California Energy Commission (CEC)

CEC is the lead state agency on zero-emission vehicle (ZEV) infrastructure planning and deployment. The CEC sets the direction for California's multi-agency ZEV infrastructure deployment and ZEV-related manufacturing efforts. This includes efforts to expand charging and hydrogen fueling, vehicle-grid integration, and planning for resilient transportation systems powered by renewable energy. This also includes funding research, development, and deployment of next-generation ZEV technologies and investments in ZEV related manufacturing. In November 2021, the CEC approved a three-year $1.4 billion investment plan update for the Clean Transportation Program[1], which will continue the transition of the state's transportation sector towards zero-emission vehicles. This investment plan incorporates the largest California budget allocation approved to date for the Clean Transportation Program. These efforts will expand deployment of plug-in electric vehicle (PEV) charging and fuel cell electric vehicle (FCEV) hydrogen fueling stations. The investment plan breakdown for the next three years is as follows:

$690 million for medium- and heavy-duty ZEV infrastructure (PEV and FCEV)
$314 million for light-duty EV charging infrastructure
$244 million for ZEV manufacturing
$77 million for hydrogen refueling infrastructure
$25 million for zero- and near-zero-carbon fuel production and supply
$15 million for workforce training and development

Equity: The CEC's Investment Plan sets a goal of spending more than 50% on projects that benefit low income and disadvantaged communities. In 2022, the CEC plans to better define, measure, track and increase benefits to communities through a robust public process and inter-agency engagement. Benefits to priority communities include increased access to ZEV infrastructure (including in multi-family dwellings and rental homes), ZEV-focused pathways to high-road jobs, increased zero emission mobility (e.g., through transit infrastructure investments), and improved air quality in priority communities.

CEC ZEV MARKET DEVELOPMENT OBJECTIVES

1. **Analysis:** Develop and maintain analysis on ZEV infrastructure needs and progress, as well as data and shared analytical understanding of the integration of transportation into the energy system, in collaboration with the California Air Resources Board (CARB), California Public Utilities Commission (CPUC), Governor's

[1] CEC Investment Plan (2021-2022 update page): https://www.energy.ca.gov/programs-and-topics/programs/clean-transportation-program/clean-transportation-program-investment-6

November 15, 2021 CEC Business Meeting page: https://www.energy.ca.gov/event/meeting/2021-11/energy-commission-business-meeting

Office of Business and Economic Development (GO-Biz), California Independent System Operator (CAISO), and other agencies. Forecast transportation energy demand for all vehicles, including ZEVs. Analyze and publicize data on California ZEV sales, ZEV on-road fleet, and ZEV infrastructure. Maintain database of California's ZEV-related manufacturing companies.

Direct Pillar Connection: Vehicles, Infrastructure, End Users
Indirect Pillar Connection: Workforce

Key Collaborators: CARB, CPUC, CAISO and grid operators, GO-Biz, local air districts, California Dept. of Transportation, California Dept. of Motor Vehicles, California High-Speed Rail Authority, national labs and universities, non-governmental organizations (NGOs) including equity and environmental justice, and private entities including vehicle and infrastructure manufacturers.

Key Results & Actions:

a. **AB 2127 Charging Infrastructure Assessment.** Complete final version of the inaugural AB 2127 Commission Report and continue modeling andcoordination activities leading to the second biennial assessment.

   - **Progress in 2021**: The inaugural AB 2127 Commission Report was published in the summer of 2021. Its analyses project that by 2030 nearly 1.2 million chargers (shared private and public) will be required to meet the needs of 8 million light-duty ZEVs and an additional 157,000 chargers will be needed for the 180,000 medium- and heavy-duty ZEVs expected on California roadways.

b. **SB 1000 Report on Equitable Distribution of Charging Infrastructure.** Continue activities under SB 1000 to assess equitable distribution of charging infrastructure.

   - **Progress in 2021**: Analytical work focused on identifying areas that lack public DC fast charging (DCFC) within a ten-minute radius.

c. **AB 8 CEC/CARB Joint Report.** Continue analysis and coordination for the AB 8 report on hydrogen infrastructure and use the process to identify additional assessment needed to accelerate the medium and heavy-duty hydrogen market.

