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California Energy Commission

Clean Transportation Program

FINAL PROJECT REPORT

GO-Biz Zero-Emission Vehicle Infrastructure Unit

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PREFACE

Assembly Bill 118 (Núñez, Chapter 750, Statutes of 2007) created the Clean Transportation Program, formerly known as the Alternative and Renewable Fuel and Vehicle Technology Program. The statute authorizes the California Energy Commission (CEC) to develop and deploy alternative and renewable fuels and advanced transportation technologies to help attain the state's climate change policies. Assembly Bill 8 (Perea, Chapter 401, Statutes of 2013) reauthorizes the Clean Transportation Program through January 1, 2024, and specifies that the CEC allocate up to $20 million per year (or up to 20 percent of each fiscal year's funds) in funding for hydrogen station development until at least 100 stations are operational.

The Clean Transportation Program has an annual budget of about $100 million and provides financial support for projects that:

- Reduce California's use and dependence on petroleum transportation fuels and increase the use of alternative and renewable fuels and advanced vehicle technologies.
- Produce sustainable alternative and renewable low-carbon fuels in California.
- Expand alternative fueling infrastructure and fueling stations.
- Improve the efficiency, performance, and market viability of alternative light-, medium-, and heavy-duty vehicle technologies.
- Retrofit medium- and heavy-duty on-road and nonroad vehicle fleets to alternative technologies or fuel use.
- Expand the alternative fueling infrastructure available to existing fleets, public transit, and transportation corridors.
- Establish workforce-training programs and conduct public outreach on the benefits of alternative transportation fuels and vehicle technologies.

To be eligible for funding under the Clean Transportation Program, a project must be consistent with the CEC's annual Clean Transportation Program Investment Plan Update. The CEC contracts 600-13-004 and 600-17-002 funded activities in the Zero-Emission Vehicles Infrastructure Unit within Governor's Office of Business and Economic Development. The activities include facilitating the hydrogen fueling station infrastructure and the electric vehicle charging infrastructure by working with local, state, and federal government agencies, hydrogen station developers, electric vehicle charging planners and installers, automakers, and other stakeholders.

ABSTRACT

This report provides an overview of the work performed from 2014 to 2017 by the Governor's Office of Business and Economic Development Zero-Emission Vehicle Infrastructure Unit, with funding from the CEC, to help accelerate the growth of the zero-emission vehicle market in California.

The methods for growth of the zero-emission vehicle infrastructure in California included:

- Convening private and public stakeholders to develop California's hydrogen refueling infrastructure in a coordinated fashion
- Developing and implementing strategies to remove barriers and expedite installations of hydrogen refueling and electric vehicle charging stations;
- Encouraging codes for dispensing hydrogen to allow reliable, safe, and commercially viable dispensing to build and encourage public acceptance of zero-emission vehicle technology;
- Conducting station-by-station analysis of hydrogen refueling stations to ensure that investments are beneficial;
- Streamlining the permitting of hydrogen refueling and electric vehicle charging infrastructure;
- Increasing the acceptance and use of zero-emission vehicles.

This report details the progress reporting from the Governor's Office of Business and Economic Development Zero-Emission Vehicle Unit to the CEC. Reporting was modified for brevity, and complete reports may be released upon request.

California's zero-emission vehicle market has developed rapidly since 2014. This acceleration has been due to the hard work and dedication of all stakeholder groups, including government agencies, station developers, auto manufacturers, and others. Collaboration and cooperation among these groups were key to success.

Keywords: Governor's Office of Business and Economic Development, zero-emission vehicle (ZEV), electric vehicle (EV)

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EXECUTIVE SUMMARY

This final report provides information about the progress fulfilling the scope of work under CEC Contracts 600-13-004 and 600-17-002 with the Governor's Office of Business and Economic Development. This final report summarizes the quarterly reports submitted by the Governor's Office of Business and Economic Development to the CEC under these contracts.

The tasks in Contract 600-13-004 and 600-17-002 address zero-emission vehicle infrastructure development, including convening a working group dedicated to developing hydrogen refueling infrastructure, and developing and implementing strategies to expedite hydrogen refueling station development, installation, and commissioning. The tasks also included planning for and installation of electric vehicle charging stations; encouraging the acceptance of the California code for hydrogen gas-measuring devices; and conducting an analysis of proposed hydrogen fueling stations to determine status, site design suitability, engineering design, permitting, and environmental concerns.

The contract tasks also included participation in and accelerating of the permitting of hydrogen fueling stations and electric vehicle charging infrastructure with local regulatory authorities and providing outreach and education services.

CHAPTER 1:
Activity Review

This report describes the activities under Contracts 600-13-004 and 600-17-002. The goal of the contracts is to support the Governor's Office of Business and Economic Development (GO-Biz) Zero-Emission Vehicle Infrastructure Project Manager and Unit. Contract 600-13-004 started in November 2013 when the network of hydrogen refueling stations in California included nine nonretail hydrogen refueling stations and nearly 50,000 plug-in electric vehicles (PEV) that had been sold into California. At the completion of 600-13-004, 31 hydrogen refueling stations were operating in California with nearly 400,000 plug-in electric vehicles in the state. Since 2014, the electric vehicle charging market expanded from about 10 vehicle models to more than 30, with public charging infrastructure increasing commensurately.

