	$ 16.66	$ 16.78	$ 16.78	
Minimum price of H70 ($/kg)	$ 13.59	$ 12.85	$ 12.85	$ 12.85	
Sales-weighted price H70 ($/kg)	$ 15.43	$ 15.19	$ 15.18	$ 15.28	$ 15.25
% change over previous quarter		↓ -2%	↓ -0%	↑ +1%	
Maximum price of H35 ($/kg)	$ 17.90	$ 16.62	$ 16.78	$ 16.78	
Minimum price of H35 ($/kg)	$ 14.01	$ 10.85	$ 10.85	$ 10.85	
Sales-weighted price H35 ($/kg)	$ 16.17	$ 14.46	$ 13.68	$ 13.36	$ 13.71
% change over previous quarter		↓ -11%	↓ -5%	↓ -2%	
Sales-weighted price H2 ($/kg)	$ 15.45	$ 15.08	$ 14.94	$ 15.11	$ 15.07
% change over previous quarter		↓ -2%	↓ -1%	↑ +1%	

Weekly Dispensing



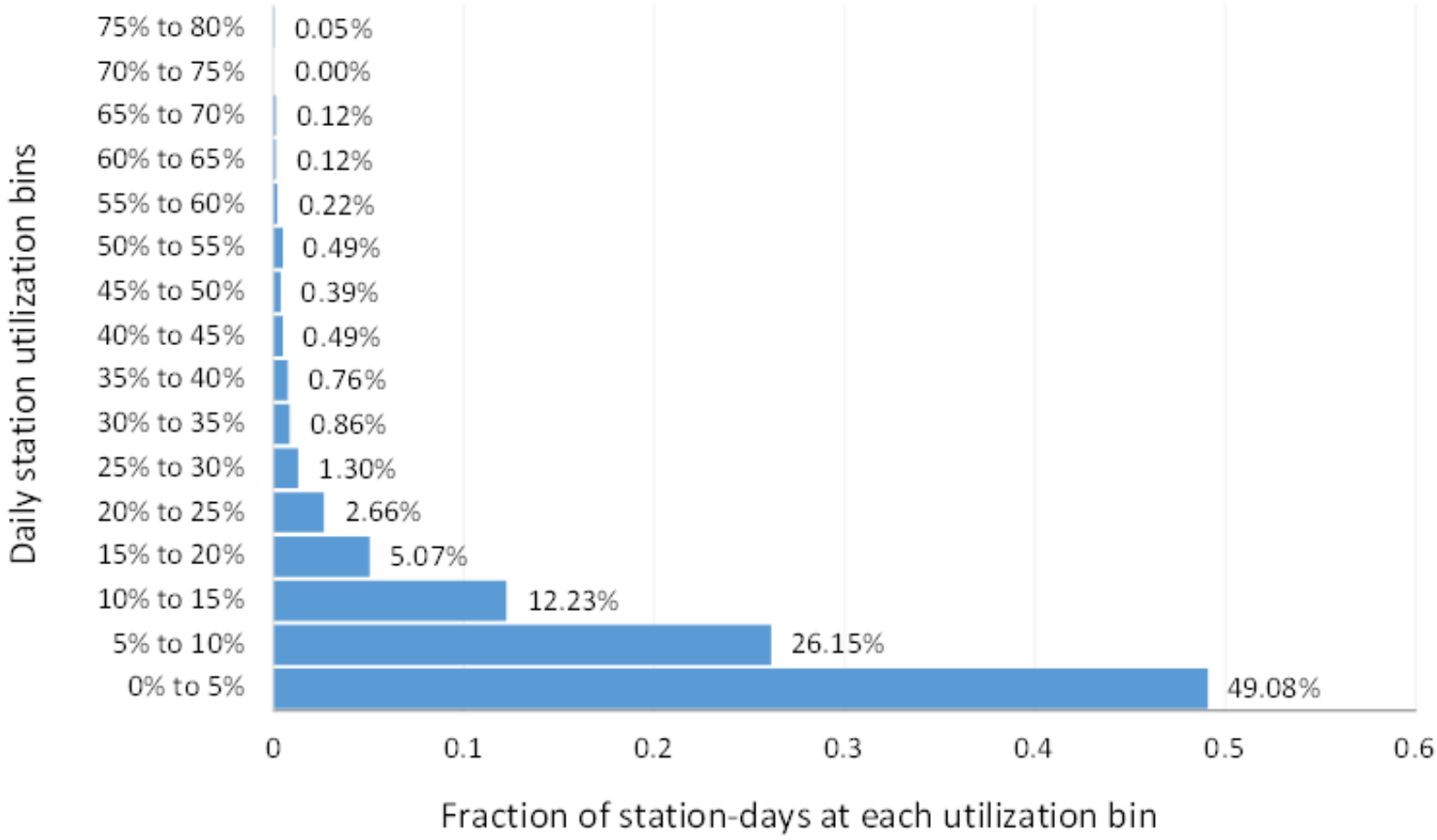
Source: NREL

