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.

   - **Action for 2022+**: The infrastructure models supporting the analysis will continue to be refined to produce updated results for the second AB 2127 assessment. Publication of the second assessment's draft report is anticipated mid-year 2022 and the final report is targeted for early 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 2022+**: Continued analysis of drive time maps developed through this evaluation will provide initial insight into locations with public DCFC needs.
   - **Action for 2022+**: Staff will assess the possibility of developing a user-friendly map showing locations needing public chargers in low-income, disadvantaged, and rural communities,

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 2022+**: Continue analysis and coordination for the AB 8 report on hydrogen infrastructure to achieve more than 100 stations by the end of 2023 and to help close the gap to the 200-station goal set by Governor Edmund G. Brown Jr.'s Executive Order B-48-18 by 2025. Additionally, use the process to identify additional assessments needed to accelerate the medium- and heavy-duty

hydrogen 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.

- **Action for 2022+**: The models will continue undergoing updates and will generate results to feed the biennial update to the AB 2127 report in early 2023. Refinements will focus on enhanced geospatial resolution of charging infrastructure projections, improving modeling of smart charging capabilities, and analysis of additional scenarios to meet the state's goals.
- **Action for 2022+:** Investigate and, if appropriate, pursue the development of modeling tools that can support charging infrastructure assessments for off-road vehicles.

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 2022+**: Incorporate information gathered from new CEC manufacturing solicitations to update the database with additional ZEV-related companies.
- **Action for 2022+**: Assess the possibility to develop a public-facing digital map or dashboard of ZEV-related manufacturers in California.

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 2022+**: Continue updating the ZEV and Infrastructure Statistics website annually.
- **Action for 2022+**: Continue assessing the possibility whether DMV data can be used to accurately track medium- and heavy-duty ZEVs.

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 2022+**: As part of the Integrated Energy Policy Report (IEPR), continue to review results of the TEDF as an indicator of weather the state is on track to meet its goals with current market conditions. Additionally, these results will be incorporated into the biennial AB 2127 assessment.
- **Action for 2022+**: Assess the incorporation of autonomous vehicles into the TEDF.

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.

- **Action for 2022+**: Complete the results for the Final Demand Scenario by mid-year 2022.
- **Action for 2022+**: Complete the results for two high-electrification scenarios by end of year 2022:
  - Policy/Compliance Scenarios aligned with expected policies.
  - Mitigation Scenario with higher PEV adoption rates.
- **Action for 2022+**: Rename "Exploratory Forecast Scenarios" to "Transportation Energy Demand Scenarios".

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 2022+**: Continue to identify additional resources that can support the development of the EDGE tool. Engage with external stakeholder to gather feedback on the development of EDGE and refine its architecture. Assess the possibility to eventually open the EDGE tool to allow public access and users to interact with its functionality and guide infrastructure deployment and investments.
- **Action for 2022+:** Considering the impact to include ZEVs as a supply-side resource in a production cost simulation model software such as PLEXOS. These simulations will incorporate the use of battery-electric vehicle as an energy storage resource for buildings or the grid. Begin the discission on the planning and designing of analysis that has valuable output metrics, along with consideration of access to the relevant data needed.

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.

   - **Action for 2022+**: Continue launching incentive projects of light-duty EV charging infrastructure, with two or three for release in year 2022.
   - **Action for 2022+**: The medium- and heavy-duty block grant project, EnergIIZE Commercial Vehicles, is expected to release initial funding for projects in 2022 starting with $17 million.

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 2022+**: Continue the pending work of the IDEAL ZEV Workforce Pilot solicitation and SB 1000 that will invest in ZEV infrastructure and workforce training and development. This will be done in parallel with creating solicitations that generate proposals addressing rural, disadvantaged, or low-income communities.

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.

- **Action for 2022+**: To support the market's growing use of ISO 15118 for high-level communication between chargers and vehicles, the CEC is proposing to issue new hardware guidelines for its charger investments. These updated hardware guidelines introduce the concept of "ISO 15118 ready" chargers and would be phased in over the coming years subject to market assessment and stakeholder input. This effort will help ensure CEC funded chargers are ready to support communication with current and upcoming vehicles and enable an easier-than-gasoline charging experience for drivers.
- **Action for 2022+**: Ensure that technical requirements for CEC-funded charging infrastructure are appropriately updated to support interoperability, align with partner agencies, and prepare for widespread EV adoption.
- **Action for 2022+**: Work with stakeholders to promote the development of frameworks, tools, and technologies to enhance the charging experience in a grid- and wallet-friendly manner and provide power resiliency. Therefore, where appropriate, use technical requirements or other funding criteria to promote charging systems that are interoperable, grid-integrated, and user-friendly.

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.

- **Action for 2022+**: Continue to develop and publish SB 1000, AB 8, and AB 2127 reports that continue to drive the evolution of funding strategies along with stakeholder feedback.

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 2022+**: Conduct workshops on medium- and heavy-duty funding opportunities to propose various concepts and solicit feedback from the public.
- **Action for 2022+**: The medium- and heavy-duty block grant project, EnergIIZE Commercial Vehicles, is expected to release initial funding for projects in 2022 starting with $17 million.

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.

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.

      - **Action for 2022+:** Pending approval of the EPIC 4 Investment Plan by the CPUC, initiate planning for new funding opportunities and host stakeholder workshops to prioritize investments and solicit feedback on scope and research needs.

   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.

      - **Action for 2022+**: Develop new transportation R&D initiatives to include in the annual Natural Gas R&D Program budget plan in 2022. Develop new funding opportunity to advance hydrogen refueling infrastructure solutions for heavy transport.
      - **Action for 2022+:** Focus on decarbonizing difficult-to-abate end-uses including heavy-duty vehicles, off-road equipment, locomotives, and marine vessels with renewable hydrogen.

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.

- **Action for 2022+**: Hold inter-agency principals briefing and publish draft and final versions of Roadmap. Begin policy next steps related to Roadmap recommendations.

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

- **Action for 2022+:** Award and initiate approximately 4-6 projects. Coordinate with investor-owned utilities on proposed pilot activities and synergies with CEC investments.

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

- **Action for 2022+:** Develop and execute new funding awards from the IDEAL ZEV Workforce Pilot solicitation.
- **Action for 2022+:** Continue expanding workforce development beyond investments in state entities to include community-based workforce training and development in and near ZEV deployments in priority communities through grant opportunities, while also supporting high-road job opportunities in the ZEV market.

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.

- **Action for 2022+:** Continuing collaboration with stakeholders to ensure the hydrogen supply and distribution system has sufficient backup to continue functioning through supply disruptions.
- **Action for 2022+:** Conduct hydrogen centric workshops to process

industry perspective to define reliability, identify metrics to track and measure hydrogen station reliability, and up-time, and proposed data collection method.

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

- **Action for 2022+:** Conduct EVSE centric workshops to process industry perspective to define reliability, identify metrics to track and measure EV charging station reliability, and up-time, and proposed data collection method.

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.

- **Action for 2022+:** The LVC will continue to meet and (with the assistance of CEC staff) develop a draft and final report reflecting the analysis, findings and recommendations called for in AB 1657

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

- **Action for 2022+:** Submit final report to Legislature by October 2022.