

2021 ANNUAL EVALUATION OF FUEL CELL ELECTRIC VEHICLE DEPLOYMENT & HYDROGEN FUEL STATION NETWORK DEVELOPMENT

California Fuel Cell Partnership Webinar
October 8, 2021



OVERVIEW OF AB 8 AND REPORTS

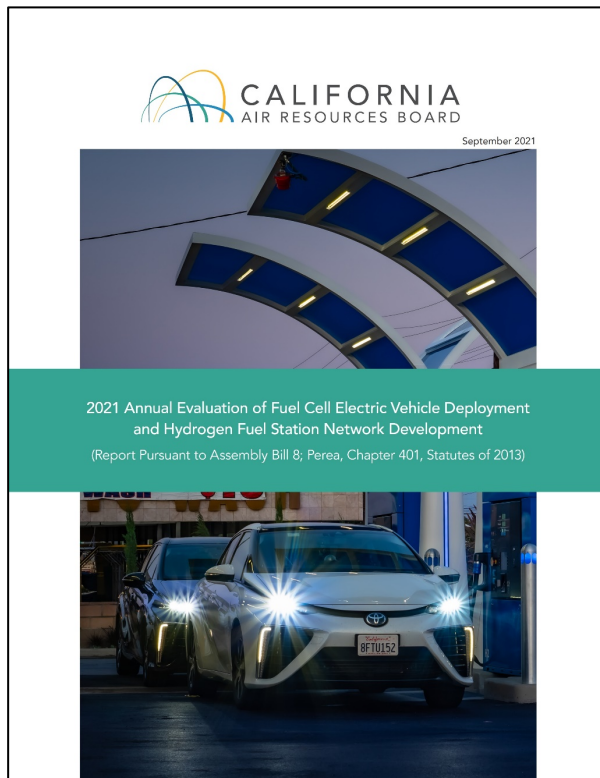
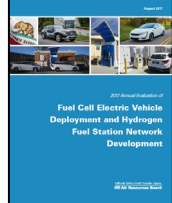
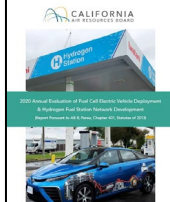
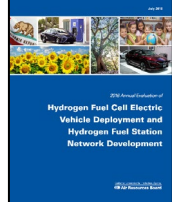
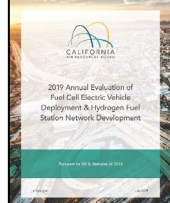
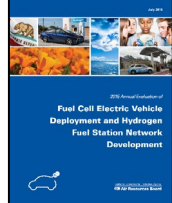
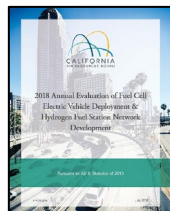
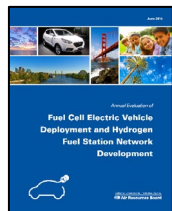


Overview of AB 8



- Assembly Bill 8 passed in 2013 and continues through January 1, 2024
- Provides California Energy Commission with up to \$20 million per year for development of at least 100 hydrogen fueling stations (through the Clean Transportation Program)
- Requires semi-annual reporting on progress and evaluation of needs

CARB's Summer AB 8 Reports



- By June 30, CARB reports to Energy Commission:
 - Current and projected FCEV fleet and station progress
 - Assessment of network coverage and capacity
 - Recommended future station placement
 - Recommended station technical specifications
- CARB also reports on other topics as appropriate for each year, including: renewable hydrogen, hydrogen production and supply, consumer responses, medium- and heavy-duty developments, and others

CEC and CARB's Joint Winter AB 8 Reports



California Energy Commission
California Air Resources Board

Joint Agency Staff Report on Assembly Bill 8: 2020 Annual Assessment of Time and Cost Needed to Attain 100 Hydrogen Refueling Stations in California

Gavin Newsom, Governor
December 2020 | CEC-600-2020-008

- By December 31, agencies jointly report on:
 - Progress on developing coverage and capacity sufficient for FCEVs deployed and planned
 - Time and cost to develop hydrogen fueling stations
 - Remaining cost and time to establish a network of 100 publicly-available stations (recent reports expand this to 200 stations per Executive Order B-48-18)
- Agencies also report on other topics, including: station utilization, station uptime, estimated emissions reductions, station economics, global developments, and others

Data Sources for Reporting

- Both reports based on data resources outlined in AB 8 along with supplementary information
 - Current FCEVs on the road per Department of Motor Vehicles data
 - Future FCEV projections based on annual survey of auto manufacturers administered by CARB
 - Public announcements of future FCEV and hydrogen infrastructure development plans
 - Operational data submitted by stations receiving State support
 - Status and projections of network development based on reporting and conversations with station developers
 - Renewable hydrogen content as reported to CEC and CARB's LCFS program by station operators
 - Regular updates from public-private cooperative efforts

Upcoming Self-Sufficiency Report

Conditions that Reduce the Economic Gap and Time to Self-Sufficiency:

- High Rates of FCEV Deployment
- Rapid Development of Economies of Scale, especially in Operational Costs
 - Faster, Earlier Network Expansion
 - Development of Larger Station Networks
- Larger Individual Stations
- Faster Reductions in Cost to Procure Hydrogen

Implications for Potential Future State Support Program Structure:



Up to \$300 Million
State Support

- Self-sufficiency can be achieved in most representative scenarios by 2030 with \$300 million or less in State support beyond AB 8
- Rapid development in California that reduces operational costs is the most effective route to economies of scale
- Strategies that wait for economies of scale in capital expenses developed outside California could be more costly
- State support may additionally accelerate reductions in prices paid by consumers at the pump



