



**CALIFORNIA
ENERGY COMMISSION**



**CALIFORNIA
NATURAL
RESOURCES
AGENCY**

California Energy Commission

Clean Transportation Program

Task 1.5 FINAL PROJECT REPORT

Central Coast Community Energy Regional Electrification Blueprint for Heavy Goods Movement

Prepared for: California Energy Commission

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Community Energy (3CE)

DECEMBER 2023 | CEC-600-2023-068

California Energy Commission

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ACKNOWLEDGEMENTS

Central Coast Community Energy (3CE) would like to thank the California Energy Commission, project stakeholders, and community members who provided valuable insight and information to the project.

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 issued GFO-20-601 to accelerate the deployment of medium and heavy-duty (MHD) zero-emission vehicles (ZEVs) and zero-emission infrastructure with a holistic and futuristic view of transportation planning. In response to GFO-20-601, the recipient submitted an application which was proposed for funding in the CEC's notice of proposed awards April 8, 2021 and the agreement was executed as ARV-21-031 on April 14, 2022.

ABSTRACT

Central Coast Community Energy is a community choice aggregator focused on procuring clean, renewable electricity for Monterey, San Benito, Santa Cruz, Santa Barbara, and San Luis Obispo counties. To bolster its zero-emission mobility ambitions, Central Coast Community Energy has created a medium and heavy-duty zero emission vehicle blueprint, developed in collaboration with Momentum. This blueprint aims to expedite the adoption of medium and heavy-duty zero-emission vehicles by gathering insights on transportation electrification. The analysis has revealed barriers for fleet managers, such as supply chain challenges and the extensive planning required for large-scale electric vehicle deployments. Additionally, there is a strong need for electric vehicle infrastructure suitable for medium and heavy-duty vehicles, particularly along the US HWY 101 corridor. The blueprint emphasizes the importance of electric vehicle infrastructure deployment in strategic areas and offers financing strategies, including public agency funding and utility company support. To ensure the effective implementation of the blueprint, various recommendations, such as developing an online resource hub and enhancing existing rebate programs, have been proposed. The success of this initiative hinges on regional collaboration, financial support, and continuous stakeholder engagement.

Keywords: Central Coast Community Energy, Community Choice Aggregator, Renewable Electricity, Greenhouse Gas Emissions, Transportation Sector, Zero-emission Mobility, Medium and Heavy-duty, Zero-emission Vehicle Blueprint, Sustainability Targets, Electrification, Partnership Development, Zero-emission Technology, Electric Vehicle Infrastructure, US HWY 101, Freight Transportation, Alternative Fuel Corridors, Public Agency Funding

Please use the following citation for this report:

Pieper, Nicholas, John Friedrich, and Van Wifvat. 2023. *Central Coast Community Energy Regional Electrification Blueprint for Heavy Goods Movement*. California Energy Commission. Publication Number: CEC-600-2023-068.

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EXECUTIVE SUMMARY

Introduction

Central Coast Community Energy (3CE) is a community choice aggregator that was founded to source clean and renewable electricity at competitive prices for customers throughout Monterey, San Benito, Santa Cruz, and Santa Barbara Counties. 3CE funds innovative energy programs designed to lower greenhouse gas emissions and stimulate community reinvestment, including within the transportation sector. To help improve its programs and advance regional zero-emission mobility, 3CE was awarded funding by the California Energy Commission (CEC) to develop a medium and heavy-duty (MHD) zero emission vehicle (ZEV) blueprint.

Purpose

The goal of the project is to help 3CE improve its programs that accelerate the deployment of MHD ZEVs and related infrastructure while advancing science-based sustainability targets.

The Central Coast region's growing population is reliant on trucks and buses moving along the US 101 corridor and within its major population centers. Electrification of this critical MHD vehicle segment has been negligible to date. The blueprint was designed to help 3CE gather information, data, and insights to inform decision-making that will facilitate ZEV-related capital investment, partnership development, and infrastructure deployment in Monterey, San Benito, Santa Cruz, San Luis Obispo, and Santa Barbara Counties. The project was developed in a partnership with Momentum, the lead blueprint developer and writer.

Objectives

The blueprint development process involved extensive engagement with internal stakeholders, community-based organizations, regulatory agencies and policymakers, education and workforce training partners, industry partners, financial partners, electricity providers, vehicle and equipment manufacturers/vendors, and community stakeholders. In addition, 3CE conducted three webinars to reach out to local municipal fleet managers, school bus administrators and transit operators in the Central Coast region. The webinars served to educate the regional fleet managers on transportation electrification efforts and to gather input on how 3CE could support their efforts to transition to ZEVs.

Findings

Outreach helped the blueprint team determine that regional fleet managers have limited bandwidth for fleet upgrades and are prioritizing transitioning light-duty electric vehicle fleets before focusing on medium- and heavy-duty vehicles. Additionally, the team found that member agencies were struggling to deploy electric vehicle (EV) infrastructure, despite having purchased ZEVs that were ready for deployment. Generally, fleet managers in all three fleet categories that were interviewed (transit, municipal, and school bus) are hampered by supply chain challenges. The inability of original equipment manufacturers (OEMs) to deliver ZEVs has dramatically slowed fleet vehicle procurement. This has created a downstream effect that is hampering some fleet managers' ability to spend procurement funds. Beyond supply chain challenges, the level of planning required for large-scale deployments of EVs (light duty and MHD) has proven to be more time-consuming and involved than expected for many fleets. Fleet managers have circumvented these challenges by either developing their MHD EV

inventory in a piece-meal approach or by acquiring vehicles through leases managed by a third party.

Supported by input gathered from the webinars, 3CE plans to support customer's ZEV transitions by creating a clearinghouse of information that provides resources for fleet transitions, as well as a list of funding opportunities, guidance on funding capture, and technical assistance.

The blueprint team found that, along the Central Coast, the transition to ZEVs will lead to new jobs and training opportunities. The team identified knowledge gaps for MHD ZEVs that need to be addressed for workforce success, including the following:

- Zero Emission Technology
- Charging Components
- Battery Theory
- Battery Safety
- Mechanical Aptitude
- Equipment Maintenance
- General Electrical

Organizations that hire staff with these skills and reskill existing staff to adapt to changing technology will be best placed to succeed. As a community choice aggregator for electric power, 3CE is well positioned to ensure its workforce is well trained and educated in these fields. The top three job types that are expected to increase with the MHD ZEV transition are equipment vending, operations and maintenance, and infrastructure installation.