   - **Progress in 2021**: As of December 2021, 52 retail stations are open in California providing hydrogen refueling capacity to support as many as 36,000 light-duty FCVs. As of the end of the second quarter of 2121, there were approximately an estimated 9,000 light-duty FCVs on the road.
   - **Progress in 2021**: New items in the AB 8 Joint Report include barriers to large scale commercialization and deployment of FCEVs and the

investments, vehicle deployment, and infrastructure development status of other countries (China, Germany, Japan, and the Republic of Korea).

d. **Charging Infrastructure Modeling Tool Maintenance.** Continue updates to charging infrastructure modeling tools such as the new version of Electric Vehicle Infrastructure Projections (EVI-Pro) model tool; continue updates to the EVI-Pro RoadTrip model tool for long distance travel.

- **Progress in 2021**: Electric vehicle infrastructure models were refined to produce updated results in the inaugural AB 2127 report published in 2021. The models include:
  - EVI-Pro 2 for infrastructure needs of light-duty short-distance travel.
  - EVI-Pro RoadTrip for infrastructure needs of light-duty long-distance travel.
  - Widespread Ride-Hailing Infrastructure Deployment (WIRED) for infrastructure needs of light-duty ride-hailing travel.
  - Medium- and Heavy-Duty Electric Vehicle Infrastructure Load, Operations, and Deployment (HEVI-LOAD) for infrastructure needs of medium- and heavy-duty travel.

e. **Maintain and Update a ZEV-Related Manufacturing Database.** Monthly meetings with CARB and GO-Biz to further develop database to include more companies and develop a public-facing tool for easy access.

- **Progress in 2021**: Updated an existing list of ZEV-related manufacturers with business analytic data. Regular-interval meetings with CARB and GO-Biz resulted in identifying new companies that are potential candidates for the database.

f. **ZEV and Infrastructure Statistics Website.** Update the ZEV and Infrastructure Statistics website with ZEV sales, infrastructure counts, and ZEV population annually. Expand the website to include MD/HD ZEVs. Compile MD/HD ZEV counts from relevant funding programs in the state through cross- agency collaboration. At the end of each year, reassess whether California Department of Motor Vehicles (DMV) data can be used to accurately track MD/HD ZEVs going forward.

- **Progress in 2021**: Updated the ZEV and Infrastructure Statistics website with updated sales and infrastructure counts. The statistics now include the addition of CEC-awarded school buses and charging infrastructure.

g. **Transportation Energy Demand Forecast (TEDF).** Complete the TEDF annually as part of the Integrated Energy Policy Report (IEPR). Review

results as an indicator of whether the state is on track to meet its goals with current market conditions. Results will feed into the biennial AB 2127 assessments as well as the IEPR.

- **Progress in 2021**: Preliminary TEDF results will be available in late-December 2021, with final adoption in early 2022.

h. **Exploratory Forecast Scenarios.** Develop exploratory scenarios for the IEPR that build from the Transportation Energy Demand Forecast to assess potential impacts of proposed plug-in electric vehicle (PEV) policies, incentives, or othertrends.

- **Progress in 2021**: Discussion of the Final Demand Scenario development will be incorporated into the 2021 IEPR, but without results, which will be completed in mid-year 2022.

i. **Vehicle-Grid Integration (VGI) Simulation Studies.** Explore electric grid impacts of including ZEVs as a supply-side resource using a production cost simulation model software such as PLEXOS. These simulations will demonstrate the cost effectiveness and resilience benefits of using a battery-electric vehicle as an energy storage resource for buildings or the grid. (This activity also supports work in Objective 4, "Infrastructure Resilience".)

- **Progress in 2021**: Collected data to integrate into the EVSE Deployment and Grid Evaluation (EDGE) tool, which further identified areas needing improvement regarding data quality, confidentiality concerns, accessibility, and usefulness. The EDGE tool is still in active development and has not been shared externally.

2. **Infrastructure Development:** Catalyze the development and deployment of economically and environmentally sustainable ZEV infrastructure, with focus on gaps in access for California's most impacted communities. Enable public and private sector investment in ZEV infrastructure, with focus on freight transport given disproportionate and growing pollution burden. Oversee publicly-owned utilities' electricity resource planning, including plans for transportation electrification through investments and rates.

