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 December 2022, the CEC adopted a $2.9 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 2022 – 2023 Investment Plan breakdown for the next four years is as follows:

- $602 million for light-duty charging infrastructure
- $465 million for clean trucks, buses, and off-road equipment and infrastructure to support electric and hydrogen vehicles[2]
- $406 million for drayage truck ZEV infrastructure
- $404 million for school bus ZEV infrastructure
- $299 million for equitable at-home charging
- $199 million for transit bus ZEV infrastructure
- $150 million for port ZEV infrastructure
- $119 million for ZEV manufacturing
- $97 million for Emerging Opportunities
- $90 million for hydrogen fueling infrastructure
- $44 million for medium- and heavy-duty ZEV infrastructure to support electric and hydrogen vehicles
- $15 million for zero- and near-zero carbon fuel production and supply
- $10 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 2023, the CEC will

[1] CEC Investment Plan (2022-2023 update page): https://www.energy.ca.gov/publications/2022/2022-2023-investment-plan-update-clean-transportation-program-0 (The Investment Plan Update is an annual activity and is subject to future Budget Act appropriations. The next iteration will reflect changes and actions that occur between Dec. 2022 and the publishing of the draft staff report version of the 2023 Investment Plan Update.)
[2] Clean trucks, buses, and off-road equipment and infrastructure includes the traditional medium- and heavy-duty ZEV infrastructure investments but can also fund a broader set of vehicle infrastructure investments.

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 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, 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.** 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.

      - **Action for 2023**: The second AB 2127 assessment's draft report is anticipated to be published in the second quarter of 2023. The draft report and results will be presented in a public workshop shortly after publishing.
      - **Action for 2023**: The final report is targeted for publication in the third quarter of 2023.

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

- **Action for 2023**: Assess existing home charging availability and the potential for expanded home charging access.

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.

- **Action for 2023**: Analysis and coordination for the AB 8 report on hydrogen infrastructure is continuing. The process will identify additional assessment needs to accelerate the medium- and heavy-duty FCEV market.

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; continue to develop and update the Medium- and Heavy-Duty Electric Vehicle Infrastructure Load, Operations, and Deployment (HEVI-LOAD) model.

- **Action for 2023**: Continue to identity modeling refinements and develop scenarios for the AB 2127 Commission Report based on stakeholder and market feedback.
- **Action for 2023**: HEVI-LOAD - incorporate grid impact analysis as a connection to the CEC's EVSE Deployment and Grid Evaluation (EDGE) tool to perform a site-specific comparison between expected vehicle charging load and available capacity based on historical circuit load profile data.
- **Action for 2023:** Harmonize total energy demand estimates from infrastructure models with results of similar models from the CEC's Energy Assessment Division.

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.

- **Action for 2023**: Continue updating the website, map, and resources for ZEV and ZEV-related manufacturing opportunities.

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.

- **Action for 2023**: Continue annual updates of the ZEV and Infrastructure Statistics website.

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.

- **Action for 2023**: Propose several modifications and updates to travel modeling to assign vehicle miles traveled or other variables related to passenger travel.
- **Action for 2023**: Develop a new Vehicle Survey with support from the CEC's Fuels and Transportation Division.

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

- **Action for 2023**: Develop 13 demand scenarios with their GHG implications. For some scenarios, transportation component variables may not significantly change.

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".)

- **Action for 2023**: Continue to incorporate additional data and informational resources into the EDGE framework that can assist users in identifying candidate locations for hosting charging infrastructure.
- **Action for 2023**: Host a public workshop to highlight the EDGE tool's functionality and potential benefits.
- **Action for 2023**: Work with utilities and other planning stakeholders to further improve the tool and identify possible connections to other grid impact work.

j. **SB 643 Report.** Conduct the first statewide assessment of the fuel cell electric vehicle (FCEV) infrastructure, fuel production, and distribution needed to meet California's zero-emission truck, bus, and off-road vehicle goals as set in Executive Order N-79-20, as well as any CARB regulation that requires or allows zero-emission heavy-duty and off-road vehicles.

- **Action for 2023**: Analysis and coordination will continue. A draft report for public review will be shared at a workshop, and a final report incorporating public comment will be published.

2. **Infrastructure Development:** Develop and deploy 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, 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 and off-road equipment for both electric and hydrogen infrastructure deployment.