The blueprint team conducted a study on regional pollution and greenhouse gas (GHG) mitigation goals and assessed the benefits of transitioning to ZEVs in 3CE's service area. Central Coast air quality is a health concern, particularly in inland and agricultural centers. 3CE serves five counties along the Central Coast, and each air district enforces statewide air quality policies and sets region-specific goals to reduce GHG, air pollutants, and air contaminants. Generally, the counties and cities on the Central Coast have yet to adopt specific, targeted MHD EV fleet goals or strategies. While there are direct current (DC) fast chargers installed along the Central Coast that can theoretically charge MHD vehicles, local jurisdictions in the region have primarily focused on deploying electric vehicle infrastructure (EVI) for light duty vehicles. The region will benefit from a more concerted effort to understand and prioritize MHD EVI deployments.

The team found that MHD fleets account for between 10 percent and 30 percent of each county or municipalities emissions. By transitioning to ZEVs, 3CE member agencies will be able to remove GHGs, air pollutants, and air contaminants from their scope one fleet emissions. Because 3CE plans to source 100 percent of its electricity from zero-emission sources by 2030, all 3CE customers that transition their fleets to electric vehicles will eliminate their scope two transportation emissions at that time.

The Central Coast region is an important agricultural production area for fresh produce and wine grape production and has other freight-related industries that are critical to the region's economy. The region relies on US HWY 101 as the primary transportation artery and the major truck route, with approximately 75 percent of all shipments in the region moved by truck. For

this reason, focusing on charging infrastructure along US HWY 101 is likely to provide the greatest benefits for decarbonizing goods and people movement in the region.

To estimate private fleet MHD vehicle use patterns in the region, the blueprint team examined employment density in the primary MHD fleet-related fields of agriculture, manufacturing, and transportation. High concentrations of agriculture businesses are found along the U.S. 101 corridor, with key clusters located around Salinas, South of Watsonville, Soledad, Santa Maria, and Paso Robles. Manufacturing is a diverse industry in the region, with key clusters in Santa Cruz, near Paso Robles, San Luis Obispo, Santa Maria, and Santa Barbara.

Regional freight transportation is conducted mainly with trucking and rail, with connections to other modes such as marine shipping at the Port of Oakland. Transportation and warehousing businesses are concentrated in areas that generally overlap with agriculture and manufacturing clusters. State Routes 46, 129, 152, and 156 are major interregional connecting routes between the Central Coast and the Central Valley that support these businesses and should be included as priorities for EVI investment to ensure zero-emission delivery of goods in the region.

There are several DC fast chargers throughout the Central Coast region, however most of these charging stations are not accessible for Class 8 vehicles. Private fleet electrification will be severely hampered until MHD EVI is deployed in sufficient amounts to enable movement of electric tractor-trailers throughout the region. The blueprint highlights priority areas for EVI installation based on geographic, demographic, and economic factors.

Within the Central Coast region, there are three types of target locations for EVI deployment: agricultural and industrial centers, population centers and transit districts, and regional transportation routes. Agricultural and industrial centers such as the Salinas Valley and Santa Ynez Valley are primary targets for EVI installation to enable zero-emission transportation of important Central Coast commodities. Population centers and transit districts are identified as priority areas for MHD EVI installation, including transit agency vehicle depots and public services utilizing MHD vehicles such as waste management, utility maintenance facilities, county services, and school districts. Two ideal location types for initial deployments of EVI along regional transportation routes include existing truck stops and state roadside rest areas (SRRAs). The National Electric Vehicle Infrastructure (NEVI) program can also serve as guidance for initial EVI deployments. Specifically, areas identified as alternative fuel corridors (AFCs) such as U.S. Route 101, California State Route 1, and California State Route 17 should be prioritized for EVI deployment.

Despite the wide geographic area and plethora of challenges associated with fleet electrification, there is an abundance of funding opportunities and support networks to help guide fleet managers as they electrify fleets. Knowledge sharing through engagement with stakeholders and leaders in the electrification space has been crucial to developing the electrification capabilities of staff throughout the region. Identifying appropriate funding sources and developing innovative financing partnerships will be crucial for successfully electrifying EV fleets on the Central Coast. As shown by the case studies within this blueprint, there are a variety of viable strategies for implementing MHD ZEVs. Fleet managers should identify the optimal approach for their fleets based on funding, staff capabilities, and equipment availability.

The blueprint also identifies strategies that fleet managers can employ to finance the electrification of their fleets. Public agency funding opportunities such as grants, equipment vouchers, or tax rebates, as well as utility company support, are available to those who wish

to switch to EVs. 3CE offers a range of incentive programs, including rebates and concierge services for agriculture customers, to help reduce greenhouse gas emissions and promote the adoption of electric vehicles.

Recommendations / Conclusions

To help 3CE implement the blueprint and improve its existing transportation programs the blueprint team provides several recommendations. These recommendations include the following:

1. Developing a comprehensive web-based clearinghouse of resources for fleet managers
2. Developing a regional MHD EV charging strategy
3. Expanding its existing rebate programs
4. Adding considerations for diversity, equity, and inclusion (DEI) and independent owner operators in its fleet programs

3CE is in a good position to lead electrification planning and deployment on California's Central Coast. However, there are various barriers to electrification, such as lack of product options, high upfront costs, limited planning integration, and stakeholder engagement. Regional collaboration and planning, financial subsidies, and education programs are essential to encourage successful electrification. The report recommends prioritizing the planning and deployment of public DCFC infrastructure along major transportation corridors to enhance goods movement. Overall, successful implementation of these recommendations requires collaboration with various partners, engagement with fleet owners and operators, and ongoing program refinement.

CHAPTER 1:

Background

1.1 Problem Statement

There is an urgent need to tackle climate change driven by GHG emissions. Diesel truck exhaust contributes significantly to global climate change and increases human health risks. While there are alternatives to fossil fuels for medium and heavy-duty (MHD) vehicles, they are not well known to most freight-related businesses. The five county Central Coast region is one of the most important agricultural production areas of California – and includes manufacturing, food processing, and other freight-related business clusters, which are critical to the state’s economy. In total, goods movement-dependent industries provide approximately one third of jobs and account for more than \$13 billion of the \$52.4 billion gross regional product. These industries are reliant on trucks moving along the US 101 corridor – stretching 270 miles from Silicon Valley to the Los Angeles Basin, as well as east-west corridors from the coast to the San Joaquin Valley. To sustainably meet the needs of the region’s growing population – projected to hit 1.7 million by 2030 – cost-efficient and zero-emission freight movement is essential. To begin building this clean, all-electric future, the region has invested strongly in charging infrastructure for light-duty vehicles and developed comprehensive plans for electrification in the light-duty segment. However, MHD trucks represent 39 percent of all transportation emissions in the region, and electrification of the critical MHD segment has been negligible to date. MHD electrification throughout the Central Coast region has been prevented by a combination of barriers, including a lack of a comprehensive strategic vision for MHD ZEVs in the Central Coast region; a lack of product options in the MHD segment (until very recently) – especially in heavy goods movement and agricultural applications; high upfront costs for both ZEV charging infrastructure and vehicles; limited business models able to overcome first-cost barriers; limited utility and local planning integration to develop programs specific to MHD needs; and limited stakeholder engagement, specifically of fleet operators operating internal combustion engine fleets.