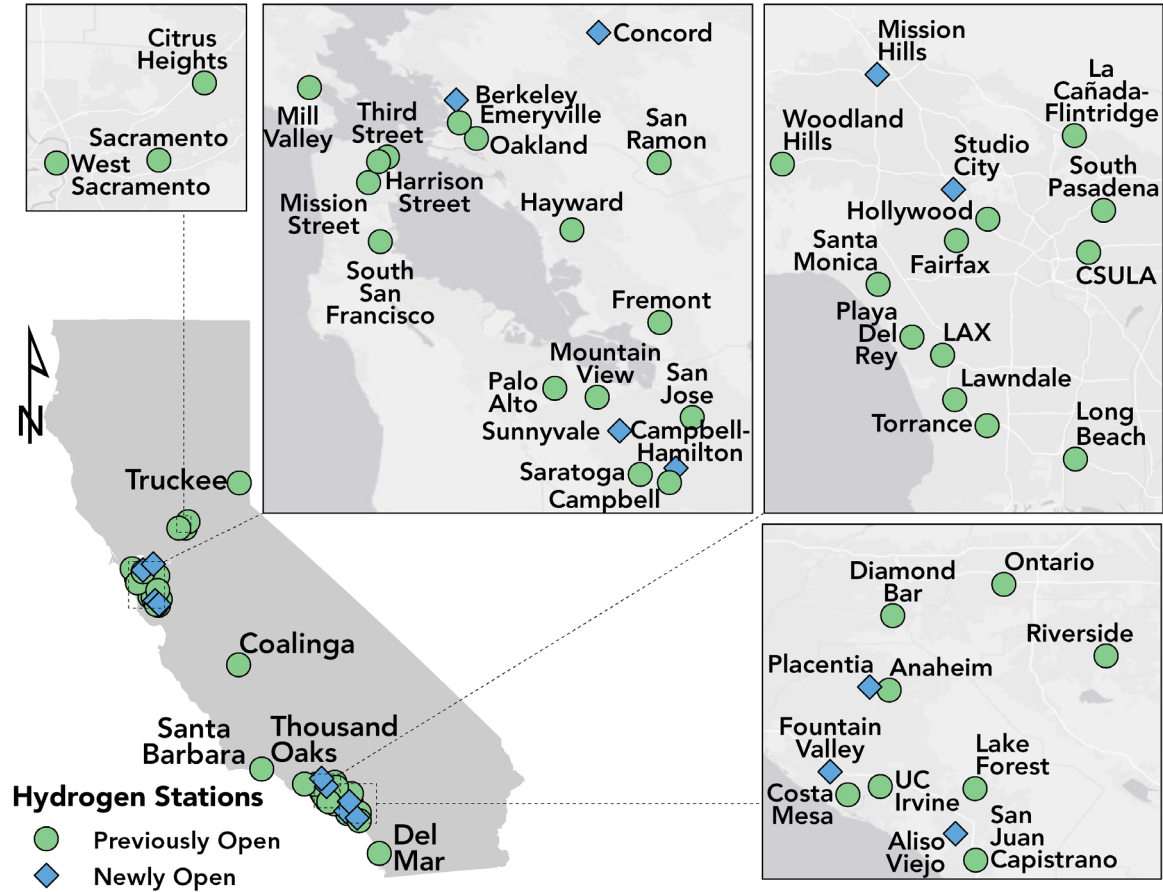
- AB 8 funding for stations provided until "the private sector is establishing hydrogen-fueling stations without the need for government support."
- Requires understanding of station and network economics to identify potential funding gap.
- CARB (with early CEC collaboration) developed a scenario analysis method to evaluate the range of possible timing to self-sufficiency and potential State support needed beyond AB 8.
- Built on extensive review of literature, interviews and surveys of industry representatives, and independent expert review.

2021 REPORT FINDINGS & CONCLUSIONS

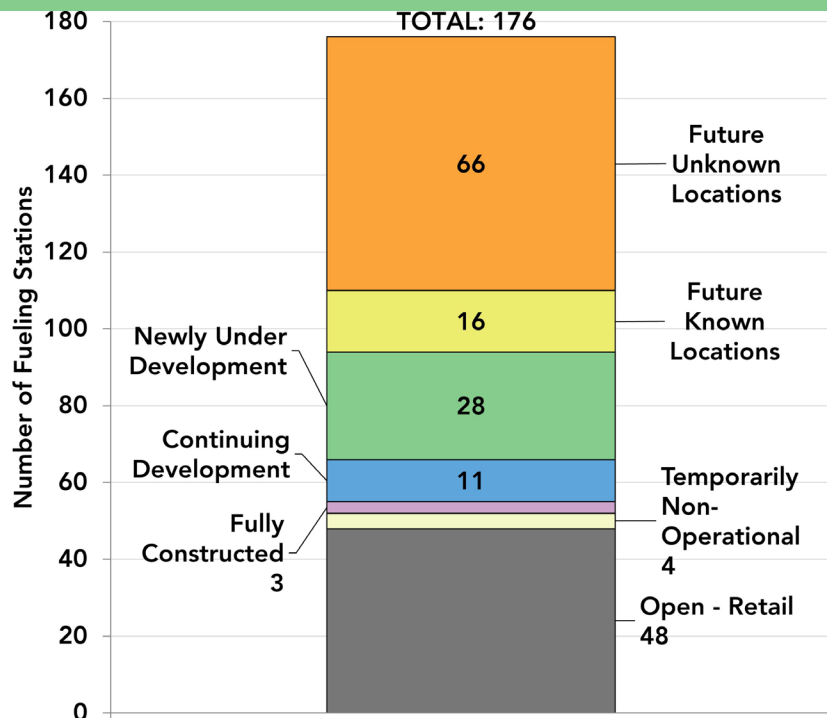


Finding 1

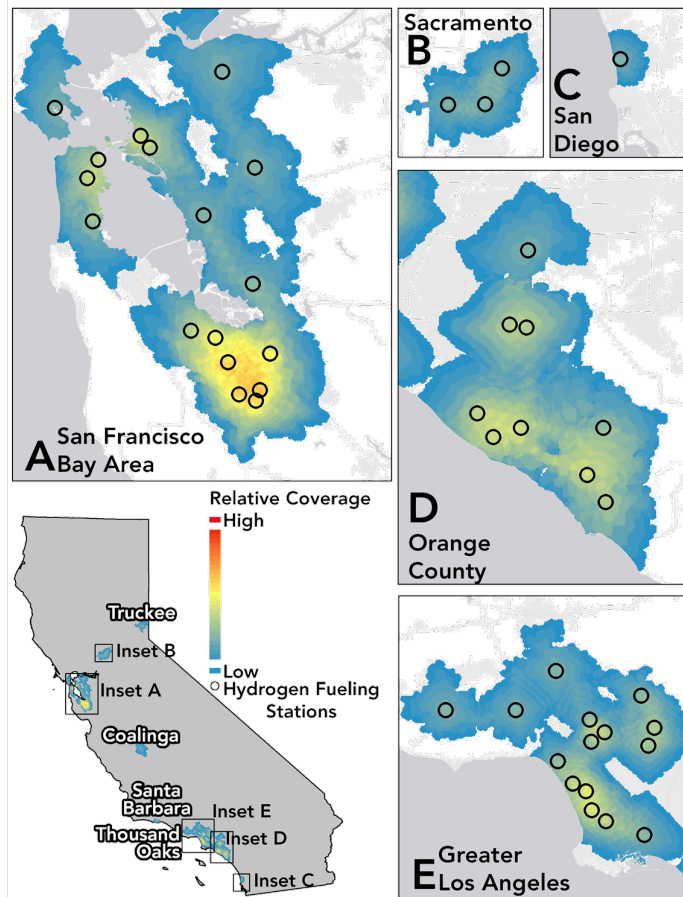
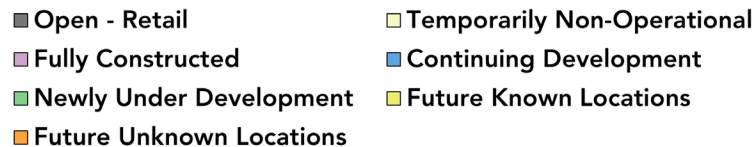
California's hydrogen fueling network has grown to 52 stations, with 48 Open-Retail stations available for customer fueling as of June 29, 2021



