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# Kern County Blueprint for MD/HD ZEV Infrastructure

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STATE OF CALIFORNIA
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Prepared in partnership with:

gna CLEAN TRANSPORTATION & ENERGY CONSULTANTS

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## List of Abbreviations

| | |
|---|---|
| AADT | Annual Average Daily Traffic |
| AB | Assembly Bill |
| AC | Alternating Current |
| ACF | Advanced Clean Fleets |
| ACT | Advanced Clean Trucks |
| AFDC | Alternative Fuels Data Center |
| AFV | Alternative Fuel Vehicle |
| AHJ | Authority Having Jurisdiction |
| AIChE | American Institute of Chemical Engineers |
| ASE | Automotive Service Excellence |
| ATEX | Atmosphères Explosibles (Fr. Explosive Environments/Atmospheres) |
| BC | Bakersfield College |
| BEB | Battery Electric Bus |
| BEV | Battery-Electric Vehicle |
| BVP | Boiler and Pressure Vessel Code |
| CAA | Clean Air Act |
| CaaS | Charging-as-a-Service |
| CaFCP | California Fuel Cell Partnership |
| CALGreen Code | California Green Building Standards Code |
| Caltrans | California Department of Transportation |
| CARB | California Air Resources Board |
| CBO | Community Benefit Organization |
| CDC | Center for Disease Control and Prevention |
| CDO | Climate Data Online |
| CEC | California Energy Commission |
| CNG | Compressed Natural Gas |
| CO2 | Carbon Dioxide |
| CoEZET | West Coast Center of Excellence in Zero Emission Technology |
| COPD | Chronic Obstructive Pulmonary Disease |
| CPUC | California Public Utilities Commission |
| CSC | Community Steering Committee |
| CTP | California Transportation Plan |
| DAC | Disadvantaged Community as defined by CalEnviroscreen 4.0 |
| DC | Direct Current |
| DCFC | Direct Current Fast Charging |
| DER | Distributed Energy Resources |



| | |
|---|---|
| DGE | Diesel Gallon Equivallents |
| DOE | Department of Energy |
| DOT | Department of Transportation |
| DPM | Diesel Particulate Matter |
| DRPEP | Distribution Resources Plan External Portal |
| EB/WB | East Bound/ West Bound |
| EDD | Employment Development Department of California |
| EERE | Energy Efficiency and Renewable Energy |
| EKAPCD | Eastern Kern Air Pollution Control District |
| EPA | Environmental Protection Agency |
| eTRUs | Electric Truck Refrigeration Units |
| EV | Electric Vehicle |
| EVCI | Electric Vehicle Charging Infrastructure |
| EVITP | Electric Vehicle Infrastructure Training Program |
| EVSE | Electric Vehicle Supply Equipment |
| FCEV | Fuel Cell Electric Vehicles |
| FHWA | Federal Highway Administration |
| FMEA | Failure Mode and Effects Analysis |
| GDP | Gross Domestic Product |
| GEM | Geospatial Energy Mapper |
| GET | Golden Empire Transit District |
| GHG | Greenhouse Gas |
| GIS | Geographic Information System |
| GNA | Gladstein, Neandross, and Associates |
| GNA | Grid Needs Assessment |
| GO-Biz | The Governor's Office of Business and Economic Development |
| HAZOP | Hazard and Operability Analysis |
| HD | Heavy-Duty |
| HFC | Hydrogen Fuel Cell |
| HFTO | Hydrogen and Fuel Cell Technologies Office |
| HSP | Hydrogen Safety Panel |
| hySafe | International Association for Hydrogen Safety |
| ICA | Integration Capacity Analysis |
| IECEx | International Electrotechnical Commission System for Certification to Standards Relating to Equipment for Use in Explosive Atmosphere |
| IFC | International Fire Code |
| IWG | Informal Working Group |



| | |
|---|---|
| KARGO | Kern Area Regional Goods-Movement Operations |
| Kern COG | Kern Council of Governments |
| LA | Los Angeles |
| LAEDC | Los Angeles Economic Development Corporation |
| LD | Light duty |
| LDV | Light duty vehicle |
| MD | Medium-Duty |
| MPO | Metropolitan Planning Organization |
| NAAQS | National Ambient Air Quality Standard |
| NB/SB | Northbound/Southbound |
| NCDC | National Climatic Data Center |
| NESHAPs | National Emissions Standards for Hazardous Air Pollutants |
| NEVI | National Electric Vehicle Infrastructure |
| NFPA | National Fire Protection Agency |
| NOx | Nitrogen Oxide |
| NREL | National Renewable Energy Laboratory |
| NRTL | Nationally Recognized Testing Laboratory |
| NZE | Near Zero Emission |
| OEM | Original Equipment Manufacturer |
| PCBs | Polychlorinated biphenyls |
| PEV | Plug-in Electric Vehicle |
| PG&E | Pacific Gas and Electric |
| PHMSA | Pipeline and Hazardous Materials Safety Administration |
| PM | Particulate Matter |
| PM | Project Manager |
| PNNL | Pacific Northwest National Laboratory |
| PSC | Project Steering Committee |
| ROG | Reactive Organic Gases |
| RPAC | Regional Planning Advisory Committee |
| RTP | Regional Transportation Plan |
| SAE | Society of Automotive Engineers |
| SB | Senate Bill |
| SCAG | Southern California Association of Governments |
| SCE | Southern California Edison |
| SCG | Southern California Gas Company |
| SCS | Sustainable Community Strategy |
| SJCOE | San Joaquin County Office of Education |



| | |
|---|---|
| SJVAPCD | San Joaquin Valley Air Pollution Control District |
| SJVCTC | San Joaquin Valley Clean Transportation Center |
| STAA | Surface Transportation Assistance Act |
| STEM | Science, Technology, Engineering, and Math |
| TaaS | Transportation-as-a-Service |
| TAC | Toxic Air Contaminants |
| TTAC | Transportation Technical Advisory Committee |
| USEER | U.S. Energy and Employment Report |
| V2G | Vehicle-to-Grid |
| Valley CAN | Valley Clean Air Now |
| VMT | Vehicle Miles Traveled |
| VOC | Volatile Organic Compound |
| VW | Volkswagen |
| ZE | Zero Emission |
| ZEB | Zero-Emission Buses |
| ZEV | Zero-Emission Vehicle |