Recognizing these urgent and unmet needs, 3CE will develop the Central Coast Medium and Heavy-Duty Zero-Emission Vehicle Blueprint, with the intention to catalyze the accelerated deployment of MHD ZEVs and ZEV charging infrastructure.

1.2 Recipient Background

Central Coast Community Energy (3CE)

3CE is a Community Choice Energy agency established by local communities to source carbon-free electricity for communities in Monterey, San Benito, Santa Cruz, San Luis Obispo, and Santa Barbara County. 3CE’s mission includes transportation electrification and as such, the agency has sponsored two significant programs to accelerate electrification in the region. The Zero Emission School Bus Program is a partnership with the Monterey Bay Air Resources District and is funding 100 percent of the cost of replacement of diesel school buses with electric buses for priority school districts. The intention of the program is to enable school districts to gain experience with electrification and thereby accelerate the transition to an all-electric school bus fleet. In addition, 3CE co-sponsors the Central Coast Incentive Project (CCIP), a component of the state-wide California Electric Vehicle Infrastructure Incentive Project (CALeVIP). Leveraging co-funding from the CEC as well as one million dollars in local

ratepayer funds, 3CE is making more than seven million dollars available to eligible customers for new electric vehicle supply equipment (EVSE) in Monterey, San Benito, and Santa Cruz counties. 3CE plans to extend funding for CCIP and expand CALeVIP throughout San Luis Obispo and Santa Barbara Counties.

Through the process of designing and administering these EV programs, 3CE program staff, led by Manager of Energy Programs, Dan Bertoldi, and Chief Executive Officer, Tom Hayashi, have developed a deep understanding of the EV ecosystem in the 3CE service territory. As part of the EV program design and development process, staff extensively engaged EV drivers, local government staff, Pacific Gas and Electric (PG&E), employers, community members, and stakeholders. As the local community-controlled electricity provider, 3CE prides itself on close relationships with customers, and is ideally suited to engage a broad stakeholder coalition to likewise accelerate MHD fleet electrification and infrastructure deployment. In addition, 3CE staff have the expertise to assess vehicle-grid-integration issues and opportunities, in order to progressively optimize both V1G (smart charging) and fully bi-directional charging as vehicle to grid (V2G) systems and standards are deployed in the MHD space.

Build Momentum, Inc. (Momentum)

Momentum designs, develops, and deploys innovation campaigns for forward-thinking organizations—from entrepreneurs to public agencies to Fortune 500 companies—that research, demonstrate, commercialize, and operate transformative transportation, energy, water, and manufacturing technologies. Momentum has supported the design and development of some of California’s most prominent programs, including the Low Carbon Fuel Standard (LCFS), the West Coast Electric Highway, and the California Sustainable Energy Entrepreneur Development Initiative (CalSEED).

1.3 Key Barriers

The blueprint team explored barriers to project implementation, including:

- Lack of current market availability of zero emission alternatives for certain equipment and vehicles.
- Potential electrical capacity shortcomings.
- The need for alternative sources of funding.
- The need to coordinate roles and responsibilities between 3CE and its public and private partners.
- Supply chain challenges and infrastructure deployment timelines challenges.
- Capital availability for vehicle and equipment replacement.
- Logistical and operational challenges associated with keeping electrical equipment charged within duty cycle constraints.
- Long-term planning uncertainty and available grid energy.
- Additional workforce training and support for O&M of ZEV fleets.

1.4 Project Need and Technical Merit

1.4.1 Project Need

The California Air Resources Board (CARB) is developing a medium and heavy-duty zero-emission fleet regulation within California with the goal of achieving a zero-emission truck and bus fleet by 2045 where feasible. This requirement will be significantly earlier for certain market segments such as delivery and drayage applications. The medium and heavy-duty drayage fleets that provide transportation and municipal services in and between the cities of the Central Coast are key targets for electrification planning due to their large impact on air quality.

The electrification of medium and heavy-duty fleets is a crucial step in reducing emissions from the transportation sector. Currently, municipal, transit, school bus and freight fleets in the region are responsible for a significant amount of air pollution in Central Coast communities. These emissions have been linked to respiratory illnesses, cancer, and other health problems. Moreover, the electrification of these fleets can lead to significant economic and community benefits. Electric vehicles have lower operating costs and require less maintenance than traditional diesel vehicles. Additionally, the use of electricity as a fuel can reduce fuel costs and dependence on fossil fuels, which are subject to price volatility. In the long run, the electrification of fleets can help reduce operational costs and increase community wellbeing. Additionally, electrification can create new job opportunities in the manufacturing, installation, and maintenance of electric vehicles and charging infrastructure. The use of electric trucks can also reduce noise levels and emissions, which can lead to a quieter and healthier environment for residents.

Despite this plurality of benefits, fleet managers face a daunting knowledge gap before electrifying their fleets. While electric passenger cars and light duty fleets have gained significant attention and adoption in the region, medium and heavy-duty electric trucks have received less attention and require more specialized knowledge and infrastructure. Many fleet managers are not yet familiar with the latest technologies and solutions for electrification, which can make it difficult for them to make informed decisions and plan for the transition to zero-emission MHD fleets.

Furthermore, the high-power requirements of medium and heavy-duty zero-emission trucks present unique challenges for charging infrastructure. While charging a passenger car can be accomplished using a standard household outlet or a level 2 charger, the high-power requirements of medium and heavy-duty trucks require specialized charging infrastructure with higher power outputs. This means that the installation of charging infrastructure will require careful planning and coordination with utility companies to ensure adequate electrical capacity and grid stability.

To address these knowledge gaps, regional fleet managers need the latest information and best practices for electrification. Additionally, there is a need for collaboration between transportation organizations, municipalities, school districts, policymakers, utility companies, and other stakeholders to develop a comprehensive plan for the electrification of medium and heavy-duty fleets that considers the unique challenges of these vehicles. This blueprint helps

achieve all these goals by creating a replicable plan for MHD ZEV charging deployment through extensive stakeholder outreach.