Current Network Status Detail

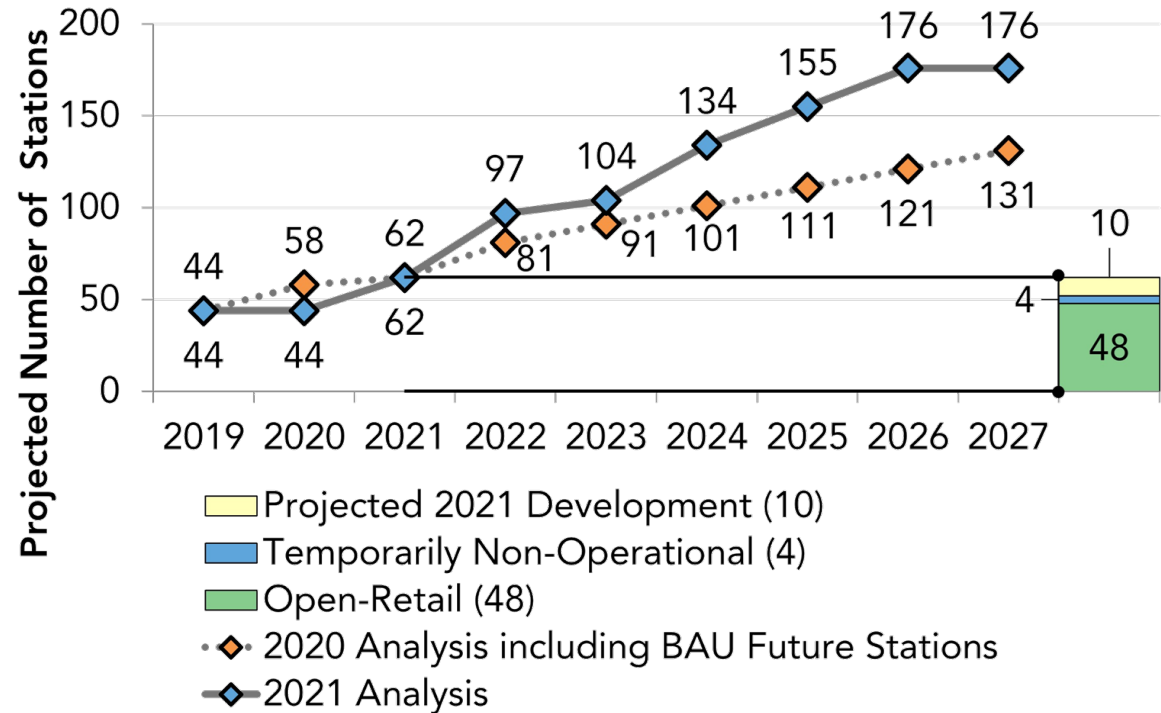


Station Progress During June 2021 Evaluation



Finding 2

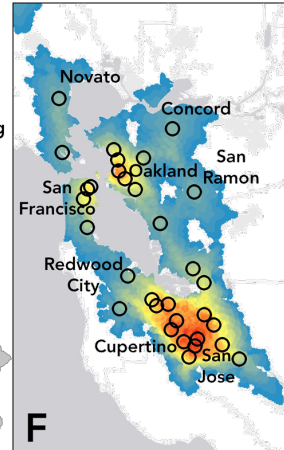
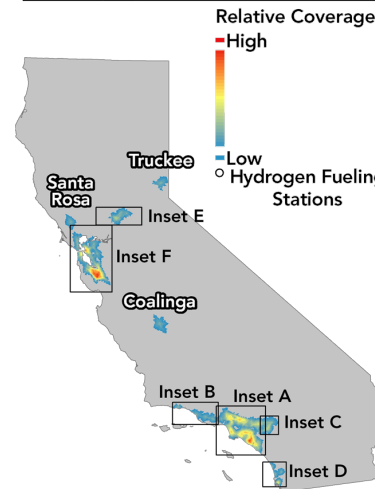
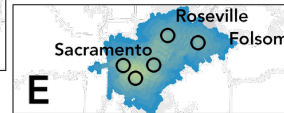
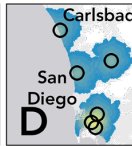
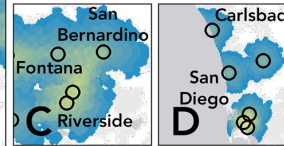
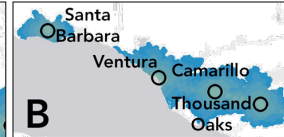
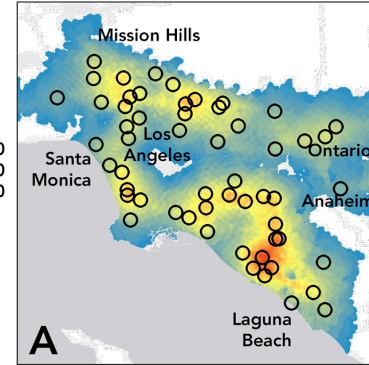
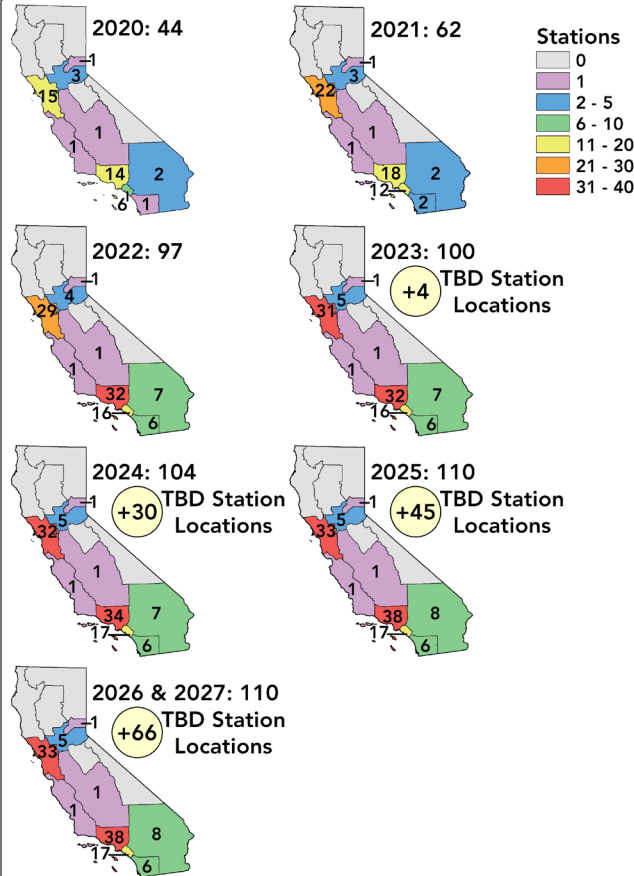
New station awards by the CEC have significantly advanced the outlook for future network development well beyond previous projections