Weekly H35 Dispensing



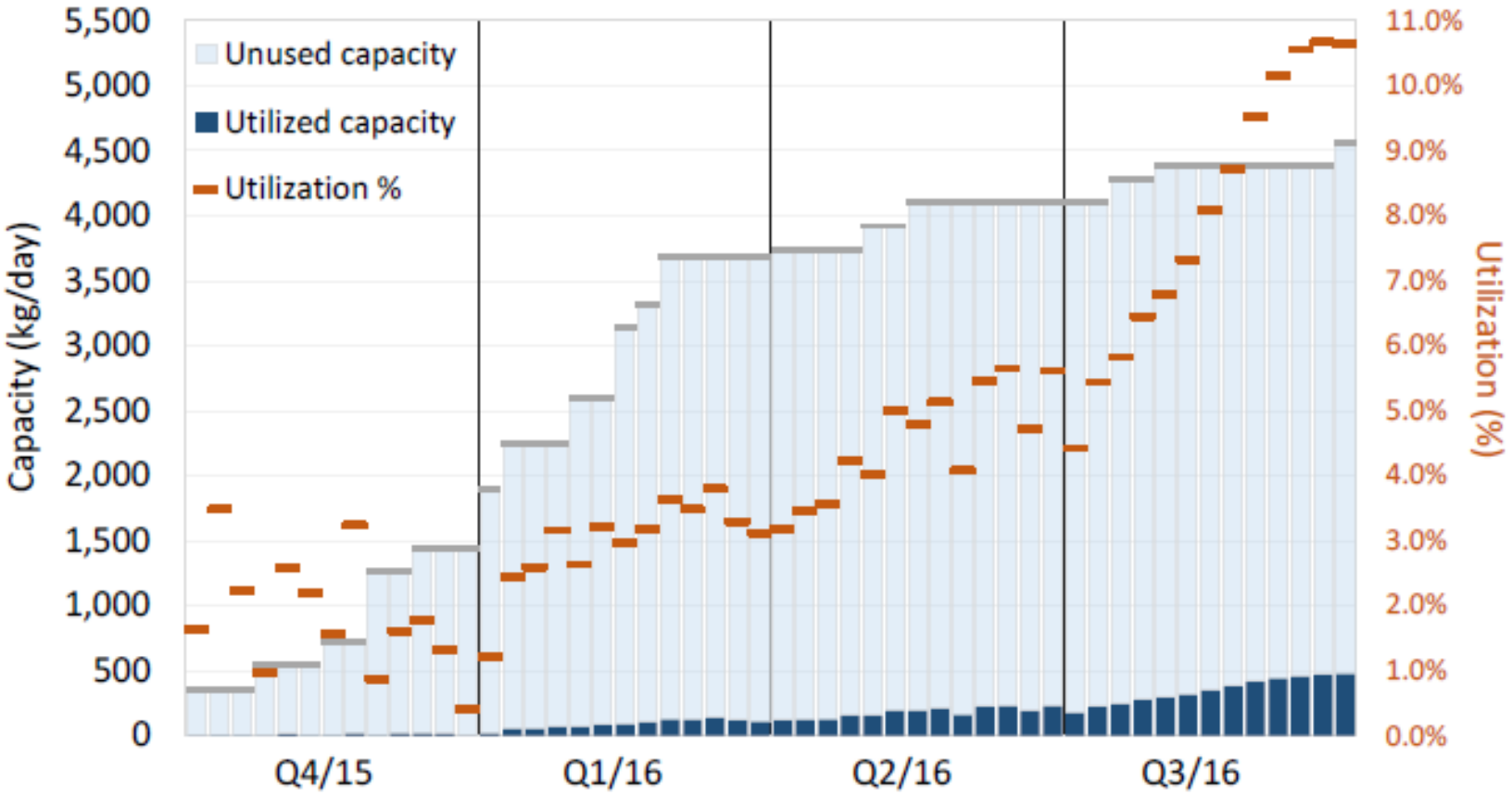
Source: NREL

Station Utilization



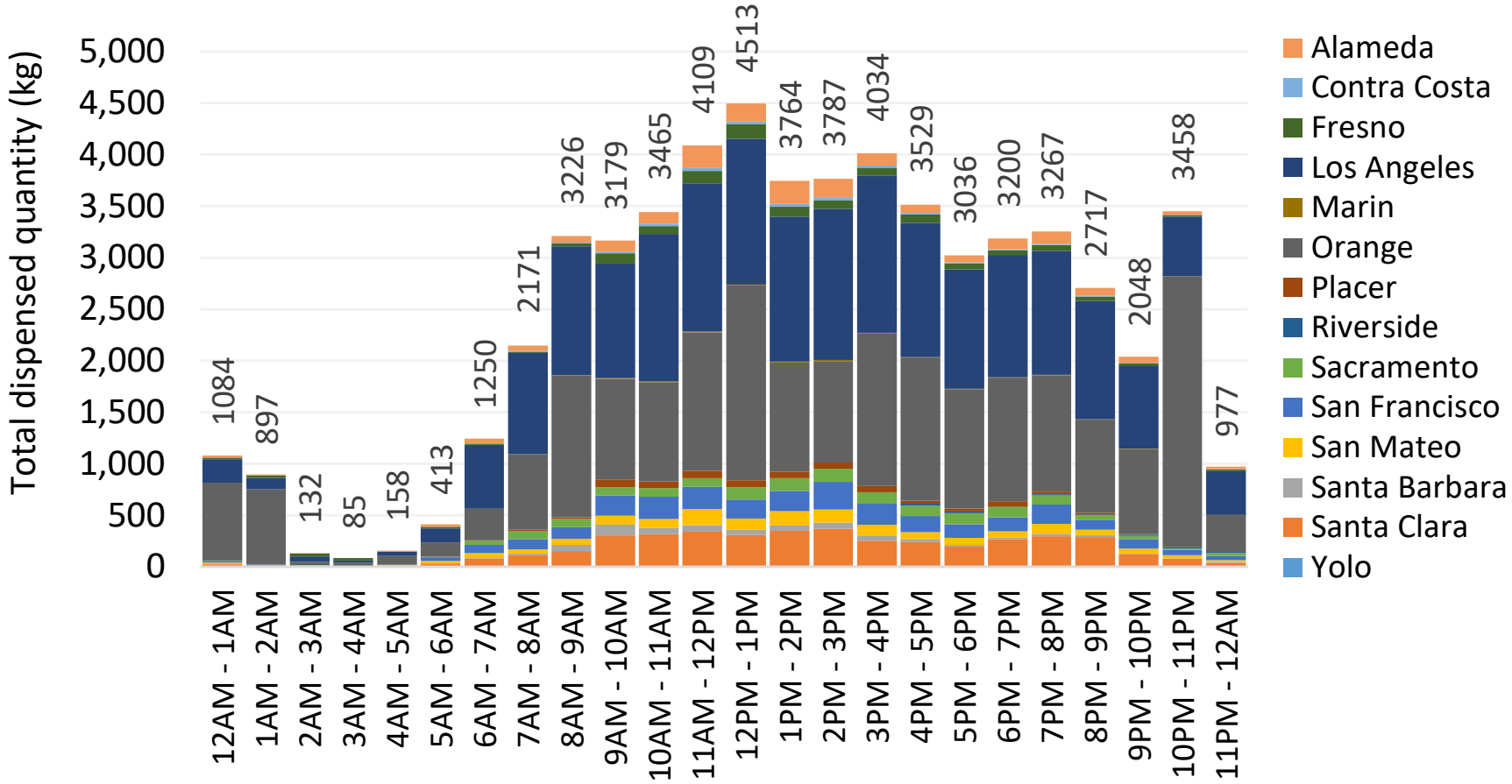
Source: NREL

Station Utilization



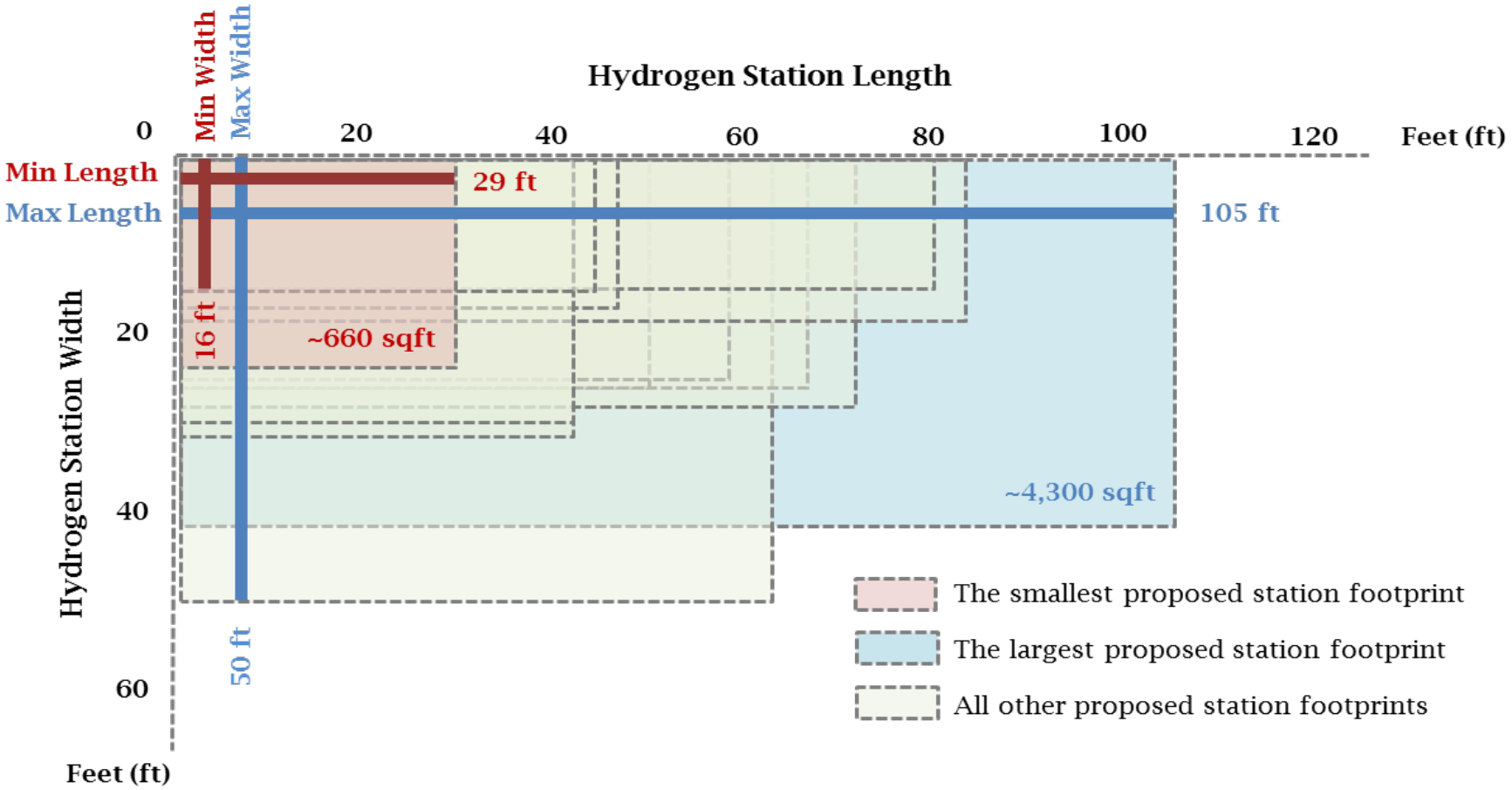
Source: NREL