      - **Action for 2023**: Launch at least two light-duty block grant projects.
      - **Action for 2023:** Develop and publish four light-duty EV charging solicitations.
      - **Action for 2023**: Release a solicitation for Innovative Charging Solutions for MD/HD Electric Vehicles.
      - **Action for 2023**: Develop and release multiple solicitations that will focus on electric and hydrogen MD/HD ZEV infrastructure and planning, including technical assistance for MD/HD blueprint development, funding for implementation of completed MD/HD zero-emission vehicle infrastructure blueprints, and funding for the demonstration of innovative solutions for electric vehicle charging and hydrogen refueling infrastructure.
      - **Action for 2023**: Release a VGI school bus solicitation.

- **Action for 2023:** Release a solicitation targeting the development and deployment of VGI-focused charging opportunities.
- **Action for 2023**: Release a solicitation targeting corridor ZEV infrastructure to support MD/HD vehicles, both battery electric and hydrogen fueling.
- **Action for 2023**: Launch a MD/HD ZEV and Infrastructure Loan Pilot Project, in collaboration with CARB.

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.

- **Action for 2023**: Launch the Clean Transportation Program's Community Benefits Framework through public workshops and specific and intentional outreach and engagement activities with local communities.
- **Action for 2023**: Coordinate and align outreach activities CEC-wide to increase access to infrastructure for communities and priority populations.
- **Action for 2023**: Promote "EV Charging in Communities" and align with similar organizations that support charging in disadvantaged and low-income communities[3].
- **Action for 2023:** Develop and release a solicitation targeting charging infrastructure needs and opportunities in tribal communities.

c. **Strive for Equipment Standardization.** Fund efforts and solicitations covering topics such as equipment testing and certification to encourage interoperability.

- **Action for 2023**: Launch the V2G Equipment List repository of laboratory-certified bidirectional charging equipment to help streamline utility interconnection (and ultimately accelerate adoption) of V2G technologies.
- **Action for 2023**: Conduct the Vehicle Interoperability Testing Symposium (VOLTS) event to convene key EV stakeholders to conduct collaborative, low-risk interoperability tests, develop and finalize products, conduct implementation testing and test tool development for charging standards and protocols, and discuss the means to overcome common technology barriers facing the industry.

d. **Use Data and Analysis to Inform Investments.** Use the results of the

[3] https://etcommunity.org/assets/files/03-StrikeForceEquityWorkgroupReport-ElectricVehicleCharginginCommunities.pdf

inaugural AB 2127 analysis, SB 1000 analysis, SB 643 analysis, and ongoing AB8 hydrogen studies to inform solicitation design.

- **Action for 2023**: Continue to develop and publish SB 1000, AB 8, SB 643, and AB 2127 reports. CEC staff are also utilizing data from CEC-funded chargers and historical station development data from NREL. These efforts, along with stakeholder feedback, will further refine the above reports and continue to drive the evolution of funding strategies.

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.

- **Action for 2023**: Conduct workshops on emerging opportunities and medium- and heavy-duty funding to propose various concepts and solicit feedback from the public.
- **Action for 2023**: Release a solicitation for Innovative Charging Solutions for Medium- and Heavy-Duty Electric Vehicles.
- **Action for 2023**: Collaborate with CARB to provide infrastructure funding for emerging opportunity and off-road construction projects.
- **Action for 2023**: Award and kick-off four to seven projects from the $16.5 million Innovative Hydrogen Refueling Solutions for Heavy Transport solicitation, which was released in collaboration with the CEC's Gas R&D Program.
- **Action for 2023**: The medium- and heavy-duty infrastructure block grant project, EnergIIZE Commercial Vehicles, is expected to launch a second round of funding for projects in the first quarter of 2023 with the EV Fast Track funding lane offering $10.4 million in infrastructure incentives, along with three additional set-aside funding lanes for public school bus, drayage, and transit infrastructure incentives.

f. **ZEV Infrastructure Plan.** The statewide ZEV Infrastructure Plan (ZIP)supports decision-making by State agencies and stakeholders, and public discussions of ZEV infrastructure policies and funding needs. The ZIP incorporates State agency plans and information needs for future decisions. CEC will engage the public for feedback and input.

- **Action for 2023:** Begin development of 2024 ZIP.