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## Executive Summary

The State of California and its constituent local and regional governments are becoming clearer and more deliberate in establishing goals to have a greater share of the medium and heavy-duty transportation sector transition to zero-emission technologies from a historically pervasive reliance on diesel. The immediate health and environmental merits of such a market transition are evident, and the impending growth of the goods movement sector throughout much of California create an urgency to equip regional fleets and road systems with the appropriate infrastructure to facilitate this imperative. As such, the California Energy Commission (CEC), through GFO-20-601, awarded funding to the Kern Council of Governments (Kern COG) and Gladstein, Neandross and Associates (GNA) to create the "Kern County Blueprint for MD/HD Zero Emission Vehicle (ZEV) Infrastructure" (Blueprint) to evaluate the county-wide factors and influences that support MD/HD ZEV infrastructure implementation while prioritizing community stakeholder interests. The Blueprint project endeavors to identify collaborators, tools and policies at the regional level and the project level that accelerate the region's transportation goals. The Blueprint evaluates five high-impact infrastructure projects in Kern County that are capable of stimulating greater market participation and demonstrating innovative ZEV deployment that will induce other fleet operators and their industry partners to invest in ZEV infrastructure.

Thoughtful economic development and greater goods movement can be a boon to the local economy. Facilitating the transition to ZEVs increases the likelihood that the increased economic activity will not come at the cost of diminished air quality and public health. This requires a Blueprint that connects stakeholder interests and reduces barriers to development that commonly face ZEV infrastructure projects.

Through creating the Blueprint and documenting the processes, the result is a template for creating future Blueprints that can be applied to other regions throughout the state. The Blueprint team documented zero-emission infrastructure progress to-date, engaged with stakeholders to align the Blueprint with community needs, developed transparent and agreed upon methodologies for project selection, conducted thorough analysis, and produced detailed implementation plans for each site. The Blueprint scope includes both electric charging and hydrogen fueling infrastructure throughout the process, although the transportation sector in Kern County is largely focused on battery electric technologies.



The Blueprint features holistic and achievable solutions to mitigate hurdles in deploying functional, accessible, and right-sized MD/HD charging and hydrogen fueling stations with the goal of increasing emissions reductions from MD/HD trucking. The Blueprint includes detailed and actionable plans for ZEV MD/HD battery-electric charging and hydrogen refueling infrastructure, while including recommendations for and analysis of workforce development training, safety plans, previous actions taken by local jurisdictions, benefits to disadvantaged communities, and future job opportunities. Interviews and site visits with MD/HD fleet operators, facility owners and infrastructure developers that have initiated or completed the infrastructure deployment process also supplement the Blueprint's content, outlining real experiences at different development stages to engage stakeholders, regardless of their progress.

### The Blueprint Process

- Through industry and stakeholder research, the Blueprint gives valuable information on the best and most applicable technologies that the market will consider in terms of vehicle infrastructure for various fleet applications.
- The Blueprint establishes, describes, and implements the methodology used to select the five most impactful, exemplary projects under development; considering the readiness and organization level of project owners and project sites that would serve as examples for future project development.
- Planning tools provide the basis for feasibility analysis and identifying community priorities. The Blueprint evaluates the tools, programs, and resources available to analyze priority actions and set goals and priorities.
- The Blueprint is designed to prioritize emission reductions and benefits to Disadvantaged Communities (DACs).
- The Blueprint provides a functional overview of safety considerations, cost considerations, and permitting for fleets that are at any stage of evaluating infrastructure investment.
- The team identified the most relevant stakeholders of vehicle infrastructure development for meaningful community inclusion and workforce and economic development impacts that informs every aspect of the blueprint.

### The Kern County Projects

The five projects represent several different business models, that in turn serve an array of customer types and exemplify diverse revenue generation strategies while offering charging infrastructure to MD/HD ZEVs. To achieve the goal of serving increased goods



movement while improving air quality in Kern County, MD/HD ZEV infrastructure must be expanded. Based on California Air Resources Board (CARB) data collected for the Advanced Clean Truck (ACT) regulation, 45% of MD/HD trucks fuel at their home base facility1 and in that spirit, the five Kern County projects represent both public and private models. Showcasing the experiences of infrastructure development at this early stage of the industry is helpful for all industry growth.

- The Wonderful Company – publicly accessible MD/HD ZEV infrastructure to serve adjacent warehouses and logistics centers in northwest Kern County central to three goods movement corridors and a rail yard.
- Frito-Lay – private access MD/HD EVSE intended for ZEV fleet expansion in western Kern County along two goods movement corridors.
- WattEV – publicly accessible MD/HD EVSE intended for charging as a service (CaaS) with plans for trucking as a service (TaaS) options in central Kern County along two goods movement corridors and near Meadows Field airport.
- City of Arvin – private access MD/HD EVSE intended for city-owned fleet.
- Tejon Ranch – publicly accessible MD/HD EVSE intended for charging as a service (CaaS) adjacent to warehouses and logistics centers in southern Kern County on Interstate 5.