Dispensing Hours



Source: NREL

Equipment Footprints



Source: California Energy Commission staff

Contacts

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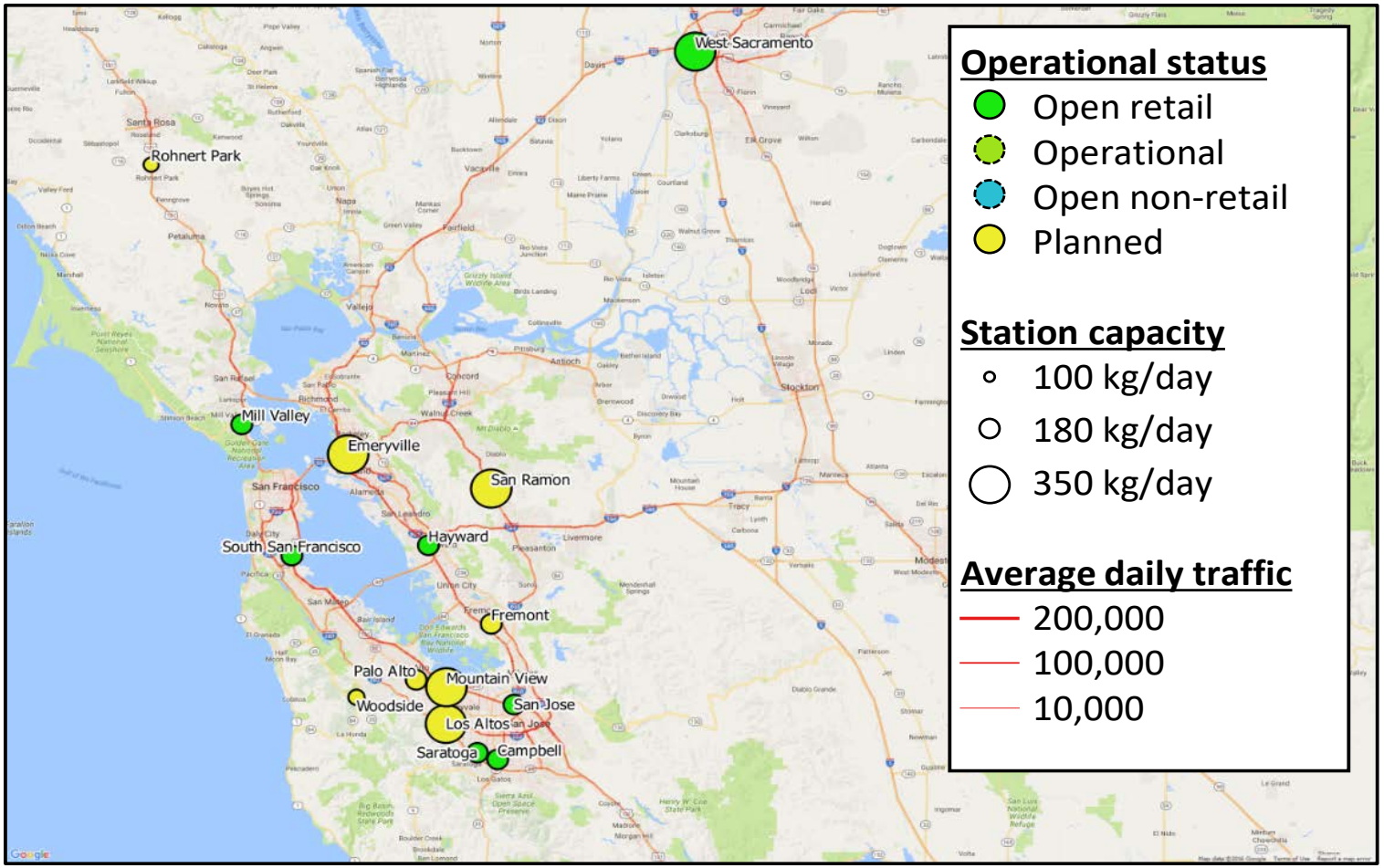
Thank You