1.4.2 Technical Merit

The project leverages 3CE's unique strengths, including pre-existing experience supporting regional transportation electrification through a variety of programs, including those designed for farm, school bus, transit and municipal fleets. 3CE staff are familiar with the region's transportation needs and zero-emission technologies. As one of the few region-wide organizations with strong ties to most of organizations deploying MHD fleets, 3CE is uniquely positioned to address knowledge gaps and advance strategic planning for the Central Coast's zero-emission future. With these qualifications in mind, 3CE is a natural choice for advancing a regional MHD electrification strategy.

1.4.3 Goals

The project was based on a set of objectives with clear and measurable goals. The primary objective of this project was to gather information, data, and insights necessary for informed decision-making regarding ZEV-related capital investment, partnership development, and infrastructure deployment in Monterey, San Benito, Santa Cruz, San Luis Obispo, and Santa Barbara Counties. The specific goals included:

- a. Assessing the status of MHD vehicle electrification within the Central Coast region, including the availability of ZEV models, charging infrastructure, and operational challenges.
- b. Identifying the key barriers and opportunities for ZEV adoption in the MHD sector, such as range limitations, charging infrastructure gaps, technological advancements, and cost considerations.
- c. Developing a comprehensive roadmap that outlines a phased approach to MHD vehicle electrification, considering regional needs, infrastructure requirements, and technological advancements.
- d. Analyzing the potential environmental, economic, and social benefits of transitioning to ZEVs in the MHD sector, including reduced greenhouse gas emissions, improved air quality, and job creation opportunities.
- e. Providing recommendations for policy and regulatory frameworks that can support the accelerated deployment of ZEVs and charging infrastructure in the Central Coast region.

1.4.3 Methodology

To achieve the objectives outlined above, the project employed the following methodology.

Data Collection and Analysis

- Conducted surveys, interviews, and workshops with key stakeholders, including MHD vehicle fleet owners and operators, charging infrastructure providers, local government agencies, and environmental organizations.
- Gathered and analyzed data on existing MHD vehicle fleets, including fleet size, vehicle types, usage patterns, and energy consumption.

- Evaluated the current state of charging infrastructure, including the availability, capacity, and accessibility of charging stations along the US 101 corridor and within major population centers.
- Collected information on ZEV models, their performance characteristics, and available incentives and subsidies.

Technical Assessment

- Evaluated the suitability of available ZEV models for different MHD vehicle applications based on range, payload capacity, and charging requirements.
- Analyzed charging infrastructure requirements, including charging station capacity, network connectivity, and grid integration.
- Assessed the impact of ZEV adoption on the electricity grid, considering load management, demand response, and potential integration with renewable energy sources.

Roadmap Development

- Developed a phased roadmap for MHD vehicle electrification, considering factors such as vehicle availability, charging infrastructure expansion, and technological advancements.
- Identified priority areas for infrastructure deployment, considering population centers, transportation hubs, and critical transportation corridors.
- Considered the scalability and interoperability of charging infrastructure to accommodate future growth and regional expansion.

Outcomes

The project delivered the following outcomes:

- A comprehensive understanding of the current state of MHD vehicle electrification within the Central Coast region, including an assessment of barriers and opportunities.
- A detailed roadmap outlining a phased approach to MHD vehicle electrification, considering regional needs, infrastructure requirements, and technological advancements.
- Recommendations for policy and regulatory frameworks to support the accelerated deployment of ZEVs and charging infrastructure.
- Analysis of the potential environmental, economic, and social benefits associated with the electrification of the MHD sector.
- Increased awareness and engagement among key stakeholders, fostering collaboration and partnership development.

CHAPTER 2:

Community and Stakeholder Engagement

The goal of this task was to bring together industry participants, stakeholders, and advocates to foster productive dialogue and effective planning focused on accelerated deployment of MHD ZEV infrastructure and vehicles to support a new paradigm in clean transportation.

2.1 Summary of Engagement Plan and Outreach

Contains material from:

- List of Outreach Targets
- Community and Stakeholder Engagement Plan
- Community and Stakeholder Engagement Report
- Multi-Language Outreach and Education Materials

The purpose of community and stakeholder engagement was to gather the perspectives, opinions, and input of community members and stakeholder groups for use in the development of the final blueprint. Outreach was designed to create a flexible and adaptable approach that meaningfully fostered a two-way dialogue to share perspectives about challenges, risks, concerns, and opportunities.

The project team facilitated outreach with key stakeholders on an ongoing and regular basis. In fall 2022, outreach efforts advanced significantly through the creation of the stakeholder webinars and surveys. Meetings were held with fleet managers from a variety of public agencies and key 3CE clients to learn about their plans and needs for MHD fleet electrification. These groups were happy to engage as often as necessary and express the difficulties they faced in electrifying their fleets.

2.2 Stakeholder Engagement and Education

The goal of this task was to engage the stakeholders identified in the Community and Stakeholder Engagement Plan and to distribute education and outreach materials for communication to local communities and stakeholders. The blueprint team held three webinars, each tailored to either municipal, school bus or transit fleet managers. The webinars consisted of multiple presentations on strategies, funding options and ZEV technology for each fleet type and included breakout sessions and comment periods for fleet managers to share knowledge. These also helped 3CE gain perspective into how to improve their fleet electrification programs and identify common challenges. The webinars were recorded and will be available on the 3CE website¹ as a resource for fleet managers.

Information gained from these webinars as well as other outreach efforts outlined in section 2.1 was compiled to create a stakeholder and community engagement report. The report identifies the unique experiences of a wide variety of Central Coast communities and organizations and was an integral part of the blueprint's development.

Contains material from:

¹ <https://3cenergy.org/>

- Survey and Interview Results Report
- Outreach and Education Materials
- Press Release about Outreach Webinar for MHD Fleet Operators
- Written Notification of Webinar Recording
- System and Technology Presentations
- Community and Stakeholder Engagement Report (Draft)
- Community and Stakeholder Engagement Report (Final)

2.3 Local Advisors (Technical Advisory Committee)

The project team formed a Technical Advisory Council (TAC) consisting of community and industry leaders with knowledge of power generation and distribution, transportation electrification, municipal, school bus, transit and freight fleets, ZEV fleet funding and finance, and 3CE operations. Members of the TAC included representatives from the cities and transit agencies of Watsonville, Guadalupe, Santa Barbara, and the Association of Monterey Bay Area Governments (AMBAG). The TAC meeting familiarized attendees with the goals of the blueprint and then garnered their input on a variety of subjects. Key outcomes from the TAC meeting included the following:

- Grid capacity for MHD vehicle charging is a significant concern and identifying priority areas for expanding grid capacity can also be a challenge.
- Implementing grid infrastructure to support last mile charging infrastructure, “Middle mile” grid issues are a challenge that needs to be examined.
- Additional work to identify priority areas for infrastructure upgrades is needed.
- 3CE can benefit stakeholders by increasing awareness of grant opportunities and to encourage flexibility to garner funds without carrying upfront costs of equipment.
- Education of stakeholders on the equipment available for the transition is necessary for less informed fleet managers.