The Blueprint is a thorough resource for fleet and facility owners involved in infrastructure projects and the community at large, functioning as a regional planning document that can assist in future-proofing new builds. At the same time, the Blueprint seeks to generate community improvements in reduced tailpipe emissions and GHGs, reduced asthma and respiratory illnesses, increased vocational education, and workforce development for advanced vehicle technologies. The Blueprint appendices detail example project materials such as schedules, outlines, and important presentations which will allow other jurisdictions to rapidly replicate this effort. Kern COG and GNA intend for the Blueprint to provide replicable directions on how to successfully develop both an integrated regional plan and refined approaches for near-term developments.

## Introduction

The transportation industry in Kern County is at the crossroads for zero-emission (ZE) HD vehicles. California has set ambitious vehicle electrification goals with the Advanced Clean Fleet (ACF) rule that will greatly impact the goods movement industry throughout the

[1] https://ww2.arb.ca.gov/sites/default/files/2022-02/Large_Entity_Reporting_Aggregated_Data_ADA.pdf



state, if not the nation. Federal legislation under the Infrastructure Investment and Jobs Act (IIJA) and Inflation Reduction Act (IRA) has laid the groundwork for increased investment in zero-emission transportation infrastructure. Meanwhile, increased trade activity and greater volume from the Ports of Los Angeles and Long Beach present Kern County and the Central Valley with great economic opportunities, profound environmental challenges, and complex infrastructure needs to address these forces impacting the MD/HD transportation sector. Already beleaguered by decades of poor air quality, much of the Kern County region is faced with an inevitable increase in MD/HD goods movement-related vehicle miles traveled (VMT) within and traversing the Central Valley. However, the County has the potential to reduce transportation-related air pollution if the state's electrification goals are achieved.

Understanding that supplanting MD/HD diesel technologies with ZEVs improves air quality, the necessity and expediency will vary from region to region. Kern County is located at the intersection of several of California's major transportation corridors, including the north/south CA-99 and Interstate 5 and the east/west CA-46 and CA-58. This translates into a large proportion of truck traffic that originates outside of the region. The Blueprint considers the status quo of air quality and transportation in Kern County, and it further accounts for the anticipated growth of goods movement in the Central Valley and throughout the major freight transportation corridors of I-5, CA-99, CA-46, and CA-58. Most corridor routes are in areas that are already disproportionately impacted by vehicle emissions. Parts of Kern County, for example, experience high rates of cardiovascular disease, asthma, and other respiratory adversities that are a direct result of exposure to diesel particulate matter and ground-level ozone[2] in addition to prodigious amounts of carbon dioxide from vehicle tailpipes. Accounting for more than a quarter of the nation's GHG emissions,[3] MD/HD fleet operators need guidance on successful infrastructure deployment strategies that will encourage the adoption of ZEVs to reduce emissions and improve air quality throughout the U.S. For the good of the local economy and the health of the regional communities, the County of Kern has an existential interest in reducing diesel emissions and making ZE transportation a reality.

To advance nascent adoption of ZEV technologies, the Blueprint aims to increase public and private participation in MD/HD ZEV infrastructure investment through aligning the interests to best serve Kern County communities and assist businesses that venture into the new technology space. In order for the County of Kern to help successfully transition

[2] https://arb.ca.gov/emfac/
[3] Inventory of U.S. Greenhouse Gas Emissions and Sinks | US EPA



the VMT in the region from diesel combustion to ZE, local planners and stakeholders must develop a plan that is technically feasible and economically viable. That is exactly what this Blueprint sets out to support. This document is best viewed as a starting point for the development of infrastructure to support ZEVs in Kern County. As such, the projects that have been volunteered by the site hosts and evaluated in the Blueprint, are considered early case-studies in ZEV infrastructure that will blaze the trail for additional projects by directly supporting the charging/fueling of zero-emission trucks (ZETs) or by establishing a process for which similar projects in the region can be developed.

### Legislative Market forces

The Blueprint is being developed in a time of great change and when synchronized activity in the three key market forces of regulations, incentives, and technology availability are ramping up to impact goods movement where it will increase dramatically—Kern County. Commercial availability for ZE technologies appears to be at the cusp of exponential growth in the United States. The timing of the Advanced Clean Fleets (ACF) rule in California and the Federal legislation Infrastructure Investment and Jobs Act (IIJA) and Inflation Reduction Act (IRA) providing funding are well-aligned with the availability of Electric Vehicle Technology for zero emission transportation in the medium and heavy-duty sector. Furthermore, the availability of Electric Vehicle Technology has increased significantly in recent years, providing fleets with more options for zero-emission vehicles. This combination of regulations, incentives, and technological advancements ensures that fleet operators have the resources and tools necessary to make the transition to zero-emission vehicles.

### CARB's Advanced Clean Trucks (ACT) and Advanced Clean Fleet (ACF) Rules

The ACF rule as proposed would require fleet owners in California to transition to zero-emissions vehicles by 2045. The ACF will require large fleet owners to purchase and operate ZEVs according to milestones that vary by vehicle type until 100% of their fleet is comprised of ZEVs. Starting January 1, 2024, fleets with revenues greater than $50 million may meet compliance by purchasing exclusively ZEVs or meet the milestones for converting their fleet based on body type. Only as long as the prescribed percent ZEV milestone is maintained may they continue to purchase diesel or gasoline vehicles. Also starting January 1, 2024, all new registered drayage trucks must be ZE, so that all Class 7 and 8 trucks that operate at or from seaports, rail yards, or other intermodal facilities will be replaced with ZEVs by 2035. Under the proposed regulation, public sector fleets, including cities, counties, and state agencies, will be required to purchase ZEVs for 50%

of 2024-2026 model years and 100% of 2027-plus model years. The California Air Resources Board (CARB) will hear and decide upon the ACF rule on April 27-28, 2023.