The Zero-Emissions Vehicle Infrastructure Unit participated and represented the GO-Biz in stakeholder discussions including meetings held with the California Fuel Cell Partnership (CaFCP), H2USA, California Hydrogen Business Council, International ZEV Alliance, and the PEV Collaborative. Furthermore, GO-Biz convened and led agency coordination activities with relevant state agencies including the CEC, California Air Resources Board (CARB), and California Public Utilities Commission (CPUC). Coordination was at all organization levels and involved staff and leadership and GO-Biz was responsible for ensuring coordination and advancement of the 2016[1] and 2018[2] ZEV Action Plans, for which GO-Biz staff led the development and writing.

Working Group on Hydrogen Refueling Infrastructure

GO-Biz established a "Green Team"[3] that focused on station permitting. Within the first year, the initial composition of the team became obsolete once there was sufficient understanding of the permitting process for hydrogen stations and general needs to enable development. At that point, GO-Biz (along with the CEC) moved to targeted outreach and one-on-one meetings

[1] 2016 ZEV ACTION PLAN (ca.gov) https://dot.ca.gov/-/media/dot-media/programs/sustainability/documents/2016-zev-action-plan-a11y.pdf

[2] 2018 ZEV Action Plan Priorities Update (ca.gov) https://static.business.ca.gov/wp-content/uploads/2019/12/2018-ZEV-Action-Plan-Priorities-Update.pdf

[3] The original Green Team consisted of leaders from the following organizations: Air Products and Chemicals, Inc., Bay Area Air Quality Management District, California Air Resources Board, California Department of Food and Agriculture Division of Measurement and Standards, California Fuel Cell Partnership, California Energy Commission, California Housing and Community Development, California State University at Los Angeles, California Public Utility Commission, California State Fire Marshal's Office, Daimler AG Automotive Company, Employment Training Panel, FirstElement Fuel, Inc., General Motors, The Linde Group, Governor's Office, National Renewable Energy Laboratory, Honda Motor Company, Ltd., Hydrogenics Corporation, Hyundai Motor Company, Orange County Fire Authority, Sandia National Laboratory, South Coast Air Quality Management District, Toyota Motor Corporation, US Department of Energy, as well as independent codes and standards experts.

with individual jurisdictions to help address specific local requirements and challenges when they arose.

The Green Team changed into the Station Confirmation Group (consisting of representatives from automakers, the CaFCP, CARB, and CEC), which GO-Biz continues to lead twice monthly. This group created and implemented the process to open retail stations, when no process existed in the world. Today, the group is sharing information to streamline the commissioning process when a station is ready to open, aligning projections on station opening to ensure drivers receive consistent information across sources, and brainstorming methods to solve specific station opening challenges. This collaboration would not have happened without the leadership of GO-Biz. The meetings are always well attended and GO-Biz hears from the original equipment manufacturer (OEMs) who participate that it is one of the more valuable meetings.

The GO-Biz and the CEC Commissioner on Transportation formed a hydrogen policy group, which met monthly to troubleshoot issues related to hydrogen station and market development. In addition to the GO-Biz, other agency's such as CEC, CARB, CPUC, and later Government Operations and California Environmental Protection Agency, joined the discussions.

Hydrogen Refueling Stations and Electric Vehicle Chargers

GO-Biz worked with some local jurisdictions and the hydrogen and plug-in project developers. GO-Biz maintained the hydrogen station status in a public worksheet. The status of the permitting, planning, and activities of the station developers were reported. GO-Biz facilitated the station confirmation process to move a station from operational to open retail for the worksheet.

GO-Biz met with key staff members in cities where a hydrogen station was installed to discuss permitting. In November 2015, GO-Biz wrote and released the *Hydrogen Station Permitting Guidebook*[4], which helps communities understand that a hydrogen station in their city is not a one-off project and points them to resources they can leverage to streamline their approval process. The permitting guidebook also offers high-level guidance to station developers on the development process and provides tips for streamlining work and avoiding common pitfalls (although by 2017, most developers in the space have good experience from which to draw).

In 2016, GO-Biz facilitated the "Lead by Example" infrastructure group, which is an informal collection of agencies with a large stake in California's 2016 ZEV Action Plan. The agencies shared information about installing EV charging at 5 percent of state-owned or -leased parking spaces.

GO-Biz coordinated outreach with state, federal, and local agencies. They planned and participated in community events to bring stakeholders (interested parties) together to learn about permitting and discuss the potential for hydrogen refueling.

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[4] 201511HydrogenStationPermittingGuidebookCApdf.pdf (ct.gov) (https://portal.ct.gov/-/media/DEEP/air/mobile/EVConnecticut/201511HydrogenStationPermittingGuidebookCApdf.pdf)

GO-Biz participated in conferences and speaking engagements to raise awareness and grow the ZEV market. Examples included hydrogen station ribbon cuttings[5], Select California Summit[6], China-U.S. Infrastructure Forum[7], and several keynote speeches to a variety of audiences. Demand continues to grow for GO-Biz participation in transportation and energy-related meetings and events. Moreover, requests are becoming increasingly higher in visibility.