Direct Pillar Connection: Infrastructure, Workforce
Indirect Pillar Connection: End Users

Key Collaborators: CPUC, CARB, GO-Biz, CAISO and grid operators, local air districts, California Dept. of Transportation, California Dept. of Motor Vehicles, California High-Speed Rail Authority, utilities, the Disadvantaged Communities Advisory Group, the Clean Transportation Program Advisory Committee, electricity and hydrogen providers, federal, regional, local and tribal

governments, NGOs, fleets, universities and researchentities, and other external stakeholders who have an interest in zero-emissiontransportation including vehicle manufacturers and infrastructure manufacturers and companies.

Key Results & Actions:

a. **Fund Infrastructure through Grants, Loans, and Interagency Agreements.** The Clean Transportation Program administers funding targeted to appropriate ZEV sectors and customer groups including light-duty passenger vehicles and medium-duty and heavy-duty vehicles andoff-road equipment for both electric and hydrogen infrastructure deployment.

- **Progress in 2021**: The light-duty charging infrastructure block grant program under the Clean Transportation Program, CALeVIP (the California Electric Vehicle Infrastructure Project), released three incentive projects, adding 17 new counties and almost $47 million in rebate funding, including funding from project partners.
- **Progress in 2021**: The Clean Transportation Program awarded grants to two block grant implementers for light-duty EV charging infrastructure, for up to $250 million each.
- **Progress in 2021:** Released a solicitation seeking proposals to fund light-duty EV charging installations to address the needs for on-demand transportation services.
- **Progress in 2021**: Released a solicitation seeking proposals to fund light-duty EV charging infrastructure to address the needs for residents of multi-family housing and provide reliable, equitable, and accessible charging.
- **Progress in 2021**: Awarded 15 applicants from BESTFIT solicitation seeking demonstration for innovative EV charging technologies and business models.
- **Progress in 2021**: Awarded seven applicants from the EV Ready Communities Phase 2 – Blueprint Implementation solicitation, to help previous community awardees transition their plans into action.
- **Progress in 2021:** Awarded five applicants from the Zero-Emission Drayage Truck and Infrastructure Pilot Project, in collaboration with the California Air Resources Board.
- **Progress in 2021:** Awarded seven applicants for Zero-Emission Transit Fleet Infrastructure Deployment.
- **Progress in 2021:** Awarded 40 applicants for planning blueprints that will identify actions and milestones needed for implementation of medium-duty/heavy-duty zero-emission vehicles and the related electric charging and/or hydrogen refueling infrastructure.

b. **Equitable Access to Infrastructure for all Californians.** Ensure all Californians have access to infrastructure by including equity

objectives in all funding opportunities and by designing programs to provide benefits to underserved communities.

- **Progress in 2021**: As part of SB 1000 analysis, analytical work focused on identifying areas that lack public DC fast charging (DCFC) within a ten-minute radius.
- **Progress in 2021:** Released IDEAL ZEV Workforce Pilot solicitation, a new community-based workforce development initiative providing up to $6.8 million (including $1 million from a partnership with CARB).

c. **Promote Sustainable Business Models and Strive for Equipment Standardization.** Fund efforts that encourage sustainable and novel business models, and solicitations covering topics such as equipmenttesting and certification to encourage interoperability.

- **Progress in 2021**: Prepared for future solicitations to harmonize charging standards along with EVSEs capable of bidirectional communication between EVSE and EV. This is in addition to the continued effort to deploy networked EVSEs.
- **Progress in 2021**: Awarded recipient for the ViGIL solicitation, which will fund expanded EVSE certification testing in the state.
- **Progress in 2021**: Funded development and testing of the Megawatt Charging System, which will provide a high-power charging connector to serve use cases such as Class 8 trucks and aviation. In an effort to avoid the fragmentation of connector standards observed in the light-duty EV market, the CEC is working with relevant stakeholders to ensure appropriate levels of standardization in its upcoming EnergIIZE block grant project, which will fund chargers for medium- and heavy-duty vehicles.

d. **Use Data and Analysis to Inform Investments.** Use the results of the inaugural AB 2127 analysis, SB 1000 analysis, and ongoing AB8 hydrogen studies to inform solicitation design.