**Draft CARB Advanced Clean Fleet (ACF) Rule**
**ZEV Phase-In Schedule**

| ZEV Fleet Targets by Vehicle Group (as of Jan 1) | | | | | | |
|---|---|---|---|---|---|---|
| Group | Vehicle Types | 10% | 25% | 50% | 75% | 100% |
| Milestone Group 1 | Light-duty package delivery vehicles, box trucks, vans, two-axle buses, yard tractors | 2025 | 2028 | 2031 | 2033 | 2035+ |
| Milestone Group 2 | Work trucks, day cab tractors, three-axle buses | 2027 | 2030 | 2033 | 2036 | 2039+ |
| Milestone Group 3 | Sleeper cabs, specialty vehicles | 2030 | 2033 | 2036 | 2039 | 2042+ |

*Figure 1: ACF Rule ZEV Phase-In Schedule*

CARB's Advanced Clean Trucks (ACT) rule, passed in 2020, requires original equipment manufacturers (OEMs) of MD/HD commercial vehicles to increase ZEV sales with the goal of having 25% percent of new medium- and heavy-duty truck sales being zero-emission vehicles by 2030, and 100% in 2045. The rule is designed to reduce the state's greenhouse gas emissions from the transportation sector and to improve air quality for the health of Californians.

### Infrastructure Investment and Jobs Act (IIJA) and Inflation Reduction Act (IRA)

The 2022 Inflation Reduction Act (IRA) following 2021's Infrastructure Investment and Jobs Act (IIJA) are expected to result in the largest investment ever by the U.S. government in ZEV infrastructure. The funding will take many forms and target different subsets of the ZEV industry in different regions, but investment in technology positions the nation for more rapid ZEV expansion across all regions and sectors. The IRA creates a $1 billion Clean HD Vehicles grant and rebate program to fund Class 6-7 ZEVs, and it includes a new tax credit up to $40,000 for MD/HD ZEVs through 2031. The IIJA originated the funding that has become the National Electric Vehicle Infrastructure (NEVI) Formula Program dedicates $5 billion to developing ZRV infrastructure corridors for light duty vehicles. The IIJA has set aside $8 billion investment to develop regional hydrogen hubs and otherwise support the infrastructure and supply chain for ZEV technologies. This



funding will ultimately help fleets that are planning make the transition to invest in ZEV programs through maturing and de-risking the investments in infrastructure that support the industry.

The IIJA and IRA provide additional opportunity for funding to reach Kern County fleets. The mechanism of funding is more indirect, as the money follows a programmatic pathway to federal agencies, such as the Federal Transit Authority and the Department of Transportation (DOT). The agencies create and administer programs targeted at transportation and infrastructure objectives, such as the NEVI program, which must first filter funds to state-level agencies, most commonly the state DOT. At the state agency level, the funds are put into competitive programs according to specifications, such as targeted corridor development, in an open solicitation for the public. It is common for Federal programs to be granted directly to a single public sector applicant, such as a local transit department, in partnership with the state Environmental Protection Agency. Understand the level of funding and the process that is necessary for local government agencies, such as the Kern Council of Government members agencies, to receive funding for infrastructure is important, however, the local government agencies are far better equipped to apply for funding when they have a clear list of priority projects and regional priorities to present for funding.



### Transportation Volume in and Through Kern County

Greater access to ZEV infrastructure funding could not come at a better time for Kern County goods movement corridors. The strain on the transportation sector is expected to increase due to three unmitigable factors: economic growth and transportation activity within Kern County, increased port cargo volume from the Ports of LA and Long Beach, and the arrival of inland port projects in nearby counties that will increase truck volume traversing Kern County. According to the Kern Area Regional Goods Movement Operation (KARGO) study, Kern County is "expected to have 75% growth in number of households and 55% growth in employment by 2042" and industrial growth is expected to increase up to 75% with certain corridors seeing increases in truck volumes up to 80%.[4] Kern County could see a dramatic increase in the logistic industry, which could capture the economic boon of goods movement from the ports and will inevitably lead to further warehouse demand.[5] To that end, the transportation corridors of Kern County are already heavily utilized by ship container volumes moving from the ports to other parts of the state and throughout the county. As of 2020, approximately 74% of containerized cargo in the Kern County market shed moved through the ports of LA and Long Beach.[6] With most goods moving into the US and California markets through the ports of LA and Long Beach, Kern County will be vulnerable to any changes in port activity, which has a large influence on the north to south truck traffic volume through the backbone of California's transportation corridors that traverse Kern County.

The growth of inland ports will also be influenced by Port activity, and inland ports within Kern County can take advantage of the growing transportation industry, but developments of inland ports in nearby Mojave County, also spurred by increased seaport activity, present Kern County with increase east-to-west truck volume.[7] These developments come without providing the tax revenue, job opportunities, and economic growth. The growth of heavy-duty truck volume in the region can lead to increased traffic congestion on local roads and highways, which can negatively impact the quality of life for residents and commuters. Heavy-duty truck volume can strain local infrastructure, including freeways, highways, roads, bridges, and rail lines. This can lead to increased maintenance costs and potential safety concerns. While inland ports can help reduce emissions through more efficient means of transportation per unit of volume, heavy-duty

[4] Kern Area Regional Goods-Movement Operations, Sustainability Study Phase I: Integrated Circulation Study (KARGO). 2021. P.53

[5] https://www.bakersfield.com/news/new-logistics-development-could-be-first-in-bakersfield/article_865b5df6-bc55-11ed-b9f2-c3a4b120fc8f.html

[6] California Inland Port. GLDP Partners, Report for Kern Council of Governments. August 24, 2020.