In June 2017, GO-Biz led a California delegation to the Northeast consisting of leadership from CARB, CEC, H2USA, United States Department of Energy, Toyota, Honda, and Air Liquide[8]. The group met with officials in five states to share information about California's experience developing a hydrogen station network and learn more about the unique challenges the northeast portion of the country faces. Collaboration remains ongoing.

In September 2017, GO-Biz presented at the Hydrogen Council Meeting in New York City and addressed energy, transport, and industry.

GO-Biz worked with CARB and the California Department of Food and Agriculture Division of Measurement and Standards (DMS) on the California code for hydrogen gas measuring, including "registered service agents" which certify dispensers. The registered service agents work with county officials to verify that type-certified dispensers meet specifications, saving DMS resources to focus on type certification for new dispensers.

GO-Biz decided not to pursue a programmatic California Environmental Quality Act review for the early market stations, per the contract.

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[5] Lake Tahoe-Truckee hydrogen station ribbon cutting - August 27, 2016 | California Fuel Cell Partnership (cafcp.org) https://cafcp.org/content/lake-tahoe-truckee-hydrogen-station-ribbon-cutting-august-27-2016

[6] GO-Biz to Lead Delegation to the Annual SelectUSA Summit in Washington D.C. and Host Select California Event | California Governor's Office of Business and Economic Development https://business.ca.gov/go-biz-to-lead-delegation-to-the-annual-selectusa-summit-in-washington-d-c-and-host-select-california-event/

[7] U.S.-China Transportation Forum | US Department of Transportation https://www.transportation.gov/office-policy/international-policy-and-trade/us-china-transportation-forum

[8] A world leader in gases, technologies and services for Industry and Health | Air Liquide (https://www.airliquide.com/)

CHAPTER 2:
2014 Highlights

GO-Biz provided quarterly progress reports between March 1, 2014, and June 30, 2017. Details included development of the fuel cell electric vehicle hydrogen refueling and EV charging networks. The following are highlights. More detailed reports may be available, upon request.

Quarter 2 (4/1 – 6/30, 2014)

Q2 2014 was used to understand the barriers to station deployment, make the information readily available, and organize stakeholders around solving them.

GO-Biz held stakeholder meetings, both in groups and one-on-one focused on key development barriers. Much of the time was spent working directly with station developers and authorities having jurisdiction to understand, and often translate, both perspectives. CEC and GO-Biz reached key staff or city leadership or both in every community with a planned hydrogen station.

GO-Biz established Smartsheet, a cloud-based spreadsheet program, as the central tool for transparency and information sharing. GO-Biz used it to track detailed station development progress for each hydrogen station and made the sheet available online to allow stakeholders to see relevant information. This tool remains fundamental to success.

GO-Biz worked with partners to exhibit and share California's efforts to build hydrogen stations. It held a community outreach event in Torrance (Los Angeles County, on the Toyota campus), as well as two hydrogen station permitting workshops. Furthermore, GO-Biz established a state team to help develop a hydrogen station permitting guidebook to promote throughout the state.

The New Energy and Industrial Technology Development Organization (NEDO) Direct Current Fast Charger (DCFC) Project[9] kicked off. NEDO had proposed working with the State of California to install between 30 to 50 DCFC stations between Monterey and Lake Tahoe, with heavy San Francisco Bay Area concentration. The idea was for NEDO to fund the project at the level of roughly $10 million.

The Hydrogen network snapshot included :

- Twelve publicly accessible stations were permitted.
- Six were in the permit process.
- Nine stations were in presubmittal.

9 NEDO: The New Energy and Industrial Technology Development Organization. (https://www.nedo.go.jp/english/)

Quarter 3 (7/1 – 9/30, 2014)

This quarter built on the momentum started in last quarter, with communities and permitting officials eager to help the market flourish. At least two key changes helped lay the foundation for a more normalized station development process. First, the National Fire Protection Association 2 was adopted by CAL FIRE, creating a clear approval pathway for fire marshals throughout the state. Secondly, the Hydrogen Station Testing Equipment Performance Device[10], implementation team kicked off its focused work, targeting a field introduction by July 2015. Hydrogen Station Testing Equipment Performance Device would become pivotal in hydrogen station testing to become open retail and available to fuel cell electric vehicle drivers.

Active community outreach continued, with notable connections made in Los Angeles. GO-Biz also held a Northern California community briefing to go along with community outreach.

Stakeholder engagement continued across public and private entities. In Q3, GO-Biz initiated a regular collaborative calls with the CEC, Department of Energy, CARB, and South Coast Air Quality Management District to discuss issues and opportunities. The Department of Energy Fuel Cells Technology Office demonstrated an eagerness to help and learn from California's efforts where possible. Much of the information gained was captured in the *Hydrogen Station Permitting Guidebook*, with 80 percent of the draft completed this quarter.

GO-Biz addressed two market uncertainties in Q3. First, GO-Biz led an effort to remove regulatory ambiguity for hydrogen. (The CPUC had the potential to regulate hydrogen as a utility.) This effort would become Assembly Bill 1008 (Quirk, Chapter 109, Statutes of 2015), which was signed by Governor Edmund G. Brown Jr. Second, stakeholders realized that no guidance existed for how to tax hydrogen fuel sales; GO-Biz kicked off an effort to understand the issues. Ultimately, stakeholders agreed the best path forward was to charge sales tax, which remains the current practice.

