CALIFORNIA
AIR RESOURCES BOARD

December 2024

2024 Annual Evaluation of Fuel Cell Electric Vehicle Deployment and Hydrogen Fuel Station Network Development

(Pursuant to AB 126; Reyes, Chapter 319, Statutes of 2023)


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Hydrogen Station

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2024 Annual Evaluation of Fuel Cell Electric Vehicle Deploymentand Hydrogen Fuel Station Network Development

(Report Pursuant to Assembly Bill 126; Reyes, Chapter 319, Statutes of 2023)


HYDROGEN
HIGH VOLTAGE INSIDE
HAUTE TENSION

Contents

List of Acronyms

AB 8	Assembly Bill 8 (Perea, Chapter 401, Statutes of 2013)
AB 118	Assembly Bill 118 (Núñez, Chapter 750, Statutes of 2007)
AB 126	Assembly Bill 126 (Reyes, Chapter 319, Statutes of 2023)
ACC II	Advanced Clean Cars II
ARCHES	Alliance for Renewable Clean Hydrogen Energy Systems
CARB	California Air Resources Board
CEC	California Energy Commission
CTP	Clean Transportation Program
DAC	Disadvantaged Community
DMV	Department of Motor Vehicles
EO	Executive Order
FCEV	Fuel Cell Electric Vehicle
GFO	Grant Funding Opportunity (California Energy Commission's formal communication of a current grant program)
H2FCP	Hydrogen Fuel Cell Partnership
LCFS	Low Carbon Fuel Standard
SB 1291	Senate Bill 1291 (Archuleta, Chapter 373, Statutes of 2022)
SOSS	Station Operational Status System developed and operated by the H2FCP
TNO	Temporarily Non-Operational
ZEV	Zero-emission Vehicle

Executive Summary

California's zero-emission vehicle (ZEV) policies and programs continue to be pivotal strategies in the global effort to combat climate change, as described in the 2022 Scoping Plan for Achieving Carbon Neutrality.[1] In August 2022, the California Air Resources Board (CARB) adopted the Advanced Clean Cars II (ACC II) regulation, which sets California on a path to 100 percent electric vehicle sales in all new light-duty vehicle purchases by 2035. California also continues to directly invest in the ZEV transition with budget commitments of up to $10 billion over seven years to advance ZEVs and infrastructure development. And nationally, as part of the Infrastructure Investment and Jobs Act adopted in 2021, federal investments are co-funding a multi-billion dollar "hydrogen hub" in California that will be transformational in accelerating the clean fuel in mobile and stationary sectors. Additionally, Department of Treasury decisions are helping to solidify large national ZEV purchase incentives that will accelerate the electric vehicle market. The scale and pace of these policy developments reflect the gravity of the work ahead. Global climate change is an enormous challenge that will require aggressive actions across all sectors of the economy in many jurisdictions across the globe.

Experience establishing the ZEV market in California has revealed that convenient access to fuel is one of the most important considerations of buyers in their purchase decision, and subsequently whether they are able to fully utilize the vehicle for all of their needs. Considerations from vehicle and fuel price parity to driving range, vehicle utility, and charging and fueling infrastructure are reasons why programs like the ACC II regulation and infrastructure investment programs need to be successful. In multiple studies and surveys, consumers have repeatedly ranked charging and fueling infrastructure as a top concern for either purchasing a new ZEV or even using the ZEV they currently drive. Large-scale development of this new infrastructure will be required to support a transition to 100 percent electric vehicle sales.

Since CARB published the 2023 Annual Evaluation, there have been many changes in California's hydrogen fueling network. Progress has proven to be slow and has not kept pace with prior near-term projections. Slow network development, with commensurate delays in actual and planned Fuel Cell Electric Vehicle (FCEV) sales, have consistently been a challenge for stations in California and the past year has proven more difficult than other recent years. Some long-standing challenges have persisted like slow permitting timelines, the loss of planned station locations, and equipment reliability challenges. Additionally, more recent challenges have been amplified that affect station network development, and impact the customer experience, including a sustained stoppage in delivery of hydrogen to Southern California stations, persistent supply chain issues, high rates of inflation, high costs of energy needed to produce hydrogen (particularly natural gas), high retail hydrogen prices[2], and market dynamics in CARB's Low Carbon Fuel Standard (LCFS) program. Details of these challenges will be expanded upon in later sections of this report.

The development of hydrogen fueling infrastructure in California has been largely supported by two main programs: the Clean Transportation Program (CTP), originally authorized by Assembly Bill (AB) 118 (Núñez, Chapter 750, Statutes of 2007), re-authorized by AB 8 (Perea, Chapter 401, Statutes of 2013) and subsequently AB 126 (Reyes, Chapter 319, Statutes of 2023), and LCFS. The CTP, managed by the California Energy Commission (CEC), has provided the main avenue for co-funding the capital expenses of designing, permitting, constructing, and commissioning hydrogen fueling stations while LCFS more directly supports the operations of hydrogen fueling stations. The CTP has historically provided operations and maintenance funding and largely discontinued it once the LCFS hydrogen station program was launched; however new CTP grant opportunities are occurring to support

1 *https://ww2.arb.ca.gov/our-work/programs/ab-32-climate-change-scoping-plan/2022-scoping-plan-documents*

2 *https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/energy-transition/060424-california-hydrogen-pump-prices-climb-slightly-remain-highest-globally*

operations and maintenance. Under the provisions of AB 126, the CEC is directed to prioritize at least 15 percent of the annual budget in the CTP to co-fund the development of hydrogen fueling stations. To date, CTP co-funding has primarily been offered in the form of competitive grants.

In addition to providing a funding source for hydrogen fueling stations, AB 126 requires analysis and reporting on the progress and projections for future development in the hydrogen fueling network and FCEV sales. Each year, two reports are developed: 1) by mid-year, CARB must report to CEC updates on the hydrogen fueling network and FCEV sales and make recommendations on locations and technical specifications for future station co-funding, and 2) by the end of each year, CEC and CARB jointly provide an additional update on the network and FCEV sales and report on the cost, timing, and other operational aspects of building and operating hydrogen fueling stations in California. Continuing the legacy of AB 8, this 2024 Annual Evaluation represents the first report from CARB to CEC as required by AB 126 and provides perspective on the current status and future projections in the light-duty vehicle hydrogen fueling network and FCEV sales through 2030.

Although the early hydrogen fueling market continues to face challenges, development is still projected through the end of the decade. As shown in the findings below, with the delayed station progress, FCEV projected sales have tapered significantly compared to last year, and the planned hydrogen station network will have the total fueling capacity to support the vehicles statewide. However, the effectiveness of the network to support light-duty FCEV drivers regionally depends on where the stations are located and whether there is a sufficient concentration of stations where demand exists. Continued targeted investments are still needed to ensure sufficient regional coverage of hydrogen fuel in major markets and in travel corridors. Further, larger station networks, coupled with successful FCEV fuel demand, can help reduce the cost of delivered hydrogen fuel.

More broadly, CEC has already committed to co-fund the development of more than the 100-station milestone previously outlined in the prior statute (AB 8) and has made progress toward a 200-station milestone outlined in Executive Order (EO) B-48-18. Funds have been made available that may present opportunities to address some of the challenges that have been reported by station operators. Uncertainty in the projected timing to resolve market challenges and accelerate development continues to influence projections for future growth, but market maturity and continued supportive policies can help address this challenge. As an example, CEC has issued a grant funding opportunity to provide operations and maintenance support to existing stations.

While the customer-facing charging and hydrogen stations are a highly visible and key touchpoint in these efforts, upstream investments in the full supply chain (such as clean and renewable hydrogen fuel production and delivery, upgrades and expansion of the electric grid, and growth of equipment supply chains) have emerged as similarly critical pieces that must be addressed in the transportation energy transition. The 2022 Scoping Plan for Achieving Carbon Neutrality demonstrates the scale of growth needed for the hydrogen sector across the economy (including vehicles of all classes, industrial heat and power, chemical processing, aviation, electric grid power, and other end uses) as it identified a potential need for renewable hydrogen use in California to grow 1,700 times current consumption rates by 2045. This would require private and public investments and development beyond the CEC's CTP. The recently announced "hydrogen hub" in California called the Alliance for Renewable Clean Hydrogen Energy Systems (ARCHES), described later in the report, is a good example of this broader investment occurring in the state.

This year's report is divided into two detailed documents. This first main report includes seven major findings from the analysis that convey important trends that inform state planning and investments for light-duty vehicle hydrogen stations. The main report includes the primary conclusions and reference appendices. The second supplemental report includes more detailed descriptions of the analysis methods, results, and additional market insights not described in the findings.