- **Progress in 2021**: Released multiple grant funding opportunities in 2021 that were built on these analyses to address infrastructure needs.

e. **Demonstrate Emerging Technologies for Sectors that are Difficult to Electrify.** Demonstrate hydrogen fuel cell and electric vehicle technologies and fueling infrastructure for zero-emission locomotivesand harbor craft serving California ports and other sectors. Focus deployments in or near priority communities whenever feasible.

- **Progress in 2021**: Providing funding to demonstrate hydrogen rail

and marine applications at seaports.

- **Progress in 2021**: In August of 2021, awarded a $4 million grant to build a multi-modal hydrogen refueling station at the Port of West Sacramento that will enable the fueling of a switcher locomotive and support the deployment of heavy-duty on-road and off-road ZEVs.

f. **ZEV Infrastructure Plan:** A new item for this year is the development of a statewide 'ZEV Infrastructure Plan' (ZIP). The ZIP will support decision-making by State agencies and stakeholders, and public discussions of ZEV infrastructure policies and funding needs. The ZIP will incorporate State agency plans and information needs for future decisions. CEC will engage the public for feedback and input. Publishing a final report mid-year 2022.

g. **Joint Agency Workshop:** In October 2021, CEC Commissioner Patty Monahan, CPUC Commissioner Cliff Rechtschaffen, and GO-Biz's Tyson Eckerle, hosted a joint agency workshop titled Accelerating Electric Vehicle Charging Infrastructure Deployment and Grid Integration. The workshop virtually gathered EV charging infrastructure stakeholders, including industry representatives, utilities, local government, state agencies, and others to discuss solutions and share best practices and learnings from different perspectives on the topics of EVSE permitting, rate structures for public charging, interconnection, and vehicle-grid integration.

3. **Research, Development & Demonstration:** Support wide range of innovative technologies to accelerate deployment of ZEV infrastructure, facilitate vehicle-grid integration, and increase benefits for all residents and markets, with focused attentionto disadvantaged and low-income communities.

Direct Pillar Connection: Vehicles, Infrastructure, End Users
Indirect Pillar Connection: Workforce

Key Collaborators: CPUC, CARB, CAISO, Caltrans, federal, tribal, local, and regional governments, vehicle manufacturers, grid operators, electricity and hydrogen providers, energy technology developers, NGOs, universities and other research entities, and fleets.

Key Results & Actions:

a. **Electric Program Investment Charge (EPIC).** Award more than $20M through competitive grants that foster innovation in ZEV integration, accelerate advanced clean technologies to market, and create opportunities for economic development. Develop new transportation electrification R&D initiatives to include in proposed investment plans for the next 5 years of EPIC.

- **Progress in 2021**: Released three competitive funding opportunities and awarded more than $35 million in transportation electrification

research grants in the following areas:
    - Addressing high-power charging demands of fleet electrification using distributed energy resources.
    - Planning and piloting publicly accessible corridor charging for drayage trucks.
    - Improving and scaling high-value lithium-ion battery recycling technologies.
- **Progress in 2021**: Developed and submitted the EPIC 4 Investment Plan requesting funding for several transportation electrification related initiatives focused on advancing efficient, flexible, and sustainable charging technologies.

b. **Natural Gas R&D Program.** Develop new funding opportunities accelerating the integration and demonstration of hydrogen fuel cell trucks and buses, including advanced hydrogen refueling station designs capable of supporting multiple heavy transport applications and submit to CPUC as part of the annual Natural Gas R&D Program budget plan in 2021.

- **Progress in 2021**: Initiated three projects to integrate and demonstrate hydrogen fuel cells in locomotive and harbor craft applications at ports. Released funding opportunity with $4M available to support demonstration projects for advanced hydrogen fuel cell trucks and buses with challenging duty cycles.

4. **Infrastructure Resilience:** Support strategies to improve resiliency including relatedto energy storage, vehicle-grid integration, hydrogen supply and refueling station reliability, electric grid and EVSE reliability, on-site generation, and related workforce adequacy.

Direct Pillar Connection: Vehicles, Infrastructure
Indirect Pillar Connection: End Users, Workforce

Key Collaborators: CAISO and grid operators, CARB, CPUC, California Labor & Workforce Development Agency, California Workforce Development Board, Employment Training Panel, GO-Biz, utilities, vehicle manufacturers and supply chain stakeholders, electricity and hydrogen providers, energy technology developers, federal and tribal governments, local and regional governments,non-governmental organizations, universities and other research entities, andorganized labor.