For EV charging, GO-Biz finalized the direct-current fast charger (DCFC) agreement with NEDO (of Japan), a national research and development agency that creates innovation by promoting technological development necessary for realization of a sustainable society[11]. Together, GO-Biz and NEDO set up a signing event for October 2014. The resulting letter of intent kicked off the NEDO's feasibility analysis, which ultimately led to the construction and operation of 55 DCFC in Northern California (five more than originally conceived).

Quarter 4 (10/1 – 12/31, 2014)

GO-Biz worked with industry partners to develop a station-opening projection system based on on-the-ground realities. This system proved to be helpful for automaker planning in terms of

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[10] "Powertech designed and built the Hydrogen Station Equipment Performance (HyStEP) testing device. The device—the first of its kind in North America—ensures public hydrogen refueling stations meet industry standards and significantly accelerates station commissioning." HYDROGEN STATION TESTING DEVICES - Powertech Labs https://powertechlabs.com/hydrogen-station-testing-devices/

[11] New Energy and Industrial Technology Development Organization (nedo.go.jp) https://www.nedo.go.jp/english/

deployment and managing customer expectations. GO-Biz initiated regular check-in and strategy meetings with CEC and CARB to align the efforts on hydrogen station development and deployment. The goal was, and continues to be, seamless communication among the agencies.

For permitting, nine in-person meetings were held with representatives of local jurisdictions, as well as ongoing conversations with eight others. GO-Biz gave seven presentations on California's progress at various events, including the hydrogen station permitting workshop in Hayward, which attracted 70 participants, as many people as there were seats in the room. GO-Biz also released the first draft of the *Hydrogen Station Permitting Guidebook* for stakeholder review.

To normalize station development, CARB took a leadership position with the Hydrogen Station Testing Equipment Performance Device, and the DMS certified three stations to sell hydrogen by the kilogram. GO-Biz supported both efforts.

A hydrogen station progress snapshot is below in Table 1.

Table 1: California Hydrogen Station Permitting – Q4 2014

Permit Stage	**Permit Report Card**
Permitted To Build*	15
Permit Applications Submitted	22
Permit Applications to be Submitted	21

***Includes one bus-only station (Oakland). All others are light duty vehicles.**

Source: GO-Biz

GO-Biz finalized the DC fast charger agreement with NEDO. GO-Biz hosted a well-received event for the letter of intent signing held October 14, 2014. The letter of intent kicked off NEDO's feasibility analysis.

CHAPTER 3:
2015 Highlights

Quarter 1 2015 (1/1 – 3/31, 2015)

GO-Biz created a station projection smartsheet to capture internal and external station opening projects. The internal version was more refined and nuanced. Stakeholders expressed comfort with the station-opening projection process.

Hydrogen station permitting progressed, and GO-Biz met in person with 10 local jurisdictions and engaged with 15 more. GO-Biz gave presentations at eight events, typically sharing California's experience and anticipated challenges and incorporating stakeholder comments into the *Hydrogen Station Permit Guidebook*.

At the start of 2015, a key issue emerged where there was no process in place to open retail stations to the public. GO-Biz worked with CaFCP and automakers to develop an automaker expectation checklist and process flow for opening a station and ultimately finalized the process in the following quarter. The process substantially decreased the time and effort required to open stations to fuel cell electric vehicle drivers.

Station permitting and the status of those projects are listed below in Table 2.

Table 2: California Hydrogen Station Permitting – Q1 2015

Permit Stage	**Permit Report Card**
Permitted To Build*	17
Permit Applications Submitted	22
Permit Applications to be Submitted	18

*__Includes one bus-only station (Oakland). All others are light duty vehicles.__

Source: GO-Biz

Assemblymember Quirk introduced Assembly Bill 1008, which aligned hydrogen regulation with natural gas and electricity. At the time, hydrogen for transportation could have been regulated by the CPUC as a utility. This bill ultimately made it clear that hydrogen sold for transportation will not be regulated as a utility, eliminating uncertainty. A similar bill was used to establish natural gas and electricity regulations. For background, the request for a legislative fix came from FirstElement Fuels after it collected concerns from potential future investors.

A variety of stakeholders approached GO-Biz with suggestions for greater GO-Biz involvement in plug-in infrastructure. It appeared that there was a strong need for high-level effort coordination with no one taking a central leadership role to ensure that collective efforts are addressing driver needs.

Quarter 2 (4/1 – 6/30, 2015)

GO-Biz formalized the station opening process, which consists of a) the city or county issuing an operational permit, b) the DMS or equivalent affixing a metrology sticker on the dispenser, c) the filling protocol being verified (by OEMs or Hydrogen Station Testing Equipment Performance Device — station tester — or equivalent or a combination) and d) the station developer opening the station. Once all steps have been verified, GO-Biz notifies CaFCP and stations developers; the CaFCP shows the newly opened station on its Station Operational Status System[12].