Generally, the counties and cities on the Central Coast have yet to adopt specific, targeted MHD EVSE goals or strategies. While there are some DC fast chargers installed along the Central Coast that are viable for charging MHD vehicles, local jurisdictions in the region have primarily focused on deploying EVI for light-duty vehicles. The region will benefit from a more concerted effort to understand and prioritize MHD EVI deployments.

2.4 Central Coast Transportation Electrification Clearinghouse

The blueprint team has developed the outline of a transportation electrification clearinghouse. The clearinghouse is intended to provide the following:

- A comprehensive listing of all federal, state, and local funding and tax credit opportunities for MHD fleets (transit, municipal, school, and private) and charging infrastructure.

- Case studies of successful transitions of MHD fleets to EVs, including sharing of the best EV procurement and charging infrastructure deployment practices, through webinars and other events.
- A menu of steps needed to convert fleets and to develop public high-capacity MHD charging infrastructure
- Direct customers to entities that can help develop MHD deployment plans, and access funds – including assistance with submitting competitive applications.
- Optimize the role of 3CE in funding and support for MHD EV fleets and infrastructure; highlight opportunities for customers to stack 3CE incentives with state and federal offerings.
- Provide options for further technical assistance from 3CE staff.

CHAPTER 3:

Blueprint Development

The goal of this task was to gather the information necessary to develop a replicable and actionable blueprint that guides future investment into MHD ZEV infrastructure.

3.1 MHD EV and EV Infrastructure Goals and Installation Timeline and Siting Map(s)

The project team was tasked with developing quantitative goals and identifying timelines for the installation and implementation of MHD ZEV charging infrastructure within the project. Due to the variety of fleet types and large geographic area covered in the scope of the blueprint, the team assessed infrastructure goals and realistic timelines on a county, city, or organizational level. Broadly, most public organizations in the Central Coast region have not established MHD electrification targets or timelines and are focused on the deployment of light duty EVs before moving on to heavy-duty trucks. Transit agencies, school bus fleets and municipal fleets are mostly pursuing electrification in a piecemeal approach. Due to the lack of regional planning for MHD fleet electrification, the blueprint team included in its list of recommendations that 3CE spearhead these efforts moving forward. The blueprint also includes estimated timelines for EVSE installation at fleet facilities. Due to the broad scope of the blueprint, specific timelines for each of 3CE's client fleets were unable to be developed.

3.2 Projected Electrification Impacts and Stakeholder Benefit Report

The project team created a Projected Electrification Impacts and Stakeholder Benefit Report that included a discussion of the following:

- **Job Creation & Workforce Development:** Types of jobs that will be created in communities where 3CE operates and strategies that will enable training and education for workers to obtain the skills and knowledge to develop, support, and maintain MHD ZEV fleets, and participate in the broader zero-emission industry.
 - Transitioning to zero-emission vehicles (ZEVs) will create new jobs in communities where 3CE operates.
 - Training and education programs are necessary to develop the skills and knowledge of workers to support and maintain ZEV fleets. As of now, workforce training opportunities for zero-emission technologies are lacking on the central coast and there is a shortage of EVITP certified electricians, despite an estimated state-wide abundance.
 - Collaboration with local community colleges and workforce development organizations can create opportunities for employment in electrical trades and ZEV maintenance.
- **Workforce Development Strategies:**
 - Job creation related to ZEVs will involve various categories such as maintenance, retail, electricity generation, grid reinforcement, installation, operation, and grid

- connection. General ZEV knowledge and task-specific training are essential for employees to operate and maintain ZEV fleets effectively.
- Workforce partnerships with development organizations and collaborations with ZEV OEMs and vendors can support training and development efforts.
 - **Emissions Reduction:** Goals to reduce GHG emissions, criteria air pollutants, and toxic air contaminants in the regions where 3CE operates.
 - Transportation accounts for between 60 percent and 70 percent of emissions in each of the Counties that 3CE serves. MHD fleets contribute to roughly 30 percent of total transportation emissions. Transitioning these fleets to zero-emission vehicles will result in a substantial reduction of scope one emissions in the region. Low-income, disadvantaged, and priority populations in the region will benefit economically, and health wise from reduced emissions of p.m. 2.5, carbon dioxide and nitrogen.
 - **Priority Populations Benefits:** Economic, health, safety, and consumer benefits that will accrue to low-income, disadvantaged, and priority populations in the vicinity of 3CE distribution centers.

3.3 Central Coast Fleet Electrification Case Study

The Fleet Electrification Case Study documents the experience and strategies of municipal, city transit, and school bus fleets as they plan and deploy EVs and EVI in California. The case studies are intended to serve as a guide to public agencies wishing to electrify their fleets. The blueprint team observed that supply chain issues consistently hinder fleet managers across all three classifications. The delayed delivery of ZEVs by OEMs has significantly impacted fleet vehicle acquisition. This delay further affects some managers' capability to allocate procurement budgets. Besides supply chain problems, planning for extensive EV deployments (light duty and MHD) is more intricate and prolonged than many fleets anticipated. To navigate these obstacles, fleet managers either incrementally build their MHD EV collection or procure vehicles via third-party leases.

Despite the challenges associated with fleet electrification, there is an abundance of funding opportunities and support networks to help guide fleet managers as they electrify fleets. Knowledge sharing through engagement with stakeholders and leaders in the electrification space has been crucial to developing the electrification capabilities of staff throughout the region. Identifying appropriate funding sources and developing innovative financing partnerships will be crucial for successfully electrifying EV fleets on the Central Coast. The team recommends that fleet managers should identify the optimal approach for their fleets based on funding, staff capabilities, and equipment availability.

CHAPTER 4:

Blueprint

The goal of this task was to develop a comprehensive and replicable blueprint for the Central Coast region to accelerate the deployment of MHD ZEVs and ZEV infrastructure that can be shared with key stakeholders to reduce uncertainty of costs and risk for fleets seeking to transition to zero-emission. This chapter discusses the purpose of the blueprint, substantive outcomes, lessons learned, and next steps.

4.1 Summary of Blueprint

The goal of the final blueprint was to compile and formalize the information gathered through task 2 (Community and Stakeholder Engagement), and task 3 (Blueprint Development). The blueprint presented this information in an accessible manner to inform fleet managers and other interested parties about fleet electrification. It includes a discussion of stakeholders and their input, ZEV technologies, vehicle and equipment deployment strategies, community benefits and impacts, mapping exercises, case studies, conclusions, and next steps.