Findings

Based on analysis of progress over the past year and projections for developments through 2030, CARB staff report the following major findings for the 2024 Annual Evaluation:

Finding 1: As of July 15, 2024, California's hydrogen fueling network has declined to 62 stations (4 fewer than last year) and is facing supply and reliability challenges

Four new stations have opened since the 2023 Annual Evaluation, including two in the city of Oakland, one in Orange County and one in the Riverside region. These stations add over 4,848 kg/day of fueling capacity across the state of California. However, because seven stations owned by Shell permanently closed, the net number of stations for this analysis is 62, a net decline of three stations since the prior evaluation.[3]

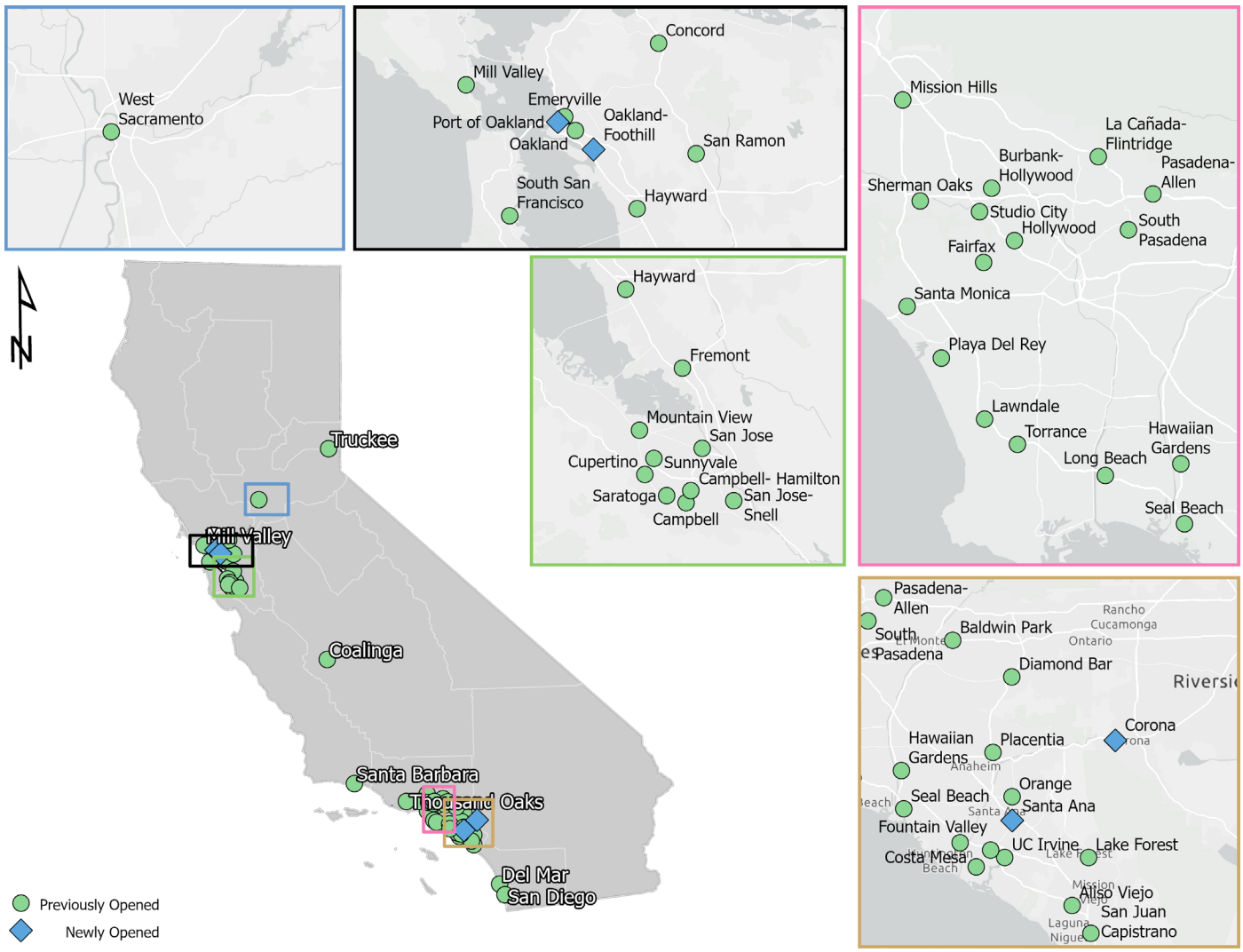
As of July 15, 2024, among 62 stations, seven stations are considered Temporarily Non-Operational (TNO) given they have been unavailable for an extended period of time[4] but are expected to eventually return to Open-Retail[5] status. In select cases, a TNO station may be available for fuel by reservation only, which is the case with an Iwatani station in Riverside. This combination of station activities results in a total of 55 stations that are Open-Retail in California at the time this analysis was conducted. The locations of these and all other open stations are shown in Figure 1.

3 Refer to last year's 2023 Annual Evaluation and Joint Agency reports for further details on Shell's actions to return state co-funding for hydrogen stations.

4 The number of TNO stations can change frequently. Refer to the Hydrogen Fuel Cell Partnership (H2FCP) station status website for the most current information: *https://m.h2fcp.org/*

5 Refer to *Appendix C* for the definition and description of "Open-Retail".

Figure 1: Current Open Hydrogen Fueling Station Network as of July 15, 2024[6]



As noted earlier, progress has proven to be slow and has not kept pace with prior near-term projections. Slow network development has consistently been a challenge for stations in California and the past year has proven more difficult than other recent years. The current network is facing gaseous supply disruptions and frequent equipment failures leading to fewer operating hours. This has disrupted the supply and demand in certain regions resulting in potentially long wait times and slow or incomplete refueling events. This has directly affected station reliability and consumers experience with the light-duty hydrogen infrastructure. Finally, the price of hydrogen has doubled in the last few years. The state should continue to support the production of clean hydrogen and lay the groundwork for ARCHES to scale up the market and drive down prices.

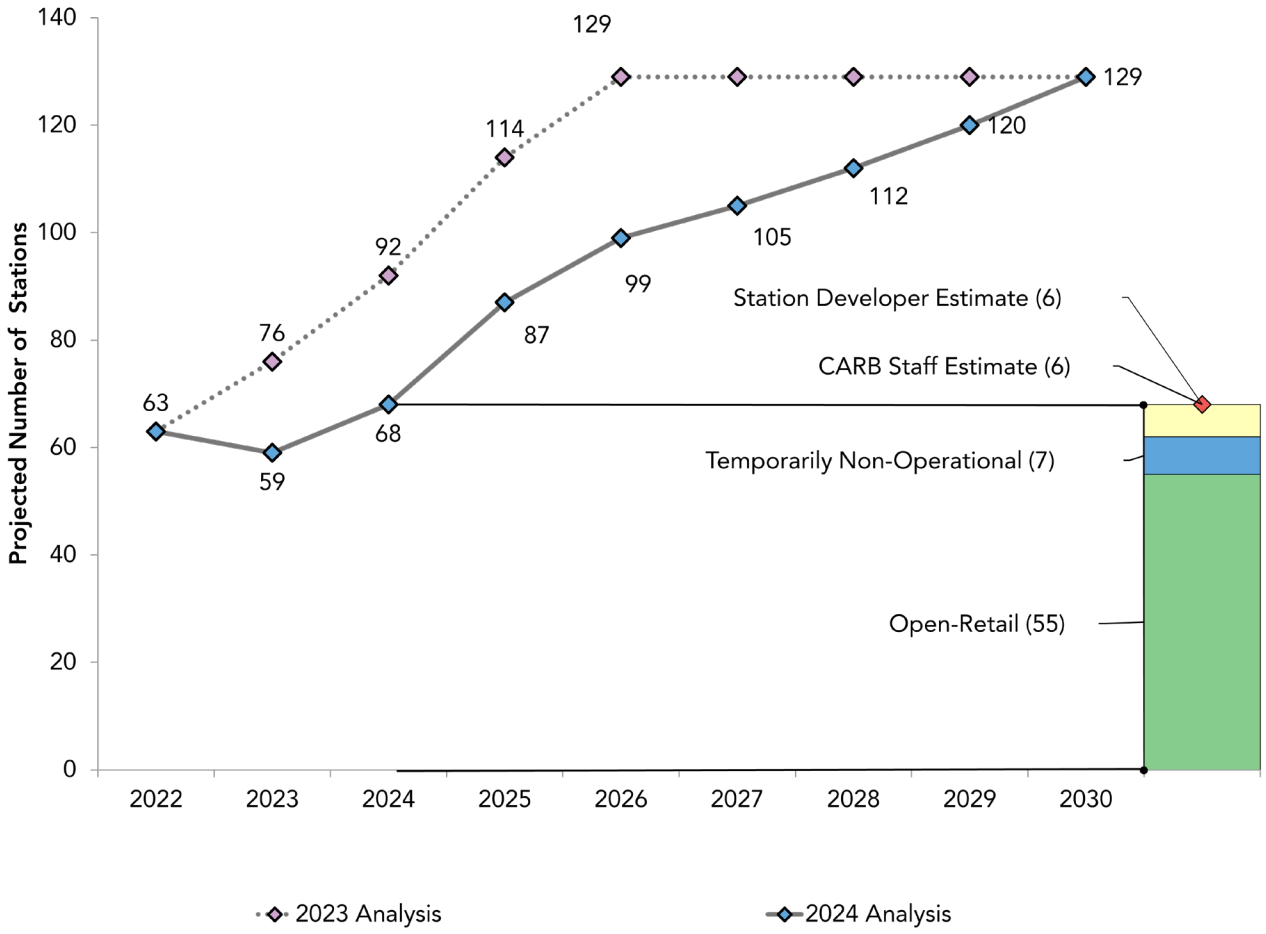
6 This map does not show real-time available status. See Figure 9 in the supplemental report for further information regarding stations that have achieved Open-Retail status but may be temporarily unavailable. Real-time status is available to drivers via the Station Operational Status System (SOSS) maintained by the Hydrogen Fuel Cell Partnership (H2FCP) and accessible at the website *https://m.h2fcp.org/*.