GO-Biz finalized the *Hydrogen Station Permit Guidebook* text and sent it to partners to do final formatting and typesetting. GO-Biz needed to do less in-person outreach this quarter but still intervened on 17 stations. GO-Biz cohosted two local stakeholder briefings with the CaFCP this quarter (San Diego and Oakland). The events attracted local leaders and permit officials. Both events featured OEM and station developer panels, with the format creating a strong dialogue between stakeholders.

Metrology certification started to become a potential bottleneck; the state had one metrology device and one person positioned to use it. GO-Biz worked with DMS to leverage county and station developer resources to ensure that this ongoing need for verification does not rely completely on the single hydrogen fuel standard in the state (which would result in considerable delays). This effort led to the system used today — station developers can become "registered service agents" who run the metrology tests with county weights and measures officials present to witness and verify them. This system proved to save considerable time and resources, allowing DMS to focus its metrology device on type certification.

GO-Biz co-organized a ZEV Action Plan Summit with the Governor's Office and gave opening remarks. GO-Biz staff also presented in six other venues, with a variety of audiences, including independent oil marketers.

In preparation for the ZEV Summit Plenary session, GO-Biz interviewed a variety of plug-in infrastructure participants. In general, the state and industry did not have a clear image of what is happening in the marketplace. GO-Biz continued developing a strategy for broader plug-in infrastructure involvement.

Quarter 3 (7/1 – 9/30, 2015)

In Q3 2015, GO-Biz initiated weekly check-in calls with the Toyota team. These calls have been used to make sure stakeholders are coordinated for Toyota's rollout of the Mirai. Its expectation for stations is perhaps the highest to date, making the stations a useful and helpful barometer for success. Toyota is basing its rollout plans on the information it receives in these calls and GO-Biz is leveraging Toyota's input to communicate with station developers.

[12] Station Status | Station Status (cafcp.org) https://m.cafcp.org/?_ga=2.141842098.1896203810.1655333542-700537902.1643397366

For hydrogen station permitting, much of the groundwork had been completed before Q3 2015, with some notable exceptions. GO-Biz held in-person meetings with seven communities and had engagements on another seven.

Station commissioning became a frontline issue in Q3, as a coordinated effort was required to take a station from fully constructed to fully open. GO-Biz took the lead in close consultation with CEC and automakers. GO-Biz created a system of shared stakeholder responsibility. To achieve consensus, GO-Biz worked individually with station developers, OEMs, CaFCP staff, and state agencies and presented the collective ideas at several meetings, ultimately achieving broad consensus on the process.

Once GO-Biz verified that the above four parameters are met, it emailed stakeholders and ultimately, the station was listed as "open" on maps and the California Fuel Cell Partnership Station Operation Status System.

One of the key issues of station commissioning was the reality that the state had access to one device that can type certify and verify hydrogen metrology. This reality created a key scheduling and resource challenge as more stations come on-line. In response, GO-Biz worked with DMS to communicate the availability of an alternate pathway allowing companies to pursue "registered service agent" status. GO-Biz sent an RSA white paper to station developers describing the process. Table 3 below shows the development of these stations and the stages involved.

Table 3: Light-Duty Station Development as of 9/30/2015

Stage of Construction	**Number of Hydrogen Stations**
Seeking New Site or On Hold	6
Finishing Permit Applications	5
In Permitting	7
Planning Approval	5
Approved to Build	3
Under Construction	14
Fully Constructed	6
Open for Demonstration	6
Open for Retail	2
Total	**54**

Source: GO-Biz

Governor Brown signed Assembly Bill 1008, which aligned hydrogen regulation with natural gas and electricity. This bill makes it clear that hydrogen sold for transportation will not likely be regulated as a utility. A similar bill was used to establish natural gas and electricity.

GO-Biz signed two memoranda of understanding with NEDO on September 10, 2015. The first kicked off the DCFC project that was projected to result in 30–50 DCFCs from Monterey to Lake Tahoe; the project ultimately delivered 55 DCFCs. The plan was for $20 million of investments by Japan into the California DCFC network. The second memorandum of understanding initiated a redox-flow battery project that will demonstrate the integration of a high-performance flow battery in the San Diego Gas & Electric Company (SDG&E territory. The flow battery project has the potential to help the state meet and exceed its Renewables Portfolio Standard targets.

GO-Biz worked with CARB to secure funding for a position to focus on plug-in infrastructure. CARB wanted GO-Biz to help accelerate market confidence and development much in the same way as GO-Biz has helped with the hydrogen market. In Q3 2015, the position was secured.

CHAPTER 4:
2016 Highlights

A ZEV Infrastructure section was created at GO-Biz, with an additional position funded by CARB, the GO-Biz-led ZEV Action Plan was finalized and released in October 2016, the NEDO-funded Drive the ARC project had a grand opening, and California ended the year with 25 open retail hydrogen stations, as shown in Table 4 below.

Table 4: Light-Duty Station Development as of 12/31/2016

Stage of Construction	**Number of Hydrogen Stations**
Establishing Site Control	1
Finishing Permit Applications	4
In Permitting	3
Planning Approval	2
Approved to Build	3
Under Construction	3
Fully Constructed	4
Open for Non-Retail	5
Open for Retail	25
Total	**50**

Source: GO-Biz

CHAPTER 5:
2017 Highlights

In addition to promoting general station development, GO-Biz deepened its focus on advancing key plug-in electric vehicle market development efforts, in part by playing an active role in helping create and identify a facilitator to support a multiagency and multistakeholder vehicle-grid integration workgroup. GO-Biz lead a public/private delegation to the northeast states to help motivate their contribution to hydrogen market development, which was well-received.