[7] https://www.mojaveinlandport.com/



trucks and other transportation modes still contribute to air pollution and greenhouse gas emissions. The growth of heavy-duty truck volume can also lead to increased noise pollution and other environmental concerns in the region. The development of inland ports and heavy-duty truck volume in the Central Valley can have both positive and negative impacts on the region. Inland ports provide an opportunity for local businesses to access global markets, which can lead to increased economic growth and job creation in the region. The growth of heavy-duty truck volume can also provide job opportunities for truck drivers, logistics companies, and other related industries. By bringing goods closer to their final destination, inland ports can reduce transportation costs and make it easier for businesses to transport goods efficiently. This can help reduce the cost of goods and increase competitiveness for businesses in the region.

Overall, the growth of inland ports and heavy-duty truck volume in the Central Valley can have significant impacts on the region. Therefore, it is paramount that local policymakers and stakeholders carefully consider and address any potential negative impacts in order to support sustainable economic growth and protect the quality of life for Kern County residents. The Blueprint for MD/HD zero emission infrastructure is designed to address these needs.

The Blueprint development process sought to identify major gaps in infrastructure for ZETs, community needs, available technology solutions, and the actionable infrastructure project plans necessary for progress. Kern County is situated between Southern California Ports and the Central Valley, making it a key location for goods movement. The high-impact clean transportation projects identified through the Blueprint will enable more widespread use of ZE MD/HD trucks along California's major truck corridors and place Kern County on a path to achieving its Sustainable Communities Strategy greenhouse gas (GHG) emission reduction goals at an accelerated rate.

The Blueprint approach accelerates the region's clean transportation goals through the identification of five high-impact or transformational infrastructure projects capable of stimulating additional outside investment in the region. Projects identified through the planning process not only have merit because of their immediate benefits (i.e., emissions reductions), but also because of their ability to demonstrate innovation and to induce other fleet operators to electrify. The project team documented the progress to-date in deploying ZE infrastructure, engaged with stakeholders to align the Blueprint with community needs, developed transparent and agreed upon methodologies for project selection, conducted thorough analyses, and produced detailed implementation plans for each site.



## How to Replicate the Blueprint

An effective and comprehensive Blueprint for MD/HD ZEV infrastructure must be replicable for other regions and counties to model, and it also must be replicable for industry participants, at the company level, within the ZEV transportation industry. Each individual company and government agency that engages in the transition to ZE transportation technologies can benefit from understanding the successful adoption strategies of the companies and entities preceding them in this effort. A successful market apparatus needs to have successive, incremental adoptions in order to grow to a critical mass that supports a network of ZEVs and infrastructure. Regional governments at a variety of levels (MPOs, County, Local, or any government taking on this task) will need to create a replicable process of building both an inventory of stakeholders and consensus amongst them regarding the appropriate tasks involved in the industry transition, while also being stakeholders themselves. The role of the regional government allows for an impartial support structure for companies and agencies that have specific interests in MD/HD ZEVs and infrastructure.

### The Blueprint Process

Requirements for ZEVs impact all commercial vehicles in California, and each MD/HD fleet in the transportation industry must have a plan for shifting their vehicle technology(ies) and operating processes from traditional diesel fuel to ZEVs. California's goals for ZE transportation in the MD/HD transportation sector are likely to bring a host of challenges that must be addressed. Along the time horizon of this transition, commercial fleets must be able to adapt and incur the costs associated with a different mode of operating and fueling, all the while, they must be able to generate profits and keep their businesses solvent. Among many considerations, they will have to finance the vehicle purchases, establish maintenance protocols, support workforce training programs, develop operational logistics, and plan for fueling in a completely different approach from traditionally fueled fleets. As each county in California needs a Blueprint for the complex and technical transition, so does each fleet operation need their own plan. The transportation industry is comprised of more than half a million fleets that will have to implement their strategies, and each of these strategies represents a microcosm of the larger MD/HD ZE Blueprint for each county that will be used as a resource for each fleet.

Large process shifts in transportation, such as the transition of MD and HD vehicles to ZE technologies, are larger than the sphere of influence that can be governed by a single county. However, regional and county governments play a key role in determining the



depth and swiftness of market penetration of these innovative technologies. The patchwork of regional and county governments ultimately comprise the marketplace and determine the fertility of new technology growth throughout the U.S. The Blueprint approach is a way to narrow the broader mandate of facilitating a large industry transformation. Localized efforts to identify broader groups of actors and market players who recognize the appropriate roles will pave the road toward the metamorphosis of transportation vehicle technology. Furthermore, Blueprints enable the work done in one county to build on, and be built upon by, similar work that will be done in different and diverse counties throughout the state and the country. Current policy actions relating to MD/HD goods movement in California provide strong evidence of the inevitable shift to ZE technologies that every region of the state must accommodate.

In order to foster a successful ZE transportation system, replicability in the Blueprint is both required and inevitable as the market can take advantage of similarities in planning and permitting requirements. The Blueprint process naturally falls on the shoulders of the planners and public agencies that will also be required to engage with communities and industries to facilitate the most efficient and effective roll-out of the transportation ecosystem in its newest form.

Steps for replicability include:

1. Identify the tasks and responsibilities;
2. Identify the stakeholders; and
3. Continuously evaluate the Blueprint and consider changes to the identified tasks and stakeholder groups to improve inclusion.