Finding 2: Hydrogen station development timelines remain a significant barrier, resulting in delayed growth of the network through 2026

Hydrogen fueling station development in the past year has continued to be slower than previously projected. During the 2023 Annual Evaluation, station developer feedback indicated as many as 92 stations could be Open-Retail or TNO by the end of 2024. This year's station development had less activity than normal, and developers are still unable to provide clear timelines for this year. In previous years, developers were more optimistic and were projecting higher station estimates than CARB staff. However, as shown in Figure 2, the current estimates are consistent from both parties and the network is projected to grow by six stations by the end of 2024, building upon the 62 stations that are currently operational.

Also as shown in Figure 2, according to station developer information provided to CEC, the network is projected to reach 129 stations, but on a longer timeline to 2030 compared to last year's analysis. This reflects expected delays given challenges with station development and fuel delivery, which will be elaborated upon below. CARB staff understand individual station development timelines will need to be adjusted as CEC works with developers to negotiate the necessary delays.

Figure 2: Comparison of Statewide Funded Station Projections Between the 2023 and 2024 Annual Evaluations



CARB staff have had multiple conversations with station developers over the past year regarding station development timelines and investment delays. Many of these issues may be due to broader economic concerns, such as high inflation in recent years, which is changing the financial business case for hydrogen station investments, the decline in credit values from the LCFS program, and the continued small scale of the hydrogen refueling industry. Barriers identified in past analyses, including securing site access, permitting timelines, utility connection timelines, and other site-specific issues may still linger but are not the dominant issues today. Station developers also increasingly report difficulty with securing skilled and affordable contractors. With respect to permitting, Senate Bill (SB) 1291 (Archuleta, Chapter 373, Statutes of 2022) sets time limits on permitting review for hydrogen fueling stations. CARB staff are aware of individual cases where this statute has helped the station permitting progress, but it does not appear to yet be universally implemented in all jurisdictions.

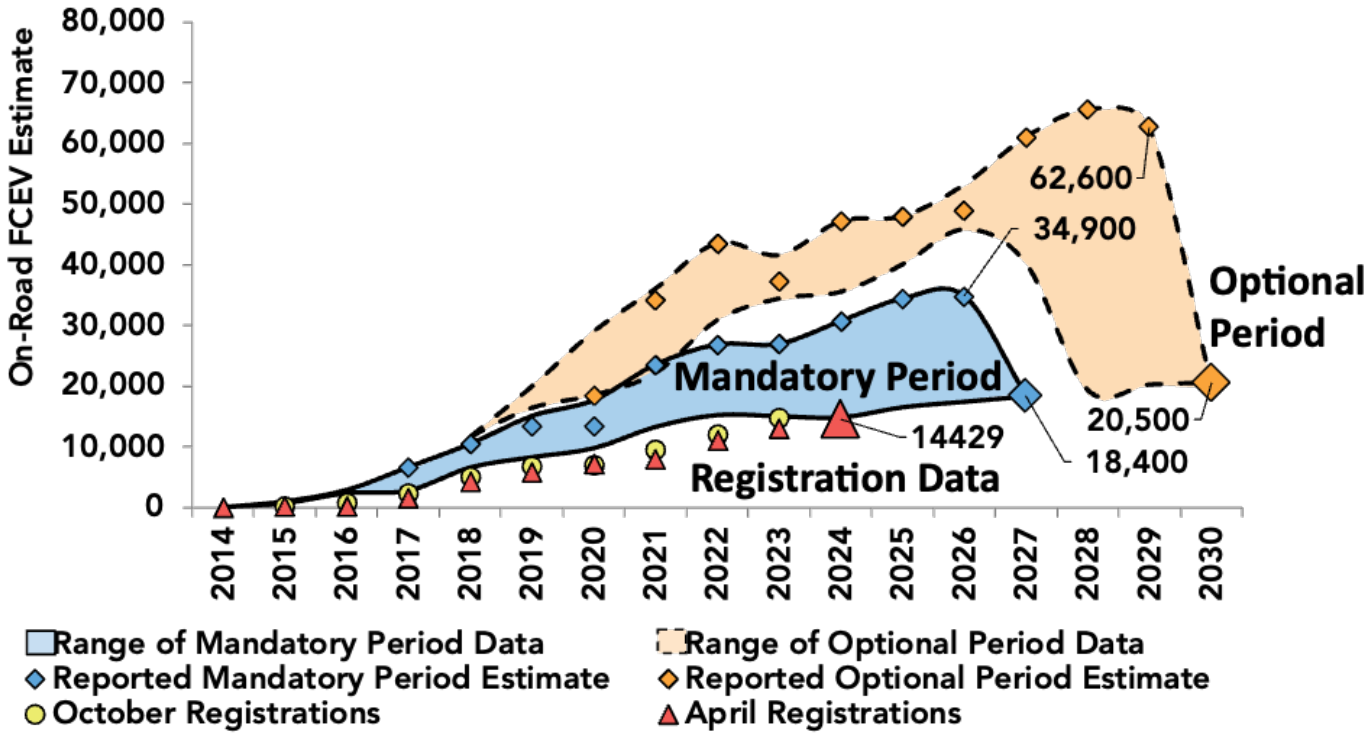
As noted earlier, staff project the number of hydrogen fueling stations to grow to 129 in the next five years. This projection is the result of several actions that staff anticipate will result in station development. To begin with, state funding granted to station developers must be spent within a specified timeframe, though the specific timeline can be negotiated with CEC. Further, a resolution of the hydrogen supply transport trucks is expected in Southern California, the bottleneck currently causing multiple stations to remain TNO. And resolutions are on the horizon to ease supply chain challenges, including mediation between equipment providers and developers, funding for maintenance and reliability of the network, and potential changes to the LCFS program to be heard by the Board later this year. Finally, scaling of hydrogen production is expected as part of the ARCHES hydrogen hub in California, with many of the projects planned to be underway by 2031.

Finding 3: Auto manufacturers projections reflect significantly slower growth in planned FCEV sales

Reporting in prior Annual Evaluations has demonstrated the close relationship between auto manufacturers' estimates for future FCEV sales and the pace of hydrogen station development, coupled with a reliable fuel supply, fuel costs, and a diversity of FCEV models. Typically, as station development timelines extend beyond their original projections, auto manufacturers similarly indicate later growth in FCEV sales than previously expected through their responses to annual surveys of future ZEV sales projections. However, the 2024 annual auto manufacturer survey responses were historically low and reflect much slower growth in sales, with on-road FCEV populations projected to grow only at the pace seen in the past few years, as shown in Figure 3.

The updated on-road vehicle projection for 2030 is 20,500 FCEVs and is almost one third of the previously reported estimate of 62,600 on-road FCEVs for 2029. Near-term projections have also been strongly impacted, with a current projection of 18,400 on-road FCEVs in 2027 compared to the previously reported values of approximately 35,000. The current projection in the 2024 annual survey is historically the lowest compared to the prior surveys and could imply auto manufacturers no longer expect an accelerated expansion of the hydrogen fueling network.