Related Conclusion: Ensure that future hydrogen fueling network development continues as close as possible to the pace of current projections.

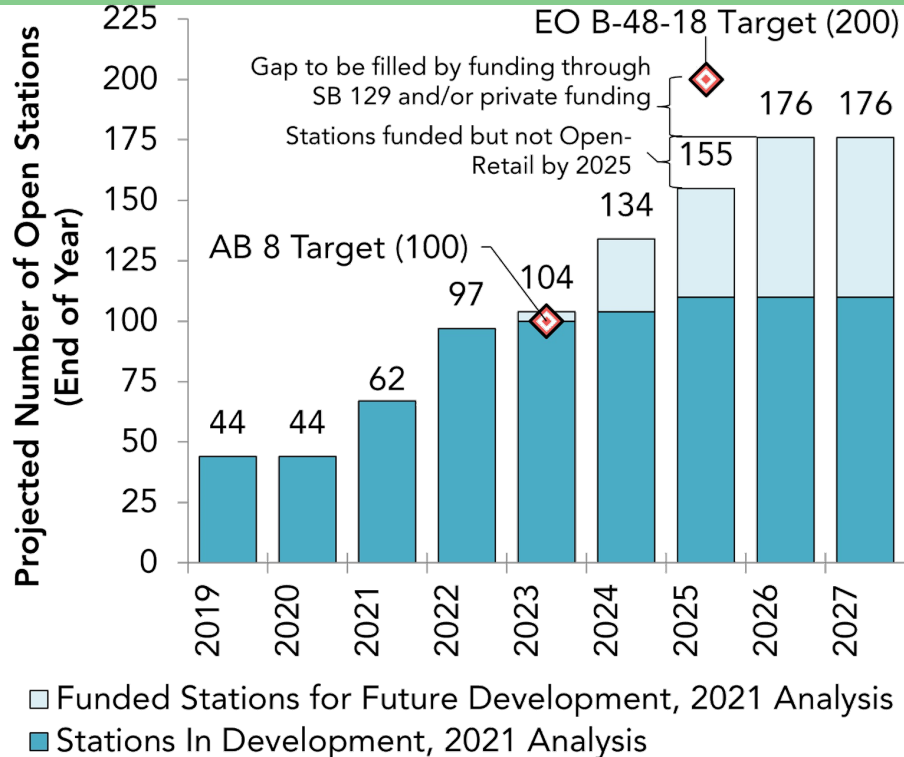
Currently Known Network Development Plans

Of more than 176 station projects, 110 currently have an address specified



Finding 3

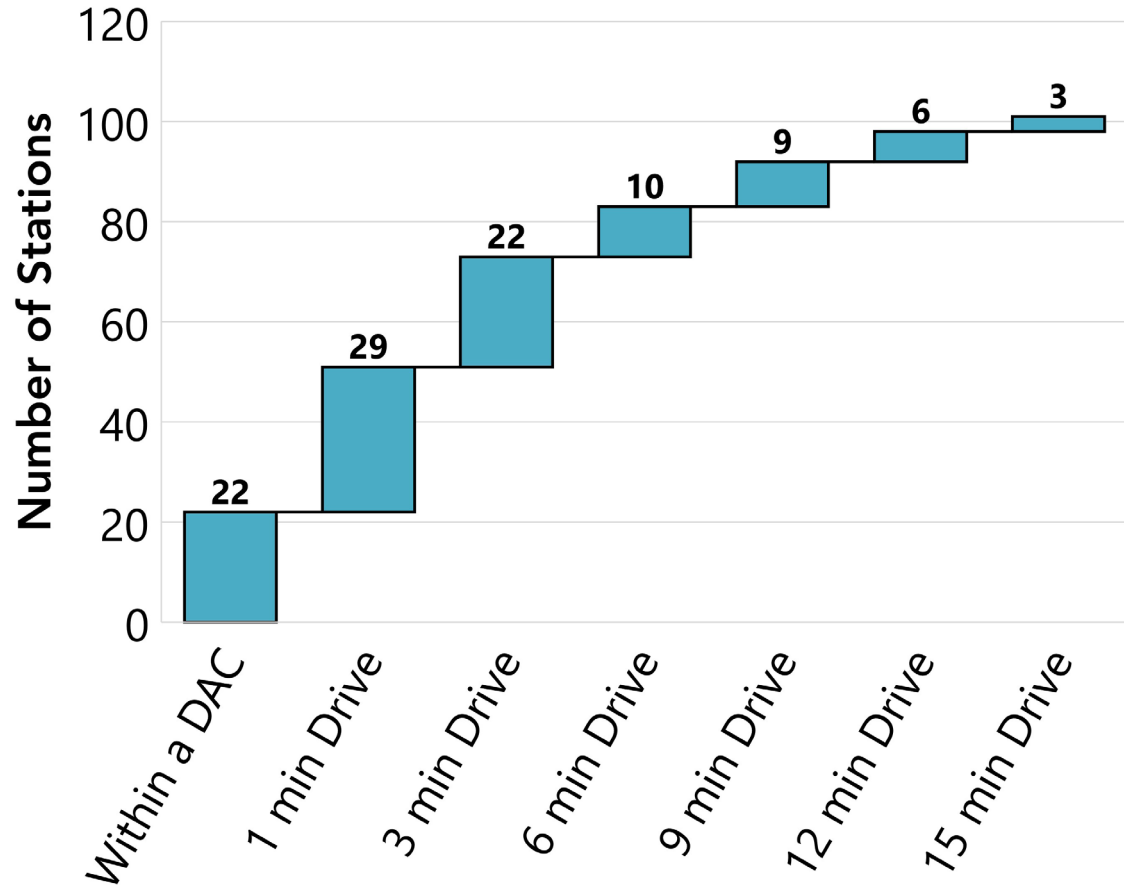
Planned network development will achieve the goals of AB 8 and narrow the gap to the target of Executive Order B-48-18



Related Conclusion: The budget outlined in SB 129 offers an opportunity for California to narrow the gap to the EO B-48-18 goal of 200 stations.