### Identifying the Tasks and Responsibilities

Industry growth requires coordination and harmonization across sectors, and the market participants gain an advantage with advanced knowledge of and planning for their roles in developing the industry. The interacting stakeholder groups that include representatives of all relevant sectors must be able to communicate fully regarding their tasks and responsibilities. Each of the following tasks and responsibilities will look very different from the perspective of the regional government versus the perspective of the fleets. For practical considerations, the planning for private fleets versus public sector fleets are considered together. The following are the core considerations for tasks and responsibilities that need to be embedded in a functional Blueprint.



### Macro Planning

Typically, macro-planning is a function of the government. However, in the case of installing novel transportation infrastructure, it requires significant coordination with industry groups, individual companies, utilities, and community benefit organizations. Public and private company input will shape the planning, but the larger goals are determined by state legislation. The scale and timing of industry growth will depend largely on the macro planning at the earliest stages.

From the fleet perspective, macro planning begins with setting achievable goals for a ZE strategy that is communicated to their internal work teams, suppliers, and in some cases, customers. The fleets will first have to create a deployment plan and a plan for hiring the appropriate personnel and/or contractors and creating the training and safety guidance for a ZEV program.

### Gathering Resources

Local governments will gather resources, and identify and call upon resources, which take the form of organizing committees and working groups for the purposes of planning, troubleshooting, and working with the transportation sector for the implementation of best practices. In some cases, this will be a taskforce that establishes protocols for infrastructure development and permitting. Local governments must also provide the support that the industry will need, particularly in support functions that individual companies and fleets cannot provide themselves. Support functions may include assistance with financial incentives such as grants, tax credits, and low interest loans; streamlined permitting; coordinated infrastructure planning; and public awareness campaigns.

The fleet ZEV goals are quickly followed by allocating capital and making a financial plan for the investment in ZE technology. In addition to the complex economic analysis required of zero emission fleet vehicle and infrastructure purchase decisions, fleets will gather and provide human resource[8] through hiring or training drivers, maintenance personnel, business or finance officers, and fleet managers.

[8] https://www.fhwa.dot.gov/environment/alternative_fuel_corridors/s



### Partnership and Vendor Relationship Development

Local governments will first partner across agencies to gain an understanding of the different groups and processes that are impacted with ZEV development. Building and permitting departments will need to interface with fire departments and emergency services. Depending upon the region, utility service, and need for transition lines, the local government may need to work with the electric utility provider. Developing a corridor of fueling opportunity may look different from enabling one site at a time. In California, the Department of Transportation (Caltrans) works with MPOs (made up of local governments) to seek designation by the Federal Highway Administration of Alternative Fuel Corridors. Fueling opportunities will differ for a return-to-base fleet from an over-the-road fleet.

The regulation and government purview of hydrogen fuel is also an issue that may be subject to change and depends on the provenance of the hydrogen. Currently, the Pipeline and Hazardous Materials Safety Administration (PHMSA), which operates within the U.S. Department of Transportation (DOT), regulates hydrogen pipelines. As the system grows and changes as technologies develop and become implemented, local governments also will adapt to the needs of their communities.

Fleet partnership and relationship development looks very different and will depend much more heavily on OEMs and fuel/electricity infrastructure providers. The utility has an inextricable interest in the long-term fleet deployment commitments, and fleets are increasingly required to have such discussions with the utilities. The electricity grid will create the backbone of battery-electric vehicle (BEV) deployments, and the question of power and distribution remains at the forefront of ZE transportation feasibility. Fleets and infrastructure providers will need expert communication with the utilities regarding their project plans and timelines as early as possible. Familiarity with vehicle and fuel technologies as early and as in depth as possible will heavily impact the success of ZEV technology adoption at the fleet level. Understanding the range of travel and time spent fueling are only completely understood through a partnership between the fleet OEM and infrastructure provider. For strategic self-sufficiency and to decrease dependence on utility services, fleets may also consider adding solar power, onsite battery-electric storage systems, or explore microgrids as part of their transition plan.



### Outreach

Local government outreach is critical to gaining the approval of the communities that will be most heavily impacted by MD/HD ZEV development. The potential public health and social gains from implementing ZEV projects and all Blueprint-related developments can be a great asset to the community, and if communicated early and effectively, can bring greater success and speed of implementation when the public lends their support behind development. A functional outreach plan also serves to seek out and incorporate stakeholders that may have been overlooked at the onset. Participation from interests within disadvantaged communities (DACs) will serve to improve the attribution of benefits of clean transportation projects to the communities that have historically been the most impacted by pollution and traffic with the least ability to relocate or to effect change.

Fleet outreach serves a similar function to government outreach; gaining consensus on socially beneficial projects increases the likelihood of public funding being allocated to support the ZEV developments. Furthermore, the greater the transparency of infrastructure development projects, the less likely there will be community opposition to project development. Outreach from the fleet also helps to spur the workforce development in the region that will provide long-term benefits and increase ZEV program success. These factors, particularly when focused on disadvantaged communities, have the potential to multiply social benefits and solutions where they are needed most urgently.

### Fleet Commitment/Implementation

The support of local government in the form of streamlined permitting, access to funding, community outreach, and workforce development all provide confidence for fleets to be able to invest in and deploy ZEV technologies. The certainty of this support lowers barriers for the companies that will be taking a risk on investing in higher-cost nascent transportation technologies. The government benefits from this beneficial feedback loop by fulfilling the state goals for BEVs in MD/HD fleets by the year 2030 and beyond. As an example, California Air Resources Board (CARB) funding led directly to a groundbreaking deployment of zero- and near-zero emission fleet vehicles and with fueling infrastructure support by Frito-Lay in Modesto, California, in 2021. The initiative helps Frito-Lay to hold closer to its commitment to reduce its GHG emissions by 20% by 2030.