Figure 3: Current and Projected On-Road FCEV Populations and Comparison to Previously Collected and Reported Projections

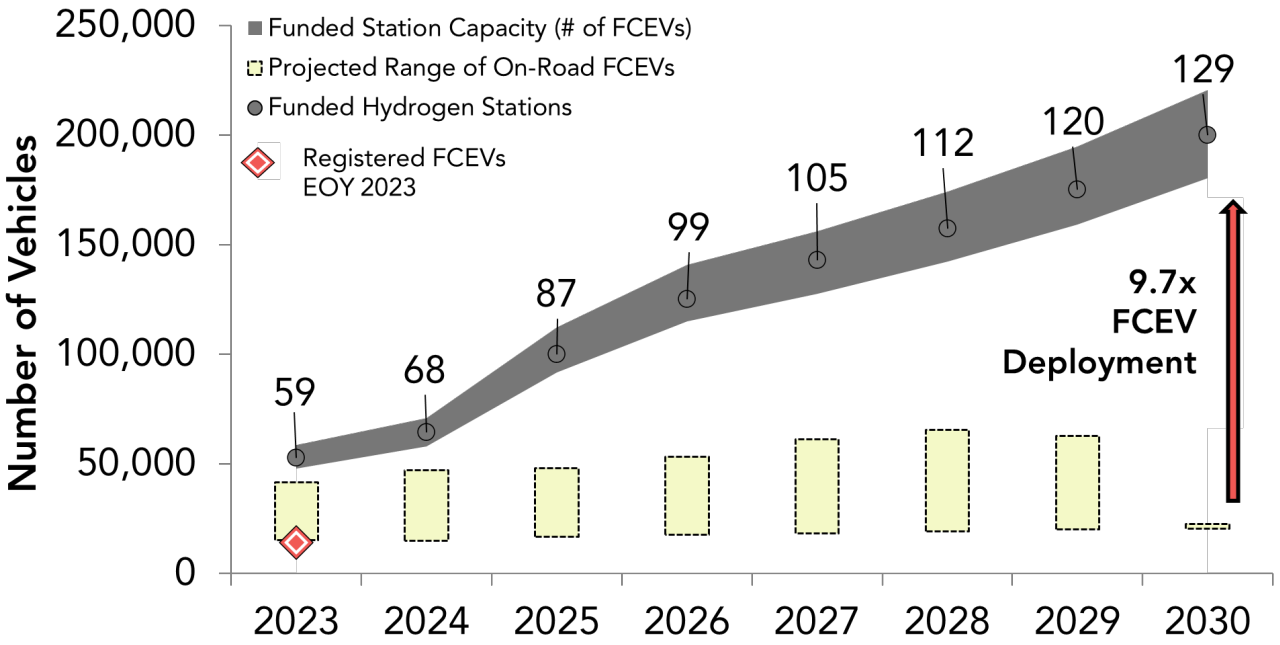


The actual on-road vehicle registrations of FCEVs in California have continued to gradually grow through the last year. Based on registration data from the California Department of Motor Vehicles (DMV), there were 14,429 FCEVs with an active registration status in California. However, April data demonstrate a recent slowing of registrations, with only 1,436 additional FCEVs registered between April 2023 and April 2024, compared to 1,859 additional FCEV registrations in the period April 2022 to April 2023.

Finding 4: Projected total statewide network capacity will outpace hydrogen fueling demand through the end of the decade

As mentioned in the above finding, the current year projection of FCEVs is historically low. With the award information from CEC's GFO-19-602 and GFO-22-607 and private investments, the projected hydrogen fueling station network will grow to 129 stations, although CARB anticipates this will be delayed to 2030. The statewide network fueling capacity from 2030 onwards, which does not account for station downtime, will be sufficient for 9.7 times as many FCEVs as are expected on California's roads, based on the most recent annual auto manufacturer survey. This is shown in Figure 4. The rate of hydrogen station network growth is projected to ensure that sufficient fueling capacity will be available at a statewide level for all future years analyzed. This presents an opportunity for FCEV sales expansions in areas where hydrogen stations are concentrated. But as will be shown in later findings, station coverage regionally does not always match where demand exists, and new targeted station investments will be needed.

Figure 4: Projected Hydrogen Demand and Fueling Capacity



Factors beyond the maximum fueling capacity of the network may alter the assessment of the balance between future hydrogen fuel demand and available fueling capacity. California's hydrogen station network had experienced significant reductions in station uptime over the past few years due to a variety of causes, including lack of sufficient delivered hydrogen supply, disruptions in hydrogen delivery to stations, equipment failure, limited availability of replacement parts, and other issues. Recent estimates of the overall station availability (the proportion of the maximum network capacity that is actually available, including TNOs) is 62 percent, similar to the estimate last year. Assuming this average station availability remains at this level into the future[7], actual statewide fueling capacity will be sufficient for 6 times the projected number of FCEVs on the road from 2030 onwards, and total statewide capacity should still be sufficient for all on-road FCEVs in the intervening years.

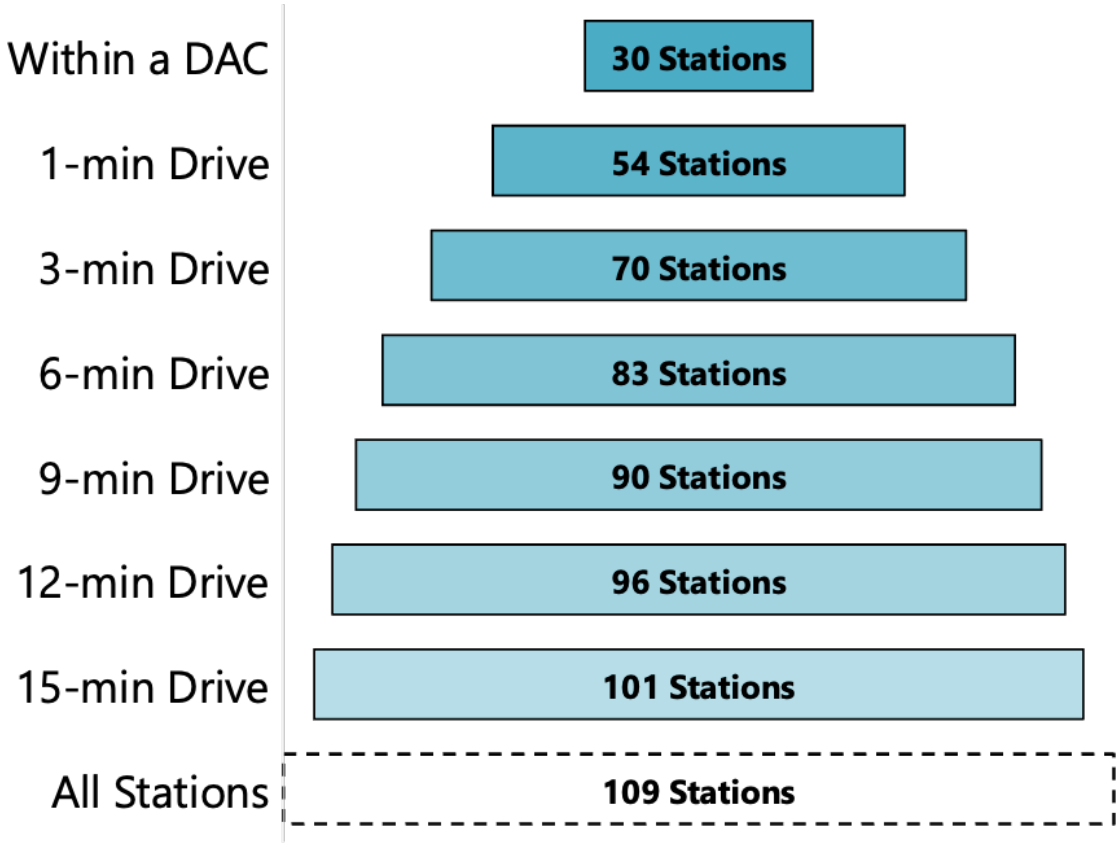
7 This scenario is for illustrative purposes only and is not an ideal or desired condition. CARB staff are actively monitoring station reliability along with public and private colleagues. In addition, station operators have shared several paths that they are currently pursuing to ensure that station reliability improves in the coming years, with strategies ranging from equipment improvements to changes in operational strategies and even workforce development.