Finding 4

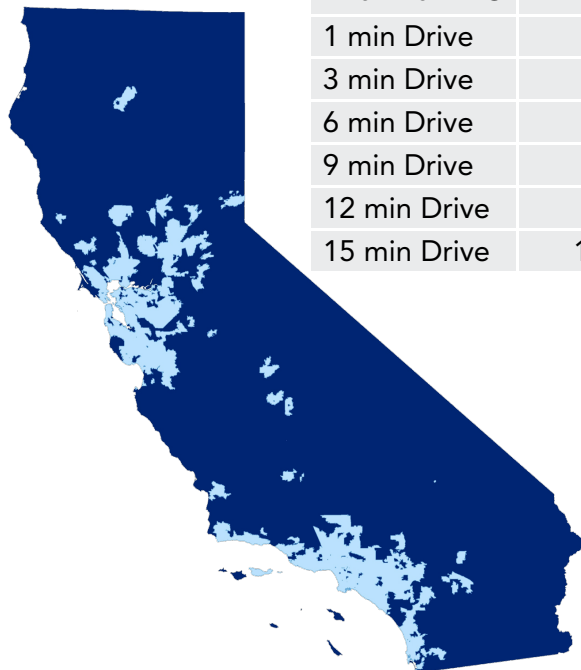
California's planned hydrogen fueling network will provide convenient fueling access to residents of disadvantaged communities



Communities with FCEVs and Stations

- FCEVs spread across nearly half the state

- Station access similar across DACs and general public



Station Proximity to a DAC	Count of Stations	Percent of Known Locations	Percent of DAC Population	Percent of Statewide Population
Within a DAC	22	20%	N/A	N/A
1 min Drive	51	46%	4%	5%
3 min Drive	73	66%	14%	15%
6 min Drive	83	75%	34%	34%
9 min Drive	92	84%	49%	49%
12 min Drive	98	89%	60%	57%
15 min Drive	101	92%	67%	62%

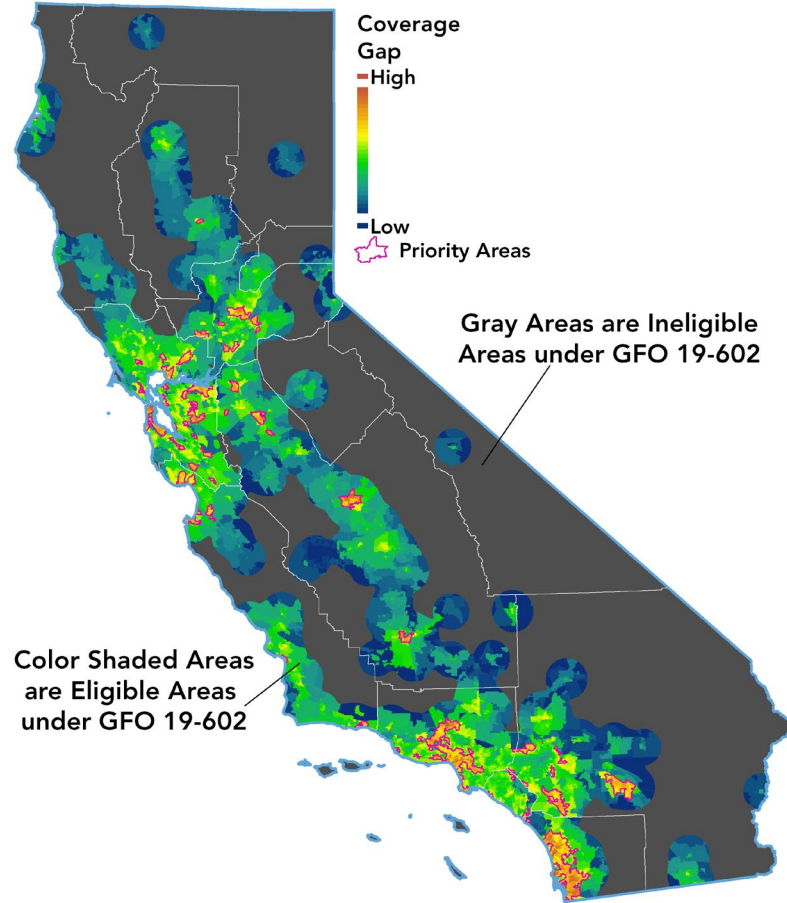
ZIP Codes with Registered FCEVs



[49% of ZIP Codes have Active Registration(s)]

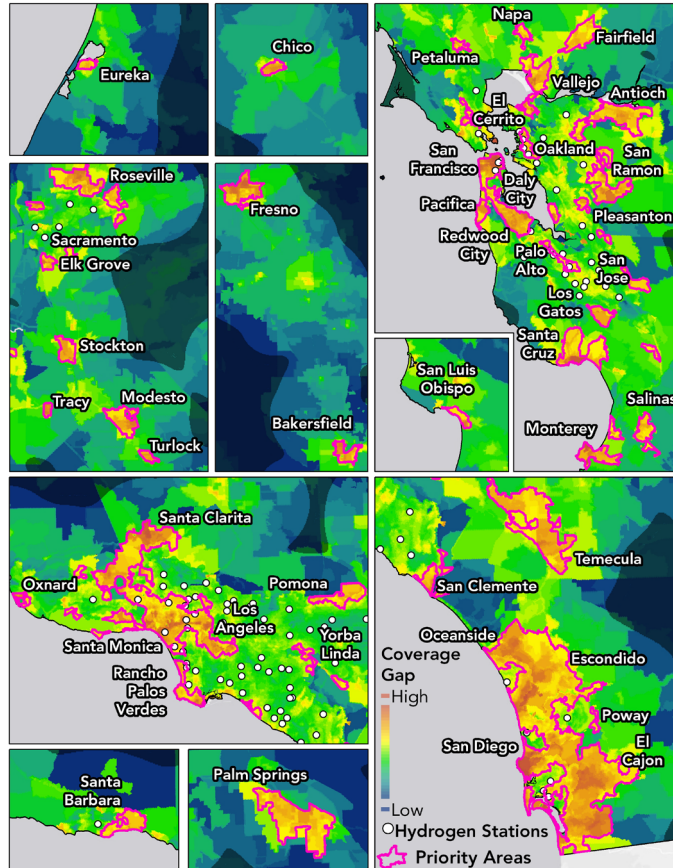
Finding 5

Future station development through GFO-19-602 and other efforts should focus on opportunities in both established and emerging markets



Related Conclusion: Encourage further hydrogen station network development in both established and new markets.