Implementation and commitment at the fleet level is the cornerstone of MD/HD ZEV program development. This process is bolstered by both the incentives provided by public

programs at the federal, state, and local level, and the enforcement of state regulations. At the time of this Blueprint, CARB is developing the Advanced Clean Fleets (ACF) regulation seeking to achieve a zero-emission truck and bus fleet over the roads of California, wherever feasible, by 2045. ZE fleet adoption is now the ultimate goal of public policies in California, which represents an essential indicator of growth and a source of momentum in ZE technology deployment. The Blueprint outlines the best strategies to help fleets remain committed to their investment and timeline commitments for ZE adoption. Therefore, the fleets need to understand their commitments and costs at the inception of project development.

### Collaboration on Troubleshooting

Collaboration on troubleshooting is the key intersection of local government and fleet planning interests. The Blueprint approach fosters aligning stakeholder groups' plans, experiences, and results so that good communication and information shared properly feeds into troubleshooting strategies. The iterative approach on a project-by-project and region-by-region basis builds the experience of both fleets and local government planners to understand where stakeholder needs can be met and where strategic flaws can be avoided. Working groups and other forms of public participation may lead to discussion of the published results adding to the compendium of troubleshooting and further increase the probability of future success of similar industry growth.

### Additional Resources

Fleets are often the first stakeholders to be recognized for lacking resources for information, and many organizations exist to meet this need, but local governments experience difficulty allocating resources to stay up to date with new programs as they are released. This can put certain regional agencies at a deficit especially when it comes to funding and grants that require sophisticated response capabilities. However, there are many information resources from trade organizations, private companies, and government agencies for fleet owners, site owners, and other agencies who are looking for guidance and best practices for their projects. The Department of Energy's Clean Cities program[9] (provides on-the-ground personnel in most regions to provide information support. DOE also maintains the Alternative Fuels Data Center[10] that provides detailed resources for learning and following statewide alternative fuel laws and incentives.

[9] https://cleancities.energy.gov/
[10] https://afdc.energy.gov/



CARB and the Air Districts throughout California all have targeted information services for fleet operators to stay up to date with the regulations and incentives. CARB hosts the Electric Vehicle Charging program website, a website that links to charging standards, building permits, public station locator resources, an many other policy and incentive links.[11]

A trade organization that works to advocate for legislation to benefit industry participants is the Electric Vehicle Charging Association[12], who also provides information on industry news, updates, and policies. And the California IOUs SCE[13], PG&E[14], and SDG&E[15] have a vested interest in providing businesses with all of the relevant EVSE resources.

For the leading industry conference, the Advanced Clean Transportation Expo (ACT Expo)[16] connects thousands of industry participants each year. The annual Advanced Clean Transportation (ACT) EXPO, facilitated by GNA brings together over 8,500 stakeholders to discuss trends, infrastructure solutions, and technologies transforming clean commercial transportation. Case studies and insights gained at conferences like these can be enormously helpful when preparing a blueprint. California's local Air Quality Management Districts can also provide a wealth of information and funding opportunities that can be valuable to short and long term planning, from the site level up to the whole region. Finally, US DOE Clean Cities coalitions offer fleets, local government stakeholders and site representatives the opportunity to network and share information that can be constructive toward developing a regional Blueprint.

[11] https://ww2.arb.ca.gov/our-work/programs/electric-vehicle-charging
[12] http://www.evassociation.org/
[13] https://www.sce.com/evbusiness/overview
[14] https://www.pge.com/en_US/small-medium-business/energy-alternatives/clean-vehicles/ev-charge-network/electric-vehicle-charging/electric-vehicle-programs-and-resources.page
[15] https://www.sdge.com/business/electric-vehicles/power-your-drive-for-fleets
[16] https://www.actexpo.com/



### Identifying the Stakeholders

The following is a list of the relevant sector participants that are the stakeholders in the Blueprint process. The stakeholders are the obvious project participants and those impacted directly and indirectly by infrastructure development projects. With the introduction of new technologies there can arise the unforeseen need for support technologies. An example of this includes batteries and the need for on-site electric storage or additional generation assets if vehicle charging demand creates untenable demand charges for electricity from the utility grid, or if the electricity demand outpaces the capabilities of the electric utility in a given region, necessitating supply interruptions. Other shifts in the market that occur faster than expected can also create the need for other industries, partners, and additional stakeholder groups, so the list must be comprehensive and adaptable. Having a clear list of the impacted interest groups helps to ensure the proper communications and considerations are made to eliminate barriers to project and industry development. Within each of the stakeholder groups, the primary action taken should be inclusion and participation in the Blueprint development process itself. When executed correctly, this establishes a comprehensive inventory of needs and adaptations for the transportation industry — most importantly fueling and charging infrastructure development. It also decreases the likelihood of unforeseen barriers to development and brings the region's transportation sector and relevant stakeholders closer to project readiness at all levels of development. The key players and their roles in achieving the goals are identified below.

Project Partners and Stakeholder Groups:

- Federal, state, local governments – including fire departments, emergency services, planning and permitting agencies, municipal fleets, and economic development
- Utilities
- Fleets and facilities, OEMs, and infrastructure/fuel providers (direct market participants)
- Financial institutions and banks
- Community benefit organizations (CBOs)
- Federal, state, and local public agencies offering grants and incentives

### Federal, State, and Local Governments

As mentioned above, the regional governments, typically County and incorporated cities, are themselves stakeholders, and due to the incumbent obligation of providing public services and goods, they must be the stakeholders that lead the Blueprint development and create a process for identifying the key regional stakeholders. In addition to assembling the stakeholders and planning and assembling the Blueprint process, governments also hold the power to incentivize and facilitate industry transportation sector development. This is carried out through high level regulations, targeted incentives — critically important at the local level — and assistance in permitting, zoning, and site plan review.