According to Table 5 below, by the end of the third quarter of 2017, California had reached 31 open-retail stations.

Table 5: Light Duty Station Development as of 9/30/2017

Stage of Construction	**Number of Hydrogen Stations**
Establishing Site Control	1
Finishing Permit Applications	17
In Permitting	3
Planning Approval	1
Approved to Build	2
Under Construction	2
Fully Constructed	3
Open for Non-Retail	3
Open for Retail	31
Total	**63**

Source: GO-Biz

CHAPTER 6:
2018 Highlights

On January 26, 2018, Governor Brown signed Executive Order B-48-18, which marked the first time any major government had set specific ZEV infrastructure targets. The executive order set targets of 250,000 chargers, including 10,000 DC fast chargers, and 200 hydrogen stations by 2025 (in support of 1.5 million zero-emission vehicles), and 5 million zero-emission vehicles by 2030.

Executive Order B-48-18 was accompanied by an administration-led budget push to ensure California had sufficient funding to meet the 2025 goals. The ZEV team supported the Governor's Office and Department of Finance, in collaboration with CEC and CARB, in making the case for the need for funding throughout the budget process. The results were mixed. The administration secured extra funding for charging, but not hydrogen.

In addition to the high-level infrastructure and vehicle deployment targets, the executive order directed GO-Biz to update the 2016 ZEV Action Plan, create a plug-in electric vehicle permitting guidebook, and update the 2015 hydrogen station permitting guidebook. The 2018 ZEV Action Plan Priorities update was published in September 2018 to focus on actions for the final year of the Brown Administration.[13] The Plug-in Guidebook was published in July 2019, and the hydrogen guidebook remained pending.

Governor Brown hosted the Global Climate Action Summit in San Francisco in September 2018, which attracted worldwide participation, and ZEVs were a focal point. The GO-Biz ZEV team helped with planning ZEV related programming, including facilitating announcements and commitments. Vehicle-charging providers, led by ChargePoint and EV Box, pledged to deploy 3.5 million charge points worldwide by 2025, and the Hydrogen Council committed to a shared target of 100 percent carbon-free hydrogen in transportation worldwide by 2030.

The year 2018 saw the release of the California Fuel Cell Partnership's long-awaited "Vision" document, which calls for 1,000 hydrogen stations to enable 1 million fuel cell vehicles by 2030. GO-Biz pushed for the targets, secured buy-in from members, and served as one of the lead authors for the document. This vision of a self-sustaining market in 2030 is compelling when coupled with the Hydrogen Council "carbon-free by 2030" announcement.

The United States Climate Alliance forms climate policy and started collaborating around ZEVs in 2018. GO-Biz promoted California's participation and helped connect states to policies that could be implemented without the benefit of California's ZEV regulation, such as the agency's ZEV-first purchasing policy.

In addition to working with the United States Climate Alliance, GO-Biz led a group of industry and agency representatives through a series of interactive "why hydrogen" webinars with representatives from several northeast states. These webinars were established in response to

13 Many of the action were underway before 2018. GO-Biz's approach was to get work going as soon as possible, not to wait for the publication of the plan for agencies to get to work on new, or revamped, tasks.

the Multi-State ZEV Action Plan[14], which called for a hydrogen focused workgroup to study the issue. The webinars were well-attended and received and laid a solid foundation of understanding. As of publication of this report, one key issue remained: hydrogen fuel cell vehicles had not been approved to travel through the Boston tunnel or New York/New Jersey Port Authority tunnels. Once those approvals are in place, outreach education can continue to ensure that northeast states learn from, and build on, California's experience.

To help measure progress toward the 250,000-charger target, GO-Biz kicked off a multiagency effort to develop a process to count shared and private chargers (often found in workplace or multifamily settings). A big portion of the 240,000 Level 2 chargers in Executive Order B-48-18 hinges on private-shared charger deployment. The key challenge is that private shared charger data are generally not shared with any public database. To date, this effort has resulted in informal statewide reporting to GO-Biz. The agency's goal remains for site hosts and station operators to share private station data with the federal Alternative Fuels Data Center and have the center protect the data and be able to share county- or zip code-level statistics.

Electrify America, a direct current fast charging station network[15], had investments that were active in 2018, and the group faced many challenges with permitting. The GO-Biz team would call the local jurisdiction and help both sides work through the issues. The GO-Biz shared a lot of education on the state's permit streamlining law, Assembly Bill 1236 (2015). Much of the lessons learned through this direct engagement fed into the final *Plug-in Electric Vehicle Charging Station Permitting Guidebook.*[16]

Battery recycling began attracting high-level administration attention in 2018. GO-Biz researched, wrote, and shared with other agencies a five-page memo on repurposing and recycling of end-of-life lithium-ion plug-in electric vehicle batteries. GO-Biz consulted with subject matter experts at CARB and CEC as part of the research for the report. The report summarizes early work in repurposing and recycling these batteries and identifies five challenges for potential state action.