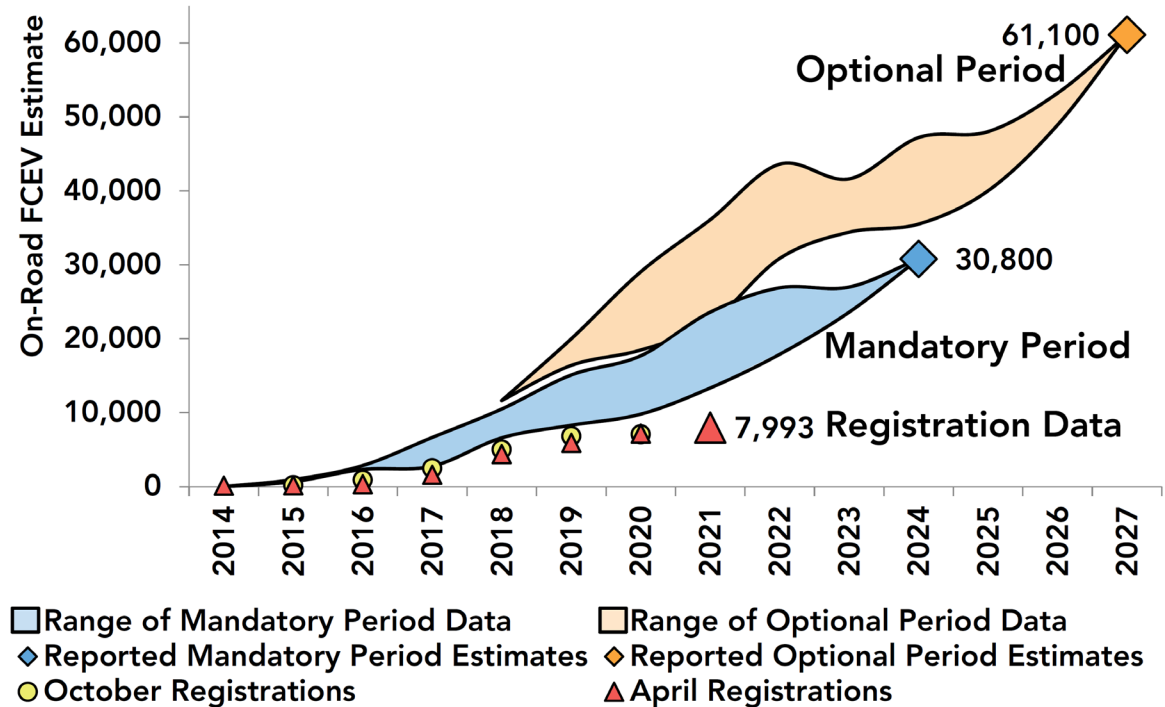
CHIT Analysis Detail



- New market opportunities in central valley, Sacramento valley, Palm Springs, central coast, and even northern California
- Sidenote: CHIT updated for 2021
 - Updated input data to most recent available from all internal and external sources
 - 2017 version will be maintained to continue support of GFO-19-602, but not used in reports

Finding 6

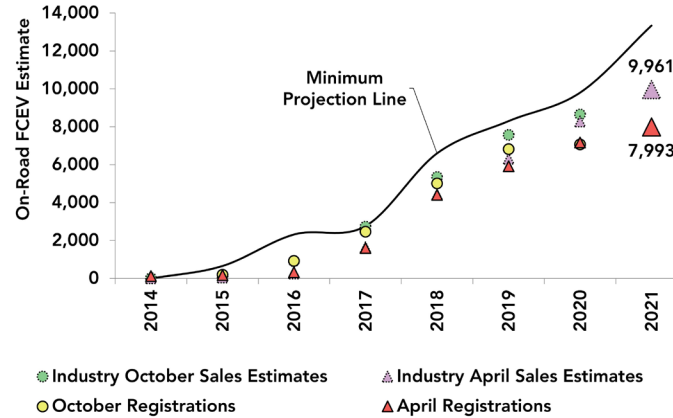
Auto manufacturer projections for future FCEV deployment show more long-term growth than prior surveys



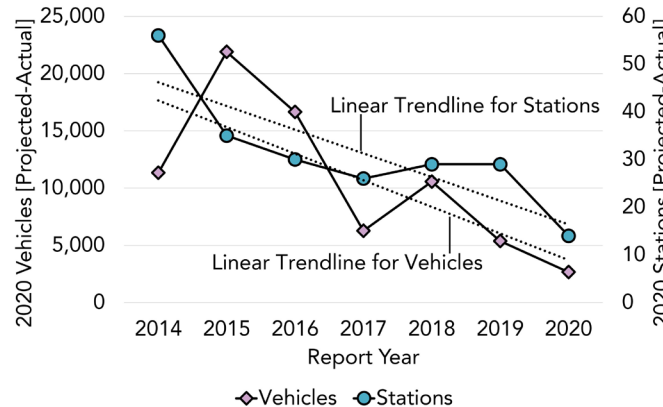
Factors in FCEV Deployment

FCEV deployment and forecasting is complex and depends on many factors that often have high uncertainty, including:

Infrastructure, model availability, consumer awareness, vehicle and fuel prices, and others