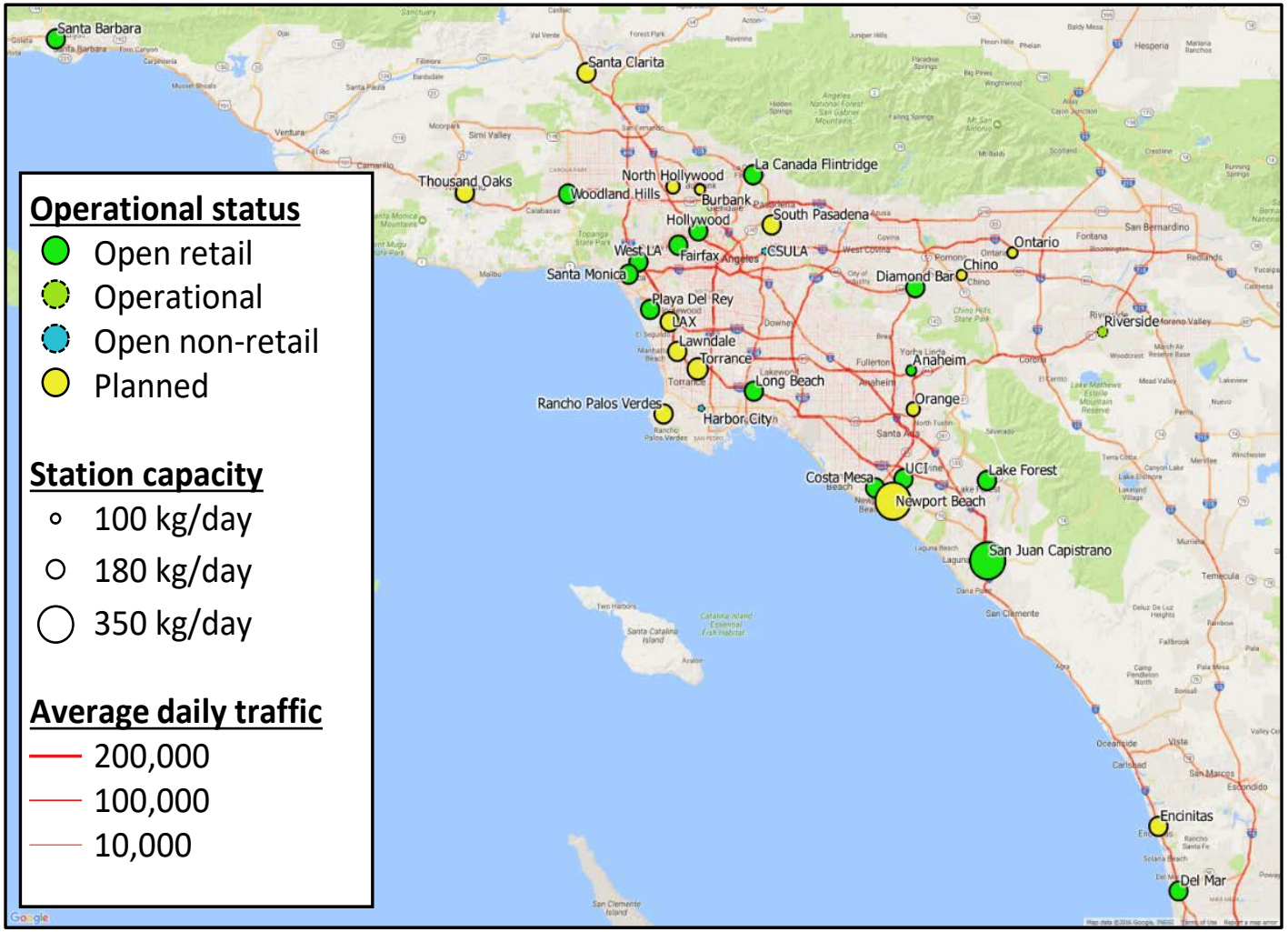
Source: California Fuel Cell Partnership

Station Locations: Northern California



Source: NREL

Station Locations: Southern California



Source: NREL

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Question and Answer Session

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Thank you!

Thank you for attending today's webinar and remember to fill out attendee survey. Slides and Recording will be made available within one week.

For more information, contact:

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