Finally, the GO-Biz team became increasingly involved in medium- and heavy-duty zero-emission vehicle deployment. GO-Biz co-hosted industry roundtables with the CARB team in charge of developing the Advanced Clean Truck Regulation. Much work remains, and a large disconnect existed between what fleets are saying, "bring us ZEVs and we will buy them," and what OEMs are saying, "the market is too small to create what fleets want."

The year 2018 ended with 39 hydrogen stations, with 4 opening in three days.

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[14] RI DEM/Air Resources- Multi-State Zero Emission Vehicle (ZEV) Action Plan and Memorandum of Understanding http://www.dem.ri.gov/zevplanmou.pdf#:~:text=The%20multi-state%20ZEV%20Action%20Plan%20includes%20four%20sections%3A,proposed%20stakeholder%20partnerships.%20ZEV%20Program%20Requirements%20and%20Benefits

[15] Electrify America: U.S. EV public charging network | Electrify America https://www.electrifyamerica.com/

[16] EV Charging Station Permitting Guidebook | CALeVIP https://calevip.org/ev-charging-station-permitting-guidebook

In addition to the above highlights, the GO-Biz ZEV team continued outreach, permit support, and general problem solving, including working with CPUC and utilities to improve the interconnection process. The details can be found in the quarterly reports archive.

CHAPTER 7:
2019 Highlights

The year 2019 marked the start of the Gavin Newsom Administration (GO-Biz worked under Agreement 600-17-002 through June 2019). Governor Newsom made it clear that ZEV priorities were to continue under his leadership. GO-Biz oversaw agency reporting the status of their 2016 ZEV Action Plan actions — most of which were either complete or in progress. Part of the GO-Biz effort in 2019 was sitting down with the new leadership to understand how it wanted us to move ahead. The message the GO-Biz ZEV team received was clear: keep doing what you have been doing and look for ways to be more ambitious.

In 2019, GO-Biz released the *Plug-in Electric Vehicle Permitting Guidebook* (final draft published in June) and a complimentary geographic information system-based ZEV readiness map designed to capture permit streamlining progress in each city and county. The initial purpose of the map was to create a shared, visual understanding of EV charging station permit streamlining across the state, starting with tracking compliance of California's Assembly Bill 1236 (Chiu, Chapter 598, Statutes of 2015). This tool will allow cities and counties to easily replicate success, leverage lessons learned, and save time as California works to aggressively build out its zero-emission-vehicle infrastructure network. The map scoring is based on the scorecard established in the guidebook and is already having a strong impact, with nonstreamlined communities coming up to speed.

The first half of 2019 commanded focus on regulations with the potential to increase the cost of plug-in charging infrastructure. GO-Biz paid particular focus to the development of CARB's open access regulations, which ultimately requires a credit card reader on all public chargers. GO-Biz also concentrated on metrology regulations, which carried the risk of having to upgrade old infrastructure before the end of useful life. GO-Biz worked behind the scenes to gain as much alignment as possible. Industry players were generally happy with the end result of the metrology regulations and found a workable compromise with the open access regulations.

The first half of 2019 exposed three exciting new opportunities: (1) partnering with Nikola to build out an initial heavy-duty hydrogen station network, (2) supporting the creation of the Green Hydrogen Council to focus on the role of hydrogen in energy storage and movement, and (3) making new investments for NEDO. A brief summary of each follows:

Nikola's business model hinges on infrastructure. GO-Biz is working with them to connect all relevant resources and find ways to bring down the effective cost of electricity so that Nikola can produce electrolytic hydrogen at prices competitive with diesel.

Energy storage stakeholders have grown increasingly interested in the capability of hydrogen. GO-Biz worked with the soon-to-be-formed Green Hydrogen Council to host a kick-off meeting aimed at raising the understanding of the potential of hydrogen and motivating action toward implementing tangible projects that can showcase how hydrogen can contribute to a carbon-neutral energy system.

Given the success of working with GO-Biz on the Drive the ARC and Redox Flow Battery projects. NEDO wants to bring more investment to California. It is eager to partner with the Newsom Administration, via GO-Biz. It is particularly interested in investing in hydrogen.

As of the end Q2, California had 40 open retail hydrogen stations. Table 6 show a snapshot of the Q2 2019 network.

Table 6: Light-Duty Station Development as of Q2 2019

Stage of Construction	**Number of Hydrogen Stations**
Establishing Site Control	1
Finishing Permit Applications	2
In Permitting	1
Planning Approval	10
Approved to Build	2
Under Construction	1
Fully Constructed	7
Open for Retail	40
Total	**64**

Source: GO-Biz

By the end of June 2019, California has 20,832 public chargers, including 3,076 DC fast chargers. Moreover, GO-Biz has about 20,000 shared private chargers in the state.

The ZEV Infrastructure Unit Budget Change Proposal was approved in the 2019–2020 California budget. The ZEV Infrastructure Unit will now be a permanent unit and includes budget to add two new positions.