Finding 5: With minor shifts in locations in the past year, network coverage in and near disadvantaged communities has remained high

With very few changes in last year's projection of stations, there has been minor variation in the location of stations and the network's coverage specifically in and near disadvantaged communities (DACs). As Figure 5 shows, 30 known station locations are now located directly within DACs. In addition, the newly proposed locations slightly increase the proportion of known station locations that will be within a 15-minute drive of DACs (93 percent of known station locations are now within this limit of coverage, compared to 92 percent reported last year) and provides coverage to a larger portion of California's DAC population. These changes are due to Shell's station closing in the San Francisco region and the new stations by Chevron and others in DAC regions. Note the analysis used for Figure 5 includes 109 instead of 129 stations given that 20 of the planned stations do not yet have a confirmed location.

While this progress is noteworthy, significant work to continue expanding coverage and capacity for these communities is still needed. Because some previously proposed locations will no longer move forward, some of these communities have lost coverage in the past year. And even though many disadvantaged and rural communities gained coverage through these newly identified locations, the needs in many other communities remain unaddressed.

Figure 5: Hydrogen station proximity to Disadvantaged Communities

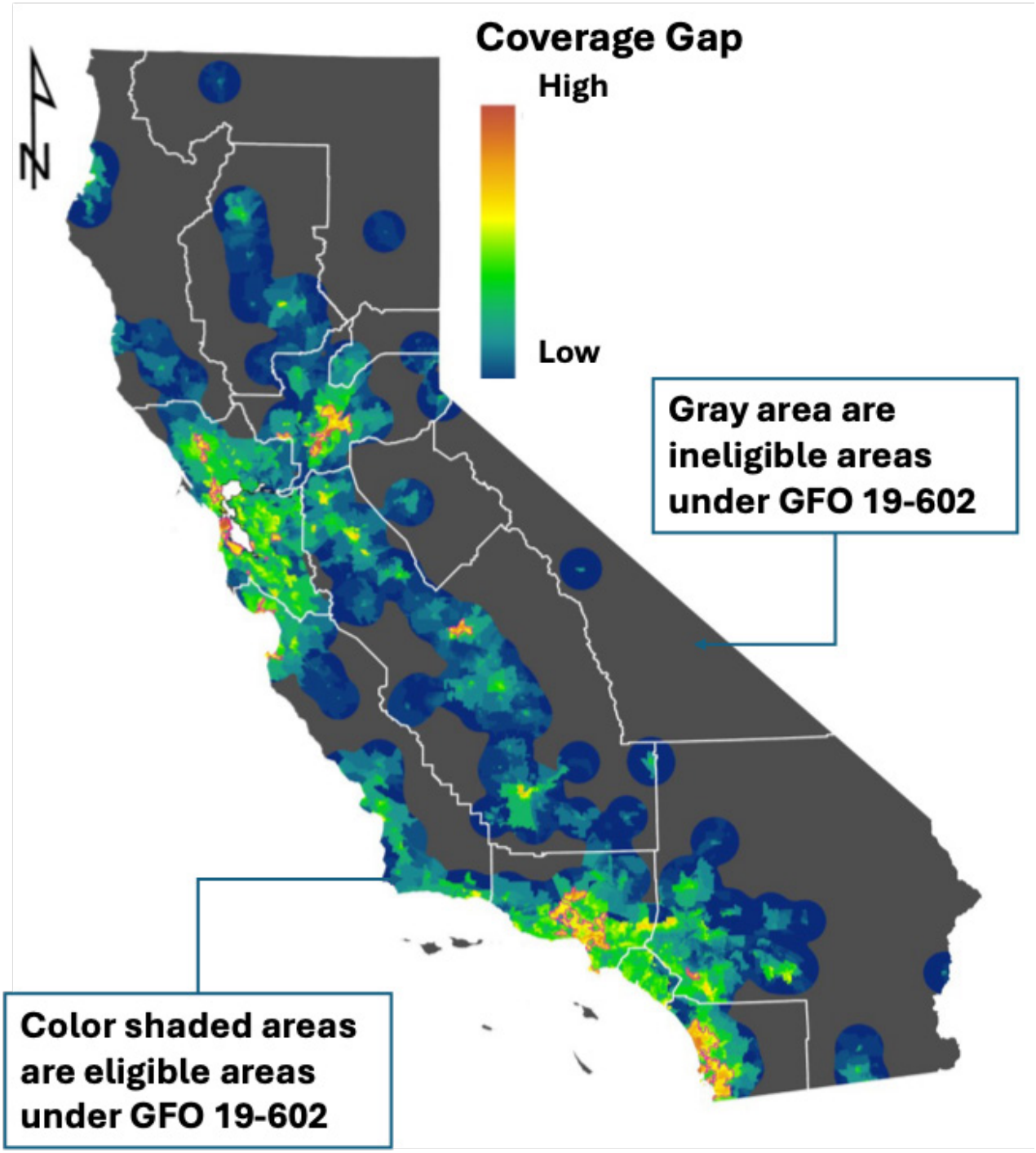


Finding 6: Priority regions across the state lack access to hydrogen infrastructure

With an approximate year delay in many of the hydrogen station developments to date, the fueling network seems to be similar compared to last year and concentrated in the Los Angeles, San Francisco Bay Area, and San Diego regions. When accounting for the lower FCEV projections and near-term stations, there are now fewer areas of priority for new stations, as shown in Figure 6 in terms of regions and total area than previously reported.

However, the priority regions of the state lack convenient access to hydrogen infrastructure. Expanding network coverage might improve the markets that have been the focus of development to date to enhance regional supply of fuel for FCEV drivers, providing more redundancy and fueling options across local markets. This needs to be complemented with actions to address station and fuel supply reliability, hydrogen fuel costs at the pump, and vehicle model diversity. Some of the priority growth areas shown beyond the major existing regions are in communities such as Davis, Elk Grove, Folsom, and Roseville in the Sacramento region, Pleasanton in the San Fransico Bay area, Santa Cruz and Monterey along the Central Coastal, and Fresno in San Joaquin Valley. Additionally, new stations in major travel corridors, such as Interstate 5 and California State Route 99 between Los Angeles and San Francisco, will enable more FCEV drivers to traverse the state. These priority growth areas based on this year's analysis are shown in the brighter colored regions in the Figure 6. Prior CARB analyses identified rural areas that should be prioritized and could be used to inform new grant opportunities. Some of these rural areas do not appear in this year's analysis given the renewed focus on large gaps in the San Francisco and Sacramento urban areas.

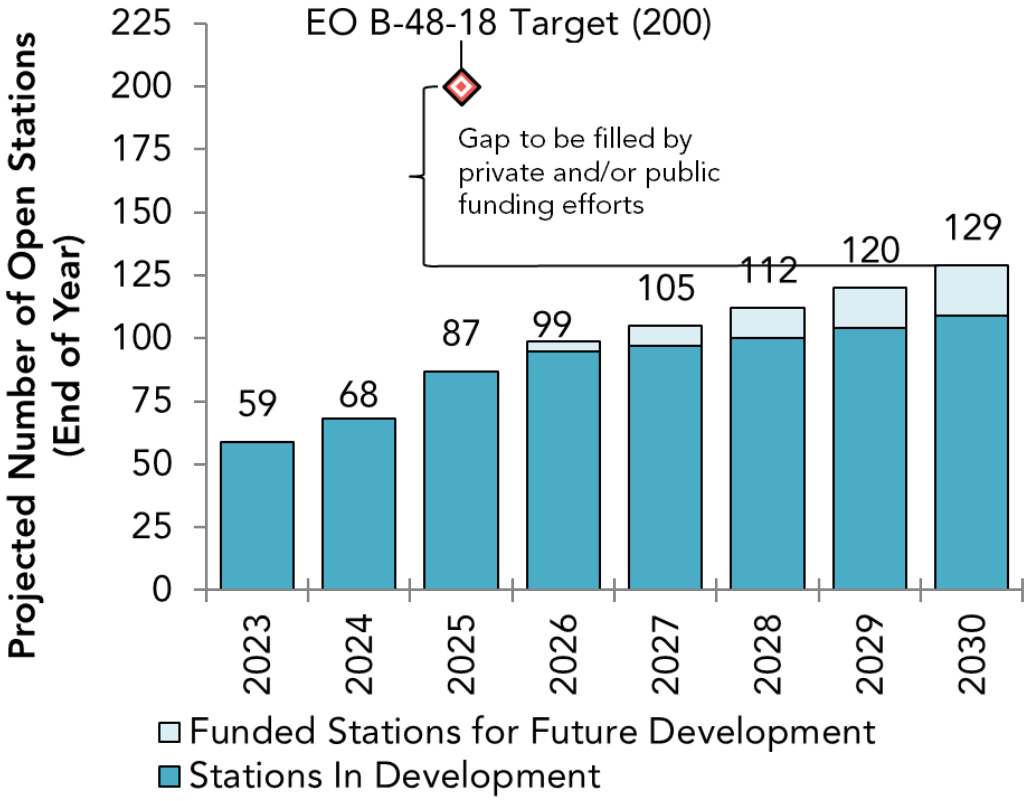
Figure 6: Coverage Gap Analysis to Inform Future Station Development



Finding 7: California's 200th hydrogen fueling station is not expected to occur with current projections

As shown in Figure 7, a gap remains to achieve the target of 200 hydrogen fueling stations co-funded through private and public efforts by 2025 as directed by the governor's Executive Order B-48-18[8]. With a shift of a few years in near-term projections of hydrogen station network growth, a maximum of 129 station is projected by 2030 revealing a gap of 71 stations to the target. CEC may award additional grants for light-duty stations, and industry investments may grow, but staff are unable to project the light-duty hydrogen station network beyond what is shown in this analysis.