4.2 Lessons Learned

The blueprint yielded a wealth of information that will form the foundation of 3CE's future electrification efforts. The blueprint conclusions include lessons learned for the deployment of zero-emission vehicles and infrastructure throughout the Central Coast, with a focus on public agencies. Stakeholder engagement, as well as analyses and case studies developed by the blueprint team, yielded the following lessons:

1. *MHD electrification throughout the Central Coast region has been prevented by a combination of barriers.* These include a lack of a comprehensive strategic vision for MHD ZEVs in the Central Coast region; a lack of product options in the MHD segment (until very recently) – especially in heavy goods movement and agricultural applications; high upfront costs for both ZEV charging infrastructure and vehicles; limited business models able to overcome first-cost barriers; limited utility and local planning integration to develop programs specific to MHD needs; and limited stakeholder engagement, specifically of fleet operators operating internal combustion engine fleets.
2. *Internal collaboration is essential:* 3CE's Policy Board, Operations Board, and Community Advisory Council all play a key role in 3CE's efforts to support customer transitions to EV fleets. The teams need to continue to collaborate with each other and external groups to develop fleet improvement projects.
3. *Financial subsidies are an important factor in encouraging the EV transition, but the effectiveness of these programs is limited by knowledge gaps and bandwidth constraints:* Community choice aggregators (CCA) and utilities broadly support fleet electrification efforts by providing funds for zero-emission vehicles, covering upgrade costs and providing expertise for EV charging. 3CE customers take subsidies into serious consideration when making the financial case for EV transition and rely on these programs to make the transition cost-effective. Despite this, program utilization by 3CE customers is limited by a lack of knowledge on fleet implementation. This was communicated to the blueprint team extensively by the technical advisory committee.

4. *County governments and municipalities are focused on transitioning light duty vehicles to zero-emissions before tackling MHD transportation.* Currently, there is a general lack of planning in the Central Coast region for zero-emission MHD vehicles and infrastructure. Agencies here are currently struggling to address light-duty vehicle transitions and are ill-equipped to broaden their efforts to include MHD vehicles. 3CE is well positioned to fill this knowledge gap and lead regional planning efforts.
5. *Community Based Organizations (CBOs) need to be engaged in the EV transition:* Many CBOs are bandwidth constrained and largely unavailable for consultation. Real engagement with local communities in the EV transition will be enhanced by further integrating the efforts of CBOs with other organizations advancing clean transportation in the region.
6. *Public agency funding is needed to encourage a successful EV transition for 3CE customers.* A multitude of federal and state regulatory agencies provide funding and financial incentives for MHD ZEV fleet adoption.
7. *Return on investment, company policy, and state and federal regulations are the primary drives of ZEV infrastructure investment:* Financial partners and stakeholders are aware of regulatory changes and are interested in minimizing financial and operational risk and saving money while they transition to new technologies.
8. *Identifying and partnering with OEMs which provide solutions that work seamlessly together is essential for transitioning to zero-emission fleets:* ZEV and refueling infrastructure OEMs are rapidly developing new zero-emission technologies to meet demand. There are a variety of products available on the market and most companies provide incentives to help their customers adjust to the risk of using their new technologies.
9. *MHD deployments on the Central Coast are being slowed by supply chain and bandwidth issues.* A plurality of organizations spoken with indicated that MHD EVs that have already been procured are unable to be deployed to a lack of critical infrastructure. Specifically, EVI switchgear procurement adds significant time to potential projects. Beyond this, most agencies contacted expressed that they are unable to commit the time and resources necessary to properly scope and plan an MHD EV transition.
10. *Education programs for MHD ZEV technologies are lacking in California and need additional development:* There are just two community colleges in the state that offer a ZEV MHD workforce education and training program, but several community colleges throughout the state that provide either MHD or ZEV programs, and these would be good targets for state funding to develop MHD ZEV training programs to meet the needs of the coming transition.
11. *Collaboration with customers and stakeholders in the ZEV transition space requires extensive coordination and clear delineation of partner responsibilities and benefits:* Public agencies, governments and regional industry are interested in collaborating and sharing knowledge to support their efforts to transition to zero-emission operations.
12. *The greatest benefit to zero-emission goods movement in the region will stem from deploying public DCFC infrastructure near US Route 101 or along the other transportation corridors mentioned in the report (State Routes 1, 17, 46, 129, 152, and 156).* Goods movement is highly concentrated along these corridors, and freight transportation electrification will necessitate consistent, reliable, high-speed opportunity charging.

Large-scale electrification within 3CE's service territory is possible in the coming decade. Project success will hinge on properly assessing the operational requirements of EV fleets and EVI and will be enhanced by developing a phased approach that prioritizes the easiest electrification targets first.

3CE's efforts to support customer ZEV fleet transitions are in alignment with their goals to reduce emissions, build a cleaner grid, and invest in the Central Coast community. With this blueprint, 3CE can catalyze the accelerated deployment of MHD ZEVs and ZEV charging infrastructure, contributing to a clean, all-electric future for the region.

4.3 Outcomes and Next Steps

The primary blueprint outcomes include widespread successful education and planning efforts in support of fleet electrification. 3CE leadership and regional fleet managers were successfully familiarized with cutting edge zero-emission technology and will be utilizing the knowledge generated in the blueprint to support their electrification efforts.

The final blueprint includes a list of action items and next steps that will serve to guide the implementation of the blueprint. This actionable roadmap provides five clear, measurable steps for 3CE to pursue upon completion of the blueprint, which are summarized here:

1. Develop and coordinate plans for a regional MHD EV charging network: 3CE can take the lead in developing a charging infrastructure network to support private freight and agricultural goods movement. As one of the organizations with ties to fleet managers in all the five counties along the Central Coast, 3CE is well positioned to lead regional MHD fleet electrification planning efforts. Strategic locations for charging infrastructure along transportation corridors should be identified in consultation with member agencies, such as metropolitan planning organizations, associations of governments, counties, and cities.
2. Expand existing rebate programs: 3CE can expand its rebate programs to include freight shipping organizations, warehousing, railyards, and other key commercial transportation nodes. This expansion could prioritize projects that contribute to greater EV connectivity within the region, specifically focusing on commercial trucks transporting goods along US Highway 101.
3. Develop a "Plan and Fund Your Fleet" program: 3CE could provide technical and knowledge-based assistance to member agencies and customers looking to transition their MHD fleets to ZEVs. This program can include fleet and EV infrastructure planning services, fundraising support, and rebates for vehicle purchases and infrastructure installation.
4. Consider DEI (Diversity, Equity, and Inclusion), Independent Owner Operators, and Small Fleets: 3CE could develop targeted technical and financial assistance programs to support independent owner operators and disadvantaged groups in the MHD fleet space. This includes programs to help these communities access funding for fleet electrification and support for small fleets to comply with state fleet regulations.
5. Develop a Workforce and Education Training Program: 3CE can develop an education and training program to address the shortage of electricians with EV Infrastructure Training Program (EVITP) certification in the Central Coast region. The program could cover the opportunity cost and course fees for electricians, ensuring an adequate supply

of trained professionals to support the deployment of electric vehicle infrastructure. Additionally, there should be a focus on addressing the lack of education and training options for MHD EV maintenance to prevent potential challenges in fleet downtimes as MHD ZEVs become more widespread.