Key Results & Actions:

a. **Vehicle-Grid Integration Roadmap.** Publish draft VGI Roadmap.

- **Progress in 2021**: Developed recommendations in coordination with CPUC, CAISO, and CARB. These will serve as the core of the Roadmap. Held workshop on charger communications and interoperability to gather input. Informed solicitation development.

b. **Fund Demonstration Projects.** Fund demonstrations of resilient capabilities such as vehicle-to-building technology.

- **Progress in 2021**: Convened stakeholder workshop on "Vehicle-to-Grid for Resilient Backup Power" with more than 200 attendees. Released competitive funding opportunity with nearly $20M available for funding applied research and technology demonstration projects.

c. **Workforce Development.** Support workforce and equity priorities articulated in the Clean Transportation Program Investment Plan.

- **Progress in 2021:** Investment Plan Update provides details on a broader scope for workforce development activities with an allocation of $15 million for the next three years.
- **Progress in 2021:** Released IDEAL ZEV Workforce Pilot solicitation, a new community-based workforce development initiative providing up to $6.8 million (including $1 million from a partnership with CARB).

d. **Vehicle-Grid Integration (VGI) Simulation Studies.** Explore electric grid impacts of including ZEVs as a supply-side resource using a production cost simulation model such as PLEXOS. These simulations will demonstrate the cost effectiveness and resilience benefits of using a battery-electric vehicle as an energy storage resource for buildings or the grid. (This activity also supports Objective#1, "Analysis". Updates on progress for 2021 and actions for 2022 are listed above in Item 1.i.)

e. **Hydrogen Supply and Station Reliability.** Collaborate with stakeholders to ensure the hydrogen supply and distribution system has sufficient backup to continue functioning through supply disruptions.

- **Progress in 2021:** Identified barriers to large-scale commercialization and deployment of FCEVs that need to be addressed, such as supply disruptions within the nascent industry of producing hydrogen for transportation, hydrogen station downtime due to equipment failures and other factors, and the lack of vehicle models and consumer options.

f. **EV Charging Station Reliability.** Collaborate with stakeholders to measure and track EV charging station reliability and up-time.

- **Progress in 2021:** Explored current definitions and metrics for reliability and looked at available data to track station reliability and up-time.

5. **Special Projects, Lithium Valley:** Work with multiple stakeholders to develop and implement recommendations for lithium extraction in California, per AB 1657 (2020), aswell as through other CEC efforts to facilitate a California-based lithium industry.

   Direct Pillar Connection: Vehicles, Workforce
   Indirect Pillar Connection: Infrastructure, End Users

   Key Collaborators: Lithium Valley Commission Appointed Members, CPUC, California Natural Resources Agency, tribal representatives, local and regional governments, and private market participants. Additional collaboration with GO-Biz, the United States Environmental Protection Agency, and the United States Department of Energy.

   Key Results & Actions:

   a. **Launch Lithium Valley Commission.** Convene Lithium Valley Commission (LVC) in March 2021. AB 1657 charges the Lithium Valley Commission with reviewing, investigating, and analyzing certain issues and potential incentives regarding lithium extraction and use in California. The Lithium Valley Commission will consider a range of issues including the further development of geothermal power and lithium recovery from existing and new geothermal facilities, market opportunities for lithium, and potential economic and environmental impacts to the state resulting from extraction and processing of lithium from geothermal brines and production of lithium-dependent products.

      - **Progress in 2021:** The LVC convened in early 2021 with eight additional meetings at monthly intervals.
      - **Progress in 2021:** Confirmed 14 members of the commission who represent a broad range of perspectives, as specified by AB 1657 (statues of 2020)
      - **Progress in 2021:** The LVC hosted a Community Forum in November 2021 to provide an overview of and introduction to the LVC and the concept of the Lithium Valley.

   b. **Report Commission Findings.** Submit report to Legislature by October 2022.

      - **Progress in 2021:** Prepared a proposed outline, schedule and process for completing the report for consideration by the LVC and provided those materials to the public through CEC docket 20-LITHIUM-01 in August 2021.