FIGURE 7: PROJECTED STATION DEPLOYMENT COMPARED TO EO B-48-18



8 EO B-48-18 established direction for California government agencies to work toward specific ZEV deployment and infrastructure development goals. Among other items, EO B-48-18 established a target of 5 million ZEVs on the road by 2030, the construction and installation of 200 hydrogen fueling stations, and the construction and installation of 250,000 chargers, including 10,000 direct current fast chargers, by 2025. The full text of EO B-48-18 is available at the following website: https://www.library.ca.gov/wp-content/uploads/GovernmentPublications/executive-order-proclamation/39-B-48-18.pdf

Conclusions and Recommendations

As directed by AB 126, CARB must provide an evaluation and recommendations to CEC to inform future funding programs. Specifically, CARB is tasked with recommending station network development targets, priority locations to meet coverage needs, and minimum operating requirements and station design features to incentivize in subsequent CEC funding programs.

Over the past few years, the CEC's CTP has made significant progress toward California state goals for hydrogen fueling infrastructure development. Current awards and station projections show a maximum of 129 stations and a gap to the 200-station target of EO B-48-18. Overall, California leads the nation in FCEV sales for light-duty FCEVs and hydrogen fueling network development.

Despite the funding awards, the progress on the ground has been slow in the past year. In fact, this year has seen a pause in the development of stations. As a result, staff don't project the network will reach 129 stations until 2030. As station development timelines have continually extended beyond prior forecasts due to development delays, high inflation rates, high energy supply costs for producing hydrogen, low LCFS credit values, and supply chain challenges, projections of future FCEV sales are much lower, by almost two-thirds compared to last year's analysis.

CARB continues to see a potential role for FCEVs in the future ZEV fleet, especially as the market evolves to reach the 100 percent ZEV sales goal of the ACC II program. The investments made through the CTP and the support provided by the LCFS program are critical pieces to the hydrogen fueling market in California and support for its development toward the ultimate goal of financial self-sufficiency. Despite the challenges, these programs remain focused on those goals and there is significant opportunity remaining in these programs to continue working to resolve challenges and expand the hydrogen fueling network so that larger numbers of consumers can reasonably and reliably choose to drive an FCEV as their ZEV of choice.

CARB staff make the following recommendations for hydrogen station support through the Clean Transportation Program and potential parallel efforts:

- **Use hydrogen infrastructure support funds to address improvement of station reliability and existing station retrofits.** To date, the CTP funding has been primarily focused on co-funding new hydrogen fueling stations. As the market has evolved, it's clear new uses of the funds are necessary to increase station reliability, and to potentially upgrade and refurbish older hydrogen stations to meet customer requirements. The recent CEC grant funding opportunity (GFO-23-604), focused on supporting operations and maintenance of existing stations, is an example of this alternative approach. Funding to support reliability could take the form of stocking redundant critical components and contracting regional site investigation and repair services.
- **Increase dialogue with hydrogen industry stakeholders to support light-duty infrastructure.** State agencies should increase dialogue with station operators to better understand if there is a state role to improve hydrogen supply disruption, and separately to increase local supply chain inventory of key components. Furthermore, new conversations with automakers would be important to gather the most current insights on their vehicle products and sales projections, beyond what was shared with CARB in the annual automaker survey. In addition, these conversations can explore potential automaker investments in hydrogen infrastructure, just as automakers are increasingly investing in building out charging infrastructure.

- **Potentially leverage opportunities with ARCHES to invest in light-duty hydrogen stations co-located with stations for heavy-duty and transit fuel cell buses.** The ARCHES program intends to fund stations for heavy-duty fuel cell trucks and transit fuel cell buses. The CTP funds could potentially be used to co-invest in select heavy-duty sites reducing the cost for light-duty stations by sharing hydrogen storage, gas compression, and/or on-site hydrogen production systems. Light-duty dispensers would be placed on publicly accessible adjacent properties.[9] Additional information about ARCHES can be found here: https://archesh2.org/arches-officially-launches/.

Beyond these core recommendations, CARB recommends a number of on-going actions to increase confidence across all stakeholders involved in the light-duty hydrogen station network. State agencies should update their projections of the renewable content of delivered hydrogen funded by the CTP and gain insights as to whether the trend has continued upwards or not. The state should continue to support the production of clean hydrogen and lay the groundwork for ARCHES to scale up the market and drive down prices. Additional support could be provided to new station developers with targeted funding for workforce training, offsetting startup costs, etc. Additionally, more state outreach and education could be provided through community engagement, particularly in DAC communities, on the emerging opportunities and benefits of hydrogen, which could increase the adoption of FCEVs.

9 An evaluation would be needed to identify sites where it's feasible for light-duty vehicles to be adjacent to medium and/or heavy-duty vehicle fueling.


Courtesy of First Element, Inc.

Appendix A: AB 126 Excerpts

The following is an excerpt of AB 126, with the language from section 43018.9 relevant to this report.

Section 43018.9 of the Health and Safety Code is amended to read:

43018.9.

(a) For purposes of this section, the following terms have the following meanings:

(1) "Commission" means the State Energy Resources Conservation and Development Commission.

(2) "Publicly available hydrogen-fueling station" means the equipment used to store and dispense hydrogen fuel to vehicles according to industry codes and standards that is open to the public.

(b) Notwithstanding any other law, the state board shall have no authority to enforce any element of its existing clean fuels outlet regulation or of any other regulation that requires or has the effect of requiring that any supplier, as defined in Section 7338 of the Revenue and Taxation Code as in effect on May 22, 2013, construct, operate, or provide funding for the construction or operation of any publicly available hydrogen-fueling station.

(c) On or before June 30, 2014, and every year thereafter, the state board shall aggregate and make available all of the following:

(1) The number of hydrogen-fueled vehicles that motor vehicle manufacturers project to be sold or leased over the next three years as reported to the state board pursuant to the Low Emission Vehicle regulations, as currently established in Sections 1961 to 1961.2, inclusive, of Title 13 of the California Code of Regulations.

(2) The total number of hydrogen-fueled vehicles registered with the Department of Motor Vehicles through April 30.

(d) On or before June 30, 2014, and every year thereafter, the state board, based on the information made available pursuant to subdivision (c), shall do both of the following:

(1) Evaluate the need for additional hydrogen-fueling stations for the subsequent three years in terms of quantity of fuel needed for the actual and projected number of hydrogen-fueled vehicles, geographic areas where fuel will be needed, and station coverage.

(2) Report findings to the commission on the need for additional hydrogen-fueling stations in terms of number of stations, geographic areas where additional stations will be needed, and minimum operating standards, such as number of dispensers, filling protocols, and pressures.

(e) (1) The commission shall allocate no less than 15 percent annually of the moneys appropriated by the Legislature from the Alternative and Renewable Fuel and Vehicle Technology Fund, established pursuant to Section 44273, attributable to the fees deposited in the fund pursuant to Section 44060.5 of this code and Sections 9250.1 and 9261.1 of the Vehicle Code until July 1, 2030, under the Clean Transportation Program to fund hydrogen-fueling stations to support hydrogen vehicles until there is a sufficient network of hydrogen-fueling stations, which includes all types available, in operation in California to support existing and expected hydrogen vehicles, that aligns with the state greenhouse gas reduction goals and plan pursuant to Sections 38561, 38562.2, and 38566, as determined by the commission, in consultation with the state board.

(2) Fifty percent of the allocated funds related to paragraph (1) shall be used to fund hydrogen-fueling stations that directly benefit or serve residents of low-income communities and disadvantaged communities as defined by CalEnviroScreen.

(3) If the commission, in consultation with the state board, determines that the full amount identified in paragraph (1) is not needed to fund the number of stations identified by the state board pursuant to subdivision (d), the commission may allocate any remaining moneys to other projects, subject to the requirements of the Clean Transportation Program pursuant to Article 2 (commencing with Section 44272) of Chapter 8.9.