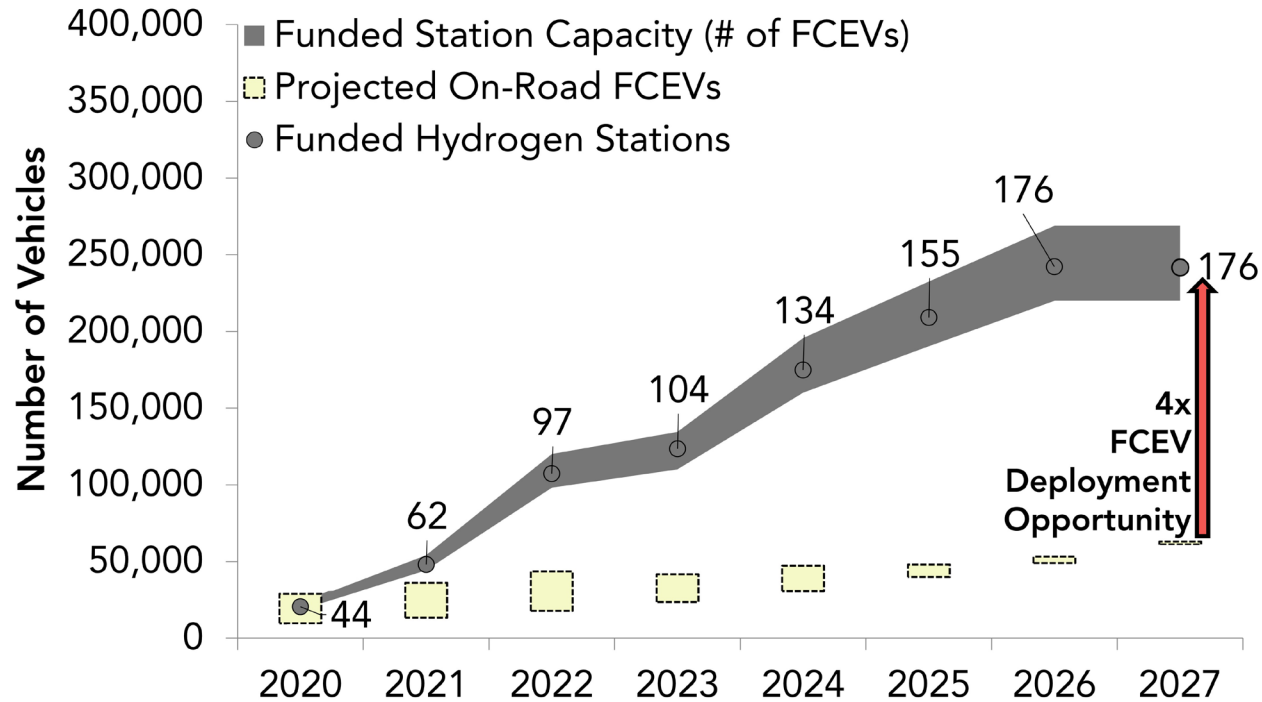
- Projections tend to be higher than actual sales



- Shifts in projected vehicle sales tend to correlate with shifts in station development plans

Finding 7

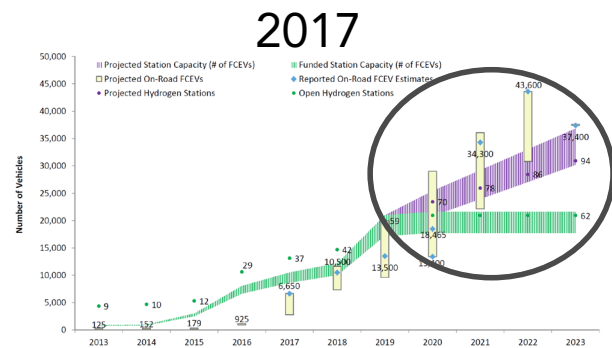
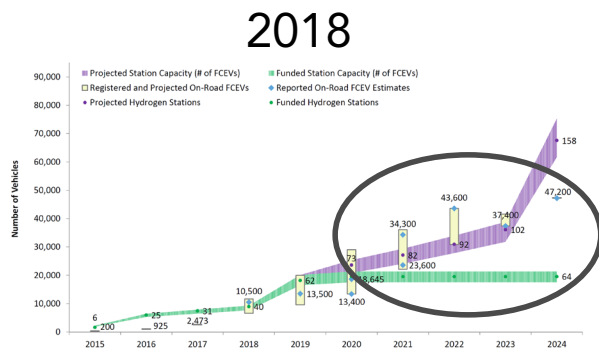
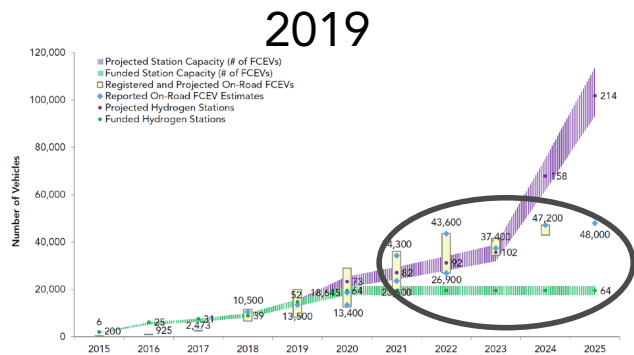
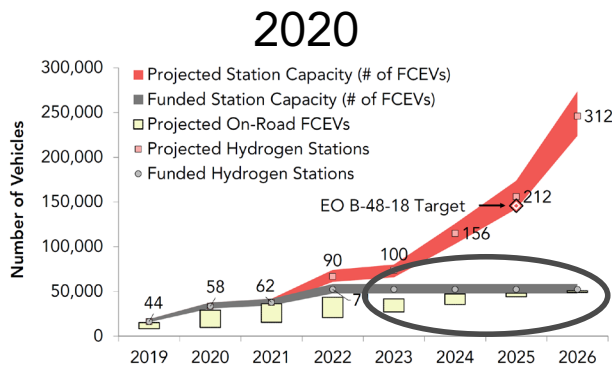
The current and planned station network provides automakers an opportunity to deploy as many as four times the FCEVs currently indicated through industry surveys



Related Conclusion: Projected network development provides substantial opportunity for FCEV deployment beyond current projections.