4.4 Conclusions

Large-scale electrification within 3CE's service territory is possible in the coming decade. Project success will hinge on properly assessing the operational requirements of EV fleets and EVI and will be enhanced by developing a phased approach that prioritizes the easiest electrification targets first. Overall, the recommendations provided in the blueprint can help 3CE promote the decarbonization of regional transportation. Successful implementation of these recommendations will require collaboration with a variety of partners, including local governments, utilities, infrastructure providers, and community organizations. It will also be important to engage with fleet owners and operators to ensure that programs meet their needs and address their concerns.

3CE's efforts to support customer ZEV fleet transitions are in alignment with their goals to reduce emissions, build a cleaner grid, and invest in the Central Coast community. With this blueprint, 3CE can catalyze the accelerated deployment of MHD ZEVs and charging infrastructure, contributing to a clean, all-electric future for the region.

GLOSSARY

ASSOCIATIONS OF GOVERNMENTS: Voluntary coalitions that advocate for and represent participating local governments, predominantly cities and counties. Their primary goal is to facilitate collaborative planning, and coordination, and provide technical support on shared concerns across jurisdictional boundaries.²

BANDWIDTH: In a workplace context, "bandwidth" can refer to an individual's or a team's capacity, capability, or availability to handle and manage tasks, projects, or additional responsibilities. It encompasses the mental, physical, and time-related resources required to effectively take on and complete new assignments or tasks.³

CALIFORNIA ENERGY COMMISSION (CEC)—The state 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 policy. The Energy Commission's five major areas of responsibilities are:

1. Forecasting future statewide energy needs
2. Licensing power plants sufficient to meet those needs
3. Promoting energy conservation and efficiency measures
4. Developing renewable and alternative energy resources, including providing assistance to develop clean transportation fuels
5. Planning for and directing state response to energy emergencies.
6. **CALIFORNIA DEPARTMENT OF TRANSPORTATION (Caltrans)**—Responsible for the design, construction, maintenance, and operation of the California State Highway System, as well as that portion of the Interstate Highway System within the state's boundaries.⁴

COMMUNITY-BASED ORGANIZATIONS (CBOs): Non-profit groups or associations operating at the local level, primarily focusing on addressing the needs and interests of a specific community. CBOs often provide various services, such as healthcare, education, social support, or advocacy, and are typically deeply rooted within the community they serve.⁵

COMMUNITY CHOICE AGGREGATORS (CCA)s: Community Choice Aggregators (CCAs) are local, not-for-profit entities that procure electricity for customers within a designated area, aiming to provide cleaner and more affordable energy alternatives than traditional utility providers.⁶

² "What are Councils of Governments." Western Riverside Council of Governments, n.d., wrcog.us/246/What-are-Councils-of-Governments

³ "8 Tips for Managing the Bandwidth of Your Remote Employees." YourVirtualProjectManager, <https://yourvirtualprojectmanager.com/8-tips-for-managing-the-bandwidth-of-your-remote-employees/#:~:text=The%20bandwidth%20of%20an%20employee,workload%20at%20any%20one%20time>

⁴ [Department of Transportation glossary webpage](https://dot.ca.gov/az.html) <https://dot.ca.gov/az.html>

⁵ University of Michigan School of Public Health. "What is Community-Based Organization?" University of Michigan, School of Public Health, n.d., sph.umich.edu/ncbon/about/whatis.html

⁶ "Community Choice Aggregation." U.S. Environmental Protection Agency, <http://www.epa.gov/green-power-markets/community-choice-aggregation>

CENTRAL COAST: The Central Coast typically refers to a region in California, USA, encompassing a series of coastal counties, including Monterey, Santa Cruz, and San Luis Obispo. It is known for its diverse landscapes, vineyards, agriculture, and coastal communities.⁷

COLLABORATION: Collaboration represents the cooperative effort of individuals or organizations working together towards shared goals, often leveraging collective skills, resources, and expertise to achieve mutual objectives.⁸

COSTS AND RISKS: Costs and Risks refer to the financial expenditures and potential drawbacks or uncertainties associated with a particular action, decision, or project. This encompasses monetary investments and the probability of unfavorable outcomes or losses.⁹

DECARBONIZATION: Decarbonization is reducing or eliminating carbon dioxide (CO₂) emissions and other greenhouse gases, primarily through shifting to cleaner energy sources, sustainable practices, and technological advancements to mitigate climate change.¹⁰

DIVERSITY, EQUITY, AND INCLUSION (DEI): Diversity, Equity, and Inclusion (DEI) represent a range of initiatives and practices aimed at fostering an environment that values and respects differences among individuals, ensures equal opportunities, and promotes fair treatment regardless of race, gender, age, and other characteristics.¹¹

DIRECT CURRENT (DC)—A charge of electricity that flows in one direction and is the type of power that comes from a battery.

ELECTRIFICATION: Electrification refers to the process of transitioning or converting systems, industries, or transportation to use electricity as the primary power source, often in place of traditional fossil fuels, to decrease environmental impacts.¹²

FINANCIAL SUBSIDIES: Financial Subsidies are monetary grants or aid provided by the government or other organizations to support specific industries, activities, or individuals, often aimed at reducing costs, encouraging development, or boosting specific sectors.¹³

FLEET: Fleet refers to a group of vehicles, ships, or aircraft owned or operated by a company, organization, or government entity.¹⁴

GRID: The electric utility companies' transmission and distribution system that links power plants to customers through high power transmission line service (110 kilovolt [kv] to 765 kv); high voltage primary service for industrial applications and street rail and bus systems (23 kv-138 kv); medium voltage primary service for commercial and industrial applications (4 kv to

⁷ "Where is the Central Coast?" CentralCoast-Tourism, centralcoast-tourism.com/where-is-the-central-coast/

⁸ "What is Collaboration?" AIIM (Association for Intelligent Information Management), <http://www.aiim.org/what-is-collaboration>