(4) Allocations by the commission pursuant to this subdivision shall be subject to all of the requirements applicable to allocations from the Clean Transportation Program pursuant to Article 2 (commencing with Section 44272) of Chapter 8.9.

(5) (A) If the allocated annual funding identified in paragraph (1) is undersubscribed after a competitive grant funding opportunity has made the funding available, the commission may allocate any remaining moneys to other projects, subject to the requirements of the Clean Transportation Program pursuant to Article 2 (commencing with Section 44272) of Chapter 8.9.

(B) The commission shall release a competitive grant funding opportunity for annual funding identified in paragraph (1) at least annually and 90 days after the start of the fiscal year, unless the commission's executive director or the lead commissioner for transportation concludes based on substantial evidence in the record, including from party filings, that an alternative schedule for the release of a competitive grant funding opportunity is warranted. The commission shall endeavor to issue a notice of proposed awards to responsive applicants within six months of issuing a competitive grant funding opportunity, consistent with this section.

(6) The commission, in consultation with the state board, shall award moneys allocated in paragraph (1) based on best available data, including information made available pursuant to subdivision (d), and input from relevant stakeholders, including motor vehicle manufacturers that have planned deployments of hydrogen-fueled vehicles, according to a strategy that supports the deployment of an effective and efficient hydrogen-fueling station network in a way that maximizes benefits to the public while minimizing costs to the state.

(7) Notwithstanding paragraph (1), once the commission determines, in consultation with the state board, that the private sector is establishing hydrogen-fueling stations without the need for government support, the commission may cease providing funding for those stations.

(8) On or before December 31, 2015, and annually thereafter, the commission and the state board shall jointly review and report on progress toward establishing a hydrogen-fueling network that provides the coverage and capacity to fuel vehicles requiring hydrogen fuel that are being placed into operation in the state. The commission and the state board shall consider the following, including, but not limited to, the available plans of automobile manufacturers to deploy hydrogen-fueled vehicles in California and their progress toward achieving those plans, the rate of deployment of hydrogen-fueled vehicles, the length of time required to permit and construct hydrogen-fueling stations, the coverage, capacity, and public accessibility of the existing hydrogen-fueling station network, and the amount and timing of growth in the fueling network to ensure fuel is available to these vehicles. The review shall also determine the remaining cost and timing to establish a sufficient network of hydrogen-fueling stations and whether funding from the Clean Transportation Program remains necessary to achieve this goal.

(f) To assist in the implementation of this section and maximize the ability to deploy fueling infrastructure as rapidly as possible with the assistance of private capital, the commission may design grants, loan incentive programs, revolving loan programs, and other forms of financial assistance. The commission also may enter into an agreement with the Treasurer to provide financial assistance to further the purposes of this section.

(g) Funds appropriated to the commission for the purposes of this section shall be available for encumbrance by the commission for up to four years from the date of the appropriation and for liquidation up to four years after expiration of the deadline to encumber.

(h) Notwithstanding any other law, the state board, in consultation with districts, no later than July 1, 2014, shall convene working groups to evaluate the policies and goals contained within the Carl Moyer Memorial Air Quality Standards Attainment Program, pursuant to Section 44280, and Assembly Bill 923 (Chapter 707 of the Statutes of 2004).

(i) This section shall become inoperative on July 1, 2035, and, as of January 1, 2036, is repealed.

Appendix B: Station Status Summary

Table 1: List of Hydrogen Fueling Station Data as of July 15, 2024

Name	Address	City	County	Retail Open	Capacity (kg/day)	Fueling Positions
Coalinga	24505 W Dorris Ave	Coalinga	Fresno	2015	266	1
Diamond Bar	21865 E Copley Dr	Diamond Bar	Los Angeles	2015	180	1
UC Irvine	19172 Jamboree Rd	Irvine	Orange	2015	180	1
San Juan Capistrano	26572 Junipero Serra Rd	San Juan Capistrano	Orange	2015	394	1
West Sacramento	1515 S River Rd	West Sacramento	Yolo	2015	394	1
Anaheim	3731 E La Palma Ave	Anaheim	Orange	2016	180	1
Campbell	2855 Winchester Blvd	Campbell	Santa Clara	2016	266	1
Costa Mesa	2050 Harbor Blvd	Costa Mesa	Orange	2016	266	1
Hayward	391 W A St	Hayward	Alameda	2016	266	1
La Cañada - Flintridge	550 Foothill Blvd	La Canada Flintridge	Los Angeles	2016	266	1
Lake Forest	20731 Lake Forest Dr	Lake Forest	Orange	2016	266	1
Long Beach	3401 Long Beach Blvd	Long Beach	Los Angeles	2016	266	1
Fairfax	7751 Beverly Blvd	Los Angeles	Los Angeles	2016	180	1
Santa Monica	1819 Cloverfield Blvd	Los Angeles	Los Angeles	2016	180	1
Playa Del Rey	8126 Lincoln Blvd	Los Angeles	Los Angeles	2016	266	1
Hollywood	5700 Hollywood Blvd	Los Angeles	Los Angeles	2016	266	1
Mill Valley	570 Redwood Highway	Mill Valley	Marin	2016	266	1
Del Mar	3060 Carmel Valley Rd	San Diego	San Diego	2016	266	1
San Jose	2101 N First St	San Jose	Santa Clara	2016	266	1
Santa Barbara	150 S La Cumbre Rd	Santa Barbara	Santa Barbara	2016	266	1
Saratoga	12600 Saratoga Ave	Saratoga	Santa Clara	2016	198	1
South San Francisco	248 S Airport Blvd	South Francisco	San Mateo	2016	266	1
Truckee	12105 Donner Pass Rd	Truckee	Nevada	2016	266	1

Name	Address	City	County	Retail Open	Capacity (kg/day)	Fueling Positions
Woodland Hills	5314 Topanga Canyon Blvd	Woodland Hills	Los Angeles	2016	180	1
Lawndale	15606 Inglewood Ave	Lawndale	Los Angeles	2017	180	1
Riverside	8095 Lincoln Ave	Riverside	Riverside	2017	100	2
San Ramon	4475 Norris Canyon Rd	San Ramon	Contra Costa	2017	393	1
South Pasadena	1200 Fair Oaks Ave	South Pasadena	Los Angeles	2017	206	1
Torrance	2051 W 190th St	Torrance	Los Angeles	2017	200	4
Fremont	41700 Grimmer Blvd	Fremont	Alameda	2017	266	1
Palo Alto	3601 El Camino Real	Palo Alto	Santa Clara	2018	136	1
LAX	10400 Aviation Blvd	Los Angeles	Los Angeles	2018	200	1
Mountain View	830 Leong Dr	Mountain View	Santa Clara	2018	241	1
Ontario	1850 Holt Blvd	Ontario	San Bernardino	2018	100	1
Emeryville	1172 45th St	Emeryville	Alameda	2018	350	1
Thousand Oaks	3102 Thousand Oaks Blvd	Thousand Oaks	Ventura	2018	266	1
Oakland	350 Grand Ave	Oakland	Alameda	2019	808	2
CSULA	5151 State University Dr	Los Angeles	Los Angeles	2019	51	1
Fountain Valley	18480 Brookhurst St	Fountain Valley	Orange	2020	1212	3
Mission Hills	15544 San Fernando Mission Rd	Mission Hills	Los Angeles	2020	1212	3
Sunnyvale	1296 Sunnyvale Saratoga	Sunnyvale	Santa Clara	2021	1212	3
Campbell - Hamilton	337 E Hamilton Ave	Campbell	Santa Clara	2021	1212	3
Concord	605 Contra Costa Blvd	Concord	Contra Costa	2021	1212	3
Sherman Oaks	14478 Ventura Blvd	Sherman Oaks	Los Angeles	2021	808	2
Studio City	3780 Cahuenga Blvd	North Hollywood	Los Angeles	2021	808	2
Aliso Viejo	26813 La Paz Rd	Aliso Viejo	Orange	2021	1616	4
Costa Mesa - Bristol	2995 Bristol St	Costa Mesa	Orange	2021	1616	4
Placentia	313 W Orangethorpe Ave	Placentia	Orange	2021	1616	4