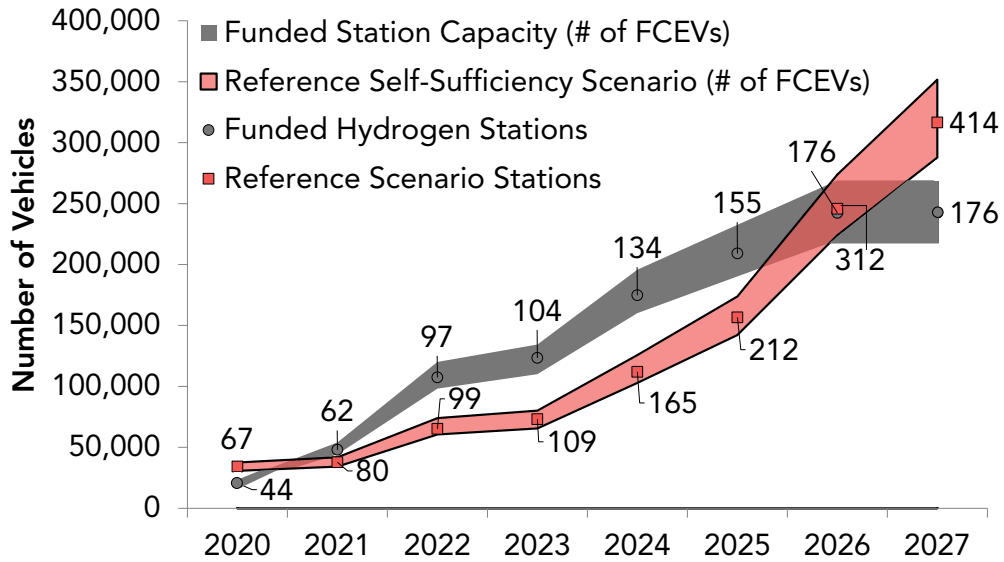
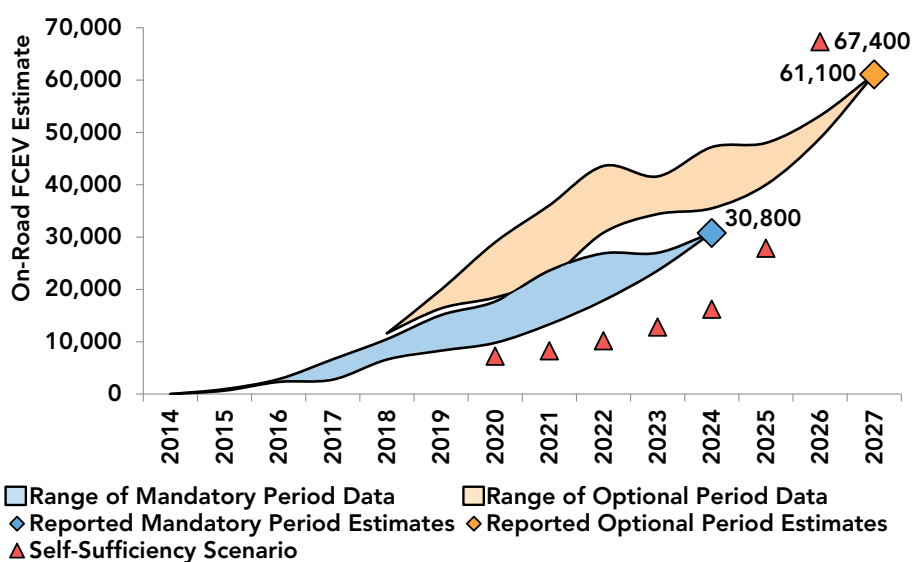
Network Projections Are a First in California

The 2021 report is the first time that funded network capacity will outpace FCEV deployment



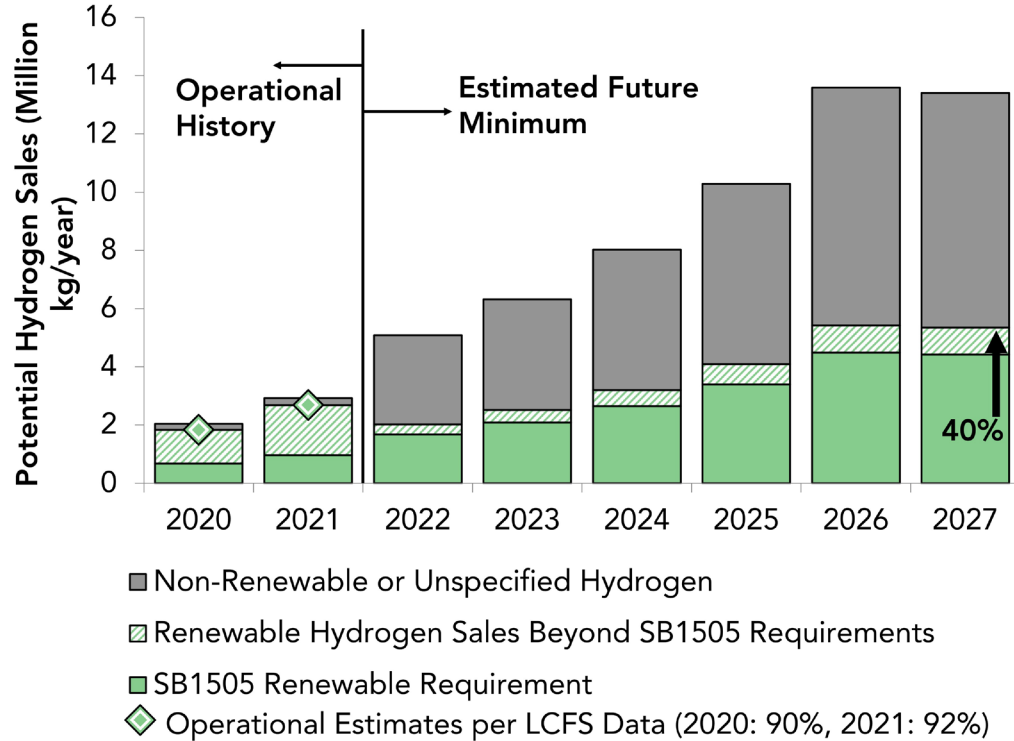
How Do Projections Compare to Self-Sufficiency?

Near-term vehicle and station projections mostly in line with self-sufficiency study scenarios. Long-term match unknown and requires acceleration beyond current estimates.



Finding 8

California's hydrogen network is on track to maintain at least forty percent renewable hydrogen implementation



Related Conclusion: Ensure that hydrogen supply, especially renewable hydrogen, does not become a bottleneck to successful hydrogen station network development and operation.

Need for Hydrogen Production Capacity

State agencies will continue to monitor and evaluate availability of hydrogen fuel (especially renewable and low-carbon hydrogen)

- At least 3 known planned private facilities with combined 71 tons/day capacity
- At least 2 State-funded facilities to add 4 tons/day (with another currently open solicitation underway)
- Altogether ~75 tons/day is sufficient for current projected vehicles to 2027, but less than 50% of funded network station capacity

QUESTIONS