CHAPTER 8: Conclusions

From the creation of the ZEV infrastructure project manager position in 2014 to the creation of the ZEV infrastructure section in 2016 and through June 2019, GO-Biz played a role in developing the hydrogen fueling station network and streamlining plug-in electric vehicle infrastructure expansion.

Success hinged on contributions from several parties, perhaps most prominently industry, state agencies, and local governments. GO-Biz's approach was relatively simple: promote market confidence through increasing transparency and information flow and working with a wide variety of stakeholders to remove development barriers and facilitate solutions. In short, GO-Biz serves as a problem solver that has earned the confidence of industry, agencies, and local governments. GO-Biz could not have contributed to market development without the ongoing support of the CEC and CARB.

GLOSSARY

CALIFORNIA AIR RESOURCES BOARD (CARB)—The "clean air agency" in the government of California, whose main goals include attaining and maintaining healthy air quality, protecting the public from exposure to toxic air contaminants, and providing innovative approaches for complying with air pollution rules and regulations.

CALIFORNIA ENERGY COMMISSION (CEC)—The California agency established by the Warren-Alquist State Energy Resources Conservation and Development Act in 1974 (Public Resources Code, Sections 25000 et seq.) responsible for energy planning. The CEC's major areas of responsibilities are:

- Forecasting future statewide energy needs.
- Licensing power plants sufficient to meet those needs.
- Promoting energy conservation and efficiency measures.
- Developing renewable and alternative energy resources, including helping develop clean transportation fuels.
- Planning for and directing state response to energy emergencies.

CALIFORNIA FOOD AND AGRICULTURE DIVISION OF MEASUREMENT STANDARDS (DMS)—Enforcement of California weights and measures laws and regulations is the responsibility of the Division of Measurement Standards. The division works closely with county sealers of weights and measures who, under the supervision and direction of the Secretary of Food and Agriculture, carry out the vast majority of weights and measures enforcement activities at the local level. Ensuring fair competition for industry and accurate value comparison for consumers are the primary functions of the county/state programs.

CALIFORNIA FUEL CELL PARTNERSHIP (CaFCP)—The California Fuel Cell Partnership is an industry/government collaboration aimed at expanding the market for fuel cell electric vehicles powered by hydrogen to help create a cleaner, more energy-diverse future with no compromises to zero-emission vehicles.

CALIFORNIA PUBLIC UTILITIES COMMISSION (CPUC)—A state agency created by constitutional amendment in 1911 to regulate the rates and services of more than 1,500 privately owned utilities and 20,000 transportation companies. The CPUC is an administrative agency that exercises legislative and judicial powers; its decisions and orders may be appealed only to the California Supreme Court. The major duties of the CPUC are to regulate privately owned utilities, securing adequate service to the public at rates that are just and reasonable both to customers and shareholders of the utilities, including rates, electricity transmission lines and natural gas pipelines. The CPUC also provides electricity and natural gas forecasting and analysis and planning of energy supply and resources. Its main headquarters are in San Francisco.

DIRECT CURRENT FAST CHARGING (DCFC)—Provides charging through 480 V AC input and requires highly specialized, high-powered equipment as well as special equipment in the

vehicle itself. Can deliver 60 to 80 miles of range in 20 minutes of charging. Used most often in public charging stations, especially along heavy traffic corridors.[17]

ELECTRIC VEHICLES (EV)—A broad category that includes all vehicles that are fully powered by electricity or an electric motor.

GOVERNOR'S OFFICE OF BUSINESS AND ECONOMIC DEVELOPMENT (GO-Biz)—The GO-Biz serves as the State of California's leader for job growth and economic development efforts. They offer a range of services to business owners including attraction, retention and expansion services, site selection, permit assistance, regulatory guidance, small business assistance, international trade development, and assistance with state government.

HYDROGEN (H2 or H2)—A colorless, odorless, highly flammable gas, the chemical element of atomic number 1.

H2USA—H2USA is a public-private partnership to promote the commercial introduction and widespread adoption of hydrogen-fueled fuel cell electric vehicles across America. H2USA's mission is to address hurdles to establishing hydrogen fueling infrastructure, enabling the large scale adoption of fuel cell electric vehicles.[18]

NEW ENERGY AND INDUSTRIAL TECHNOLOGY DEVELOPMENT ORGANIZATION (NEDO)—Japan's largest public management organization promoting research and development as well as deployment of industrial, energy and environmental technologies.[19]

ORIGINAL EQUIPMENT MANUFACTURER (OEM)—Makes equipment or components that are then marketed by its client, another manufacturer, or a reseller, usually under that reseller's own name.

PLUG-IN ELECTRIC VEHICLE (PEV)—is a general term for any car that runs at least partially on battery power and is recharged from the electricity grid. There are two types of PEVs to choose from — pure battery-electric and plug-in hybrid vehicles.

ZERO EMISSION VEHICLE (ZEV)—Vehicles that produce no emissions from the onboard source of power (for example, an electric vehicle)

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[17] Energy.gov. (2019). Vehicle Charging. [online] Available at: (https://www.energy.gov/eere/electricvehicles/vehicle-charging) [Accessed 17 Dec. 2019].

[18] H2USA (https://www.h2usa.org/)

[19] NEDO (https://en.wikipedia.org/wiki/New_Energy_and_Industrial_Technology_Development_Organization)