Name	Address	City	County	Retail Open	Capacity (kg/day)	Fueling Positions
Baldwin Park	14477 Merced Ave	Baldwin Park	Los Angeles	2022	1616	4
Cupertino	21530 Stevens Creek Blvd	Cupertino	Santa Clara	2022	1616	4
Orange	615 South Tustin St	Orange	Orange	2022	1616	4
San Jose - Snell	3939 Snell Ave	San Jose	Santa Clara	2022	1616	4
Burbank - Hollywood	800 N Hollywood Way	Burbank	Los Angeles	2022	1616	4
Pasadena - Allen	475 N Allen Ave	Pasadena	Los Angeles	2022	1469	4
Hawaiian Gardens	11807 East Carson St	Hawaiian Gardens	Los Angeles	2022	808	2
Seal Beach	13980 Seal Beach Blvd	Seal Beach	Orange	2022	808	2
San Diego	5494 Mission Center Rd	San Diego	San Diego	2023	1212	4
Oakland - Foothill	4280 Foothill Blvd	Oakland	Alameda	2023	1616	4
Anaheim - Euclid	1100 N Euclid St	Anaheim	Orange	2023	808	2
Corona	616 Paseo Grande	Corona	Riverside	2024	808	2
La Mirada	13550 S Beach Blvd	La Mirada	Los Angeles	2024	808	2
Santa Ana	2120 E McFadden Ave	Santa Ana	Orange	2024	808	2
Port of Oakland	2450 Engineer Rd	Oakland	Alameda	2024	1616	4
Vacaville	299 Orange Dr	Vacaville	Contra Costa	2024	808	2
Moreno Valley	12431 Heacock St	Moreno Valley	Riverside	2024	808	2
SunLine Transit	32505 Harry Oliver Trail	Thousand Palms	Riverside	2024	808	2
Fontana	16880 Slover Ave	Fontana	San Bernardino	2024	1616	4
Chino Hills	3260 Chino Ave	Chino Hills	San Bernardino	2024	808	2
Woodside	17287 Skyline Blvd	Woodside	San Mateo	2025	68	2
Redwood City	503 Whipple Ave	Redwood City	San Mateo	2025	1212	3
Riverside - Upgrade	8095 Lincoln Ave	Riverside	Riverside	2025	708	2
San Ramon - Upgrade	4475 Norris Canyon Rd	San Ramon	Contra Costa	2025	1212	3

Name	Address	City	County	Retail Open	Capacity (kg/day)	Fueling Positions
San Bernardino	1930 South Waterman Ave	San Bernardino	San Bernardino	2025	1616	4
El Cerrito	3160 Carlson Blvd	El Cerrito	Contra Costa	2025	1616	4
Rancho Bernardo	11030 Rancho Carmel Dr	Rancho Bernardo	San Diego	2025	1616	4
Buena Park	6392 Beach Blvd	Buena Park	Orange	2025	1616	4
Carson	111 E Victoria St	Carson	Los Angeles	2025	1212	3
Galt	Carol Dr and Amador Ave	Galt	Sacramento	2025	1616	4
Antioch	2413 A Street	Antioch	Contra Costa	2025	808	2
Beaumont	325 Luis Estrada Road	Beaumont	Riverside	2025	808	2
Perris	796 Ramona Expy	Perris	Riverside	2025	1212	3
SoHyCal	24205 W Whitesbridge Ave	Kerman	Fresno	2025	850	3
San Diego - Washington	1832 W Washington St	San Diego	San Diego	2026	1616	4
San Jose - Santa Clara	510 E Santa Clara Street	San Jose	Santa Clara	2026	1616	4
Fremont - Warm Springs	47700 Warm Springs Blvd	Fremont	Alameda	2026	1616	4
Orinda	67 Moraga Way	Orinda	Contra Costa	2026	1616	4
Camarillo	2911 Petit Street	Camarillo	Ventura	2026	1520	4
Riverside - Central	3505 Central Ave	Riverside	Riverside	2026	1616	4
Lancaster	43144 10th Street West	Lancaster	Los Angeles	2026	808	2
West Sacramento - Capital	4900 W Capital Ave	West Sacramento	Yolo	2026	1616	4
Ventura	2121 Harbor Boulevard	Ventura	Ventura	2027	1616	4
Los Angeles - Santa Monica	10867 Santa Monica Blvd	Los Angeles	Los Angeles	2027	1616	4
Vallejo	10 Sage St	Vallejo	Solano	2027	1616	4
Lakewood	5500 South St	Lakewood	Los Angeles	2027	1616	4
San Jose - Capitol	1898 N Capitol Ave	San Jose	Santa Clara	2027	1616	4
Kettleman City	33252 Hubert Way	Kettleman City	Kings	2027	1616	4
Fairfield	2595 N Texas St	Fairfield	Solano	2028	1616	4

Name	Address	City	County	Retail Open	Capacity (kg/day)	Fueling Positions
Bellflower	9409 Alondra Blvd	Bellflower	Los Angeles	2028	1616	4
San Jose - Union	3707 Union Ave	San Jose	Santa Clara	2028	1616	4
San Jose - Redmond	1331 Redmond Ave	San Jose	Santa Clara	2028	1616	4
Moreno Valley - Graham	12520 Graham St	Moreno Valley	Riverside	2028	1616	4
McClellan Park	4785 Bailey Llop	McClellan Park	Sacramento	2028	1616	4
Livermore	7810 National Drive	Livermore	Alameda	2028	1616	4
Fresno	4163 S Chestnut Ave	Fresno	Fresno	2029	1616	4
Rosemead	939 San Gabriel Blvd	Rosemead	Los Angeles	2029	1616	4
Palm Springs	E Vista Chino & N Gene Autry Trail	Palm Springs	Riverside	2029	1616	4
Torrance - Hawthorne	24505 Hawthorne Blvd	Torrance	Los Angeles	2029	1616	4
Ontario - Euclid	2160 S Euclid Avenue	Ontario	San Bernardino	2029	1616	4
Los Gatos	666 N Santa Cruz Ave	Los Gatos	Santa Clara	2029	1616	4
Los Altos	988 N San Antonio Rd	Los Altos	Santa Clara	2029	1616	4
Tustin	14244 Newport Ave	Tustin	Orange	2029	1616	4

Appendix C: Station Status Definition Details

The new awards for station development made by CEC through GFO-19-602 have significantly expanded the outlook of hydrogen fueling network development in California. This Annual Evaluation adopts a set of station status definitions designed to reflect the current state of the operating and planned hydrogen fueling network. Definitions remain aligned with those adopted by the Governor's Office of Business and Economic Development and other stakeholders, though this report has re-grouped some of these definitions into new categories in order to streamline reporting.

Open-Retail stations are defined by:

1. The station has passed local inspections and has operational permit
2. The station is publicly accessible
3. The station operator has fully commissioned the station and has declared it fit to service retail FCEV drivers. This includes the station operator's declaration that the station meets the appropriate SAE fueling protocol, and three auto manufacturers have confirmed that the station meets protocol expectations and their customers can fuel at the station, and it has passed relevant hydrogen quality tests.
4. Division of Measurement Standards' Weights and Measures has verified dispenser performance, enabling the station to sell hydrogen by the kilogram (pursuant to California Code of Regulations Title 4, Division 9, Chapter 1).
5. The station has a functioning point of sale system.
6. The station is connected to the Station Operational Status System (SOSS), maintained by the Hydrogen Fuel Cell Partnership.

The remainder of the status definitions are as follows:

Temporarily Non-operational: These stations have previously achieved open-retail status in California's hydrogen fueling network but have not been available to customers for fueling for an extended period of time. The reasons for the change in operating status vary for each station in this group. These stations are currently expected to return to open-retail status in the future, but the timeline is unknown.

Fully Constructed: Construction is complete at these stations and the station developer has notified the appropriate authority having jurisdiction.

Continuing Development: These stations initiated development as a result of efforts prior to awards made through GFO-19-602. These stations were initiated through prior grant funding administered by CEC or began development as they received approval to participate in the LCFS HRI program.

Newly Under Development: Most of the stations in this group are part of batch one in awardees' planned networks of stations through grant awards made in GFO-19-602. This group also includes stations that developers are currently building without funding through GFO-19-602.

Future Known Locations: These stations are part of batch two in awardees' planned networks of stations through grant awards made in GFO-19-602. Per the requirements of GFO-19-602, station developers must first complete batch one stations before being eligible for reimbursement on development of batch two stations. Even though these locations are known via applications to GFO-19-602, construction is not expected to begin until a future date.

Future Unknown Locations: These stations are all part of awards made through GFO-19-602. These stations are included in batch two or later of awardees' station development plans. Awardees were not required to provide addresses for these stations at the time of application but will determine and share the specific locations with CEC as they complete each sequential batch in their station construction plans.

California Air Resources Board
1001 I Street
P.O. Box 2815
Sacramento, CA 95812
(916) 323-2514
arb.ca.gov

Sustainable Transportation and Communities Division

arb.ca.gov/our-work/programs/hydrogen-fueling-infrastructure

cleancars@arb.ca.gov