The State of California has set clear goals to increase the numbers of ZEVs in MD/HD fleets by the year 2030 and beyond. Meeting these goals will require significant expansion in ZEV purchases and infrastructure development throughout the state, and it requires commitment to change standard fleet operations. Agencies, municipalities, and utilities have begun introducing programs to help fleet customers make ZEV infrastructure investments, through both funding support and accelerated project reviews. Southern California Edison's Charge Ready Transport and Pacific Gas and Electric's EV Fleet program both aim to assist private fleet customers to build out charging infrastructure. As mentioned above, some private companies are leading the change to ZEVs by their own commitments, yet they require help to make the changes cost competitive. The regulations such as ACF, present challenges for fleets in economic, operational, logistical terms, and the government needs to make the goals achievable if they are to make the requirements enforceable.

Electric vehicle supply equipment (EVSE) installations require a building permit or similar nondiscretionary permit regardless of the project's size or charging level. Under Assembly Bill 1236, all California jurisdictions have been required to adopt an expedited approval process for EVSE permits, and to provide the public with a checklist of the information that an applicant must provide to be eligible for expedited review.[17] A project manager or prospective EVSE owner can download or request the checklist from the jurisdiction in which the EVSE will be installed, as well as the appropriate application forms, at the beginning of the project development process. County planning organizations can assist project managers and developers with this part of the process. Planners can harmonize

[17] https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160AB1236

codes and permits to expedite infrastructure projects further. Additional programs are likely to emerge as needs become more defined over time.

### *Utilities*

Utilities are responsible for expanding the grid's capacity to deliver power, while minimizing delivery interruptions. This includes ongoing grid maintenance and new infrastructure development of power generation and distribution. To manage these responsibilities, utilities maintain regular inspection and operational review schedules for power lines, transformers, and substations. As more ZEVs are put on the road, some utilities are developing long-term maintenance protocols for newly laid ZEV charging infrastructure. On the other side of this equation, consumers who own/operate charging infrastructure are responsible for conducting regular maintenance to ensure that their equipment safely and successfully receives power and transmits it to vehicles.

At the top of this food chain of energy, the utilities will need support and planning assistance through the California Public Utilities Commission (CPUC) and the California Energy Commission (CEC) in order to be able to supply the market with adequate power and fuel. Interruptions in the electricity or source fuel that have the effect of halting commercial and industrial operations are devastating for supply chains, order fulfillment, and meeting contract terms. In the exact same manner, interruptions in power supply will halt or delay operations of the rolling stock of carriers and logistics companies. This can be devastating for the transportation industry, all industries that rely on the transportation industry, and all efforts to keep the ZE fuel technology transition momentum going toward the State's goals. It is incumbent on electric utilities to develop resiliency plans that consider the transition of MD/HD transportation from diesel to electricity and the anticipated growth of the transportation industry especially in relation to the growth of inland ports activity.

### Fleets and Facilities, OEMs, and Infrastructure/Fuel Providers

Fleets following a successful, replicable approach will be best served by communicating their plans with the community, local governments, vehicle manufacturers, infrastructure providers, and the utility companies that will provide the power for their projects. Fleet managers in California are navigating a mix of business opportunities and technology innovations as they consider adopting clean, sustainable fuels. The selection of clean MD/HD vehicles is expanding, with a growing number of manufacturers providing battery-electric options now or in the next several years for a variety of truck operations. The manufacturer development timelines for the relatively new technology options may



be longer than traditional vehicle technologies, and the supply chains are also similarly navigating their way to maturity. Fleets benefit by creating realistic and well-communicated vehicle deployment goals with customers, end users, and the vehicle manufacturers to set expectations.

As ZEV technologies for these applications approach commercial readiness there is a clear need for charging infrastructure that can provide cost-effective vehicle charging on a reliable schedule. The optimal charging solution is unique to each fleet and depends on a variety of factors. Fleets must know and communicate their vehicles' charging standards and fleet charging needs clearly so that the project design can be understood by the utility to best support these requirements. Understanding the growth goals of the ZEV program is also important, and design layout and electrical infrastructure in the immediate term must support the long-term fleet growth objectives. This minimizes future construction and connection costs. The more strategic ZEV fleet deployment plans will always consider the longer time horizon of decision making for the utility company. The volume of customers and the process for permissions and authorizations for any utility company will be many times larger than most private fleets. In any region, at every point in time, the fleet must communicate as early and often as possible with the utility company. Fleet operators, whether government fleets or private fleets, will invariably be able to adapt and make changes faster than the utility company.

A fleet's first project to set up charging infrastructure will likely be the most time-intensive, since they will be working on this with the utility, vehicle manufacturers, and EVSE vendors/infrastructure developers for the first time. Fleet managers find that subsequent projects — whether follow-on phases of the first project or projects at new facilities — become more efficient through established relationships. In either case, establishing the best practices will help protect future developments from avoidable risk.

### Financial Institutions and Banks

The early stages of capital-intensive technology in the commercial sector are often tenuous due to the risk of financing. The financial sector is a strong determining factor in whether projects commence. Currently, the electric vehicle (EV) transportation sector is heavily reliant on subsidies due to the relatively new and lesser-proven technology, high-cost of inputs, and low cost of traditional fossil fuel alternatives. The subsidies carry with them policy risk for sustained support and investment, and it demands