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 $20 million through competitive grants that foster innovation in ZEV integration, accelerate advanced clean technologies to market, and create opportunities for economic development. Develop new transportationelectrification R&D initiatives to include in proposed investment plans for the next 5 years of EPIC.

- **Action for 2023:** The 2021-2025 EPIC Investment Plan (EPIC 4) was approved by the CPUC. It outlines new transportation electrification research initiatives to be implemented over the next five years, including:
  - Efficient transportation electrification and charging technologies.
  - Technology enablers for using EVs as distributed energy resources.
  - Integrating distributed energy resources for grid-supportive EV charging.
  - Lithium-ion battery reuse and recycling technologies.
- **Action for 2023:** Initiate implementation of the transportation electrification research initiatives included in the EPIC 4 Investment Plan.
- **Action for 2023:** Conduct public workshops to solicit input on transportation electrification-related EPIC solicitation concepts.
- **Action for 2023:** Execute federal cost share agreements with UC San Diego and Smartville Inc. to leverage $16 million of DOE funds with $2.7 million of EPIC funds to scale up novel lithium-ion battery recycling and reuse technologies.
- **Action for 2023:** Initiate demonstrations of heavy-duty vehicle charging coupled with on-site solar and storage at a transit bus facility in Gardena and all-electric truck stop in Bakersfield. Initiate demonstrations of bidirectional charging of electric school buses in Richmond.

b. **Gas R&D Program.** Develop new funding opportunities accelerating

the integration and demonstration of hydrogen fuel celltrucks 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.

- **Action for 2023**: Award and kick-off four to seven projects from the $16.5 million Innovative Hydrogen Refueling Solutions for Heavy Transport solicitation with CEC's Clean Transportation Program.
- **Action for 2023**: Build and initiate demonstrations of a hydrogen fuel cell switcher locomotive and harbor craft funded under the solicitation Hydrogen Fuel Cell Demonstrations in Rail and Marine Applications at Ports (GFO-20-604).

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

      - **Action for 2023:** Make progress with vehicle-to-building R&D projects. Coordinate with investor-owned utilities to synergize pilot activities.

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

      - **Action for 2023:** Work with the California Workforce Development Board to collaborate on high road training, assess labor standards, and focus investments/partnerships in disadvantaged and low-income communities and rural areas.
      - **Action for 2023:** Work with small, certified business enterprises to

access Clean Transportation Program funding.
- **Action for 2023:** Cultivate new communities and partnerships to expand clean transportation career pathways.
- **Action for 2023:** Establish the Clean Transportation Program Workforce web portal that includes increasing better access to EVITP training and certification.
- **Action for 2023:** Assess expansion of the Electric School Bus Training Project to include CARB and other school partners to offer statewide training to all schools.

c. **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.

- **Action for 2023:** Continue focusing on increasing hydrogen production for the California mobility market, with a focus on clean hydrogen and low carbon intensities. In addition, more hydrogen production projects, even outside the transportation sector, will help reduce the costs of hydrogen production and delivery in general and will help advance technologies.
- **Action for 2023:** The CEC identified various barriers to widespread FCEV commercialization and deployment in 2022. The CEC continues to explore options to enhance the hydrogen station network reliability, resilience, and availability by working with station developers and operators who have agreements with the CEC and by setting requirements in future solicitations. In addition, CEC, CARB, and GO-Biz are in the planning phase for conducting a FCEV driver survey to learn about FCEV driver experiences and what drivers would like to see in the hydrogen station network. CEC, CARB, and GO-Biz staff plan to present the findings from the survey at a future workshop.

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

- **Action for 2023:** Continue developing reliability recordkeeping and reporting requirements for CEC grant funding opportunities to ensure the reliable operation of chargers installed using CEC funds.
- **Action for 2023:** Develop regulations for reliability requirements for state- and ratepayer-funded chargers.
- **Action for 2023:** Develop the field testing program. The CEC is also working closely with CARB to send out joint surveys to EV charging service providers to request data on charger reliability. These surveys are expected to be released in the first quarter of 2023.

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. **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 issuesincluding 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.

      - **Action for 2023:** The Lithium Valley Commission has completed its work and statutory responsibility and will be dissolved in 2023. Conduct a workshop in the first quarter of 2023 to discuss future activity of the LVC with a summary of ongoing responsibilities under AB 1657, CEC resources for future activities, and recommendations for next steps.