⁹ "The Definition of Cost of Risk." The-Definition.com, the-definition.com/term/cost-of-risk

¹⁰ "DOE Industrial Decarbonization Roadmap." U.S. Department of Energy, www.energy.gov/industrial-technologies/doe-industrial-decarbonization-roadmap

¹¹ "What is Diversity, Equity, and Inclusion?" McKinsey & Company, www.mckinsey.com/featured-insights/mckinsey-explainers/what-is-diversity-equity-and-inclusion

¹² "Electrification Futures Study." National Renewable Energy Laboratory (NREL), <http://www.nrel.gov/analysis/electrification-futures.html>

¹³ "Subsidy." Encyclopedia Britannica, <https://www.britannica.com/money/topic/subsidy>

¹⁴ "Fleet Definition." Merriam-Webster, <http://www.merriam-webster.com/dictionary/fleet>

35); and secondary service for commercial and residential customers (120 v to 480 v). Grid can also refer to the layout of a gas distribution system of a city or town in which pipes are laid in both directions in the streets and connected at intersections.

INDEPENDENT OWNER OPERATORS: Independent Owner Operators are individuals who own and operate their own commercial vehicles, such as trucks or vans, while working independently or contracting their services to transport goods or passengers.¹⁵

INFRASTRUCTURE: Generally refers to the recharging and refueling network necessary to successful development, production, commercialization and operation of alternative fuel vehicles, including fuel supply, public and private recharging and refueling facilities, standard specifications for refueling outlets, customer service, education and training, and building code regulations.

LESSONS LEARNED: Lessons Learned refer to insights, knowledge, or experiences acquired from past projects, actions, or endeavors that can be utilized to improve future processes or decision-making.¹⁶

LIGHT-DUTY VEHICLES: Light-duty vehicles are automobiles, trucks, or vans designed for relatively light loads or passengers, typically used for personal transportation or small-scale commercial purposes.¹⁷

METROPOLITAN PLANNING ORGANIZATIONS (MPO): Metropolitan Planning Organizations are agencies responsible for transportation planning and policy-making in metropolitan areas, coordinating transportation-related decisions within designated regions.¹⁸

MEDIUM AND HEAVY-DUTY (MHD) VEHICLES: Medium and Heavy-Duty (MHD) Vehicles refer to a category of trucks, buses, and other commercial vehicles designed for various tasks that require more substantial power and load-bearing capacity compared to light-duty vehicles.¹⁹

MUNICIPALITIES: Municipalities are local government entities responsible for governing specific geographical areas, such as cities or towns, managing public services, and infrastructure, and enforcing local ordinances and regulations.²⁰

ORIGINAL EQUIPMENT MANUFACTURERS (OEMs): Refers to the manufacturers of complete vehicles or heavy-duty engines, as contrasted with remanufacturers, converters, retrofitters, up-fitters, and re-powering or rebuilding contractors who are overhauling engines, adapting or

¹⁵ "Owner Operator vs. Independent Contractor: The Differences." DrayNow, draynow.com/owner-operator-vs-independent-contractor-the-differences

¹⁶ "Lessons Learned: Taking It to the Next Level of Communicating." Project Management Institute (PMI), <http://www.pmi.org/learning/library/lessons-learned-next-level-communicating-7991>

¹⁷ "Light-Duty Idle Reduction." Alternative Fuels Data Center (AFDC), afdc.energy.gov/conservation/idle_reduction_light.html

¹⁸ "Metropolitan Planning Organization (MPO)." U.S. Department of Transportation - Federal Transit Administration, www.transit.dot.gov/regulations-and-guidance/transportation-planning/metropolitan-planning-organization-mpo

¹⁹ "Medium and Heavy Zero-Emission Vehicle Statistics." California Energy Commission - Energy Almanac, <http://www.energy.ca.gov/data-reports/energy-almanac/zero-emission-vehicle-and-infrastructure-statistics/medium-and-heavy>

²⁰ "Municipality." Encyclopedia Britannica, <https://www.britannica.com/topic/municipality>

converting vehicles or engines obtained from the OEMs, or exchanging or rebuilding engines in existing vehicles.

PHASED APPROACH: A phased approach is a systematic strategy involving consecutive stages or steps in addressing complex projects or implementing solutions, allowing for gradual progress and flexibility in the implementation process.²¹

RETURN ON INVESTMENT (ROI): The interest rate at which the net present value of a project is zero. Multiple values are possible.²²

STAKEHOLDERS: Residents, environmentalists, businesses and government representatives that have a stake or concern about how air quality is managed.

SUBSTANTIVE OUTCOMES: Substantive outcomes refer to tangible, significant, and meaningful results or achievements produced from efforts, initiatives, or projects, often indicating a substantial impact or change.²³

SUPPLY CHAIN: The interconnected network of organizations, resources, activities, and processes involved in producing and delivering goods or services to consumers, encompassing procurement, production, distribution, and logistics.²⁴

UNCERTAINTY: Uncertainty refers to a lack of knowledge or information regarding future events, outcomes, or conditions, often leading to unpredictability or doubt about potential results or consequences.²⁵

UTILITY: A regulated entity which exhibits the characteristics of a natural monopoly. For the purposes of electric industry restructuring, "utility" refers to the regulated, vertically-integrated electric company. "Transmission utility" refers to the regulated owner/operator of the transmission system only. "Distribution utility" refers to the regulated owner/operator of the distribution system which serves retail customers.

WORKFORCE EDUCATION AND TRAINING PROGRAM: A Workforce Education and Training Program refers to a structured initiative designed to enhance the skills, knowledge, and expertise of employees or individuals within a specific industry or organization.²⁶

ZERO-EMISSION VEHICLE (ZEV): Vehicles which produce no emissions from the on-board source of power (e.g., an electric vehicle)

²¹ "The Phased Approach to Project Management Implementation." Project Smart, <http://www.projectsmart.co.uk/project-management-office/the-phased-approach-to-project-management-implementation.php>

²² [Office of Energy Efficiency and Renewable Energy](https://www.energy.gov/eere/bioenergy/full-text-glossary#R) (https://www.energy.gov/eere/bioenergy/full-text-glossary#R)

²³ "Substantive." Merriam-Webster, www.merriam-webster.com/dictionary/substantive

²⁴ "Supply Chain." Investopedia, <http://www.investopedia.com/terms/s/supplychain.asp>

²⁵ "Uncertainty." Merriam-Webster, www.merriam-webster.com/dictionary/uncertainty

²⁶ "What is Workforce Development?" Federal Reserve Bank of St. Louis - Bridges Magazine, www.stlouisfed.org/publications/bridges/spring-2010/what-is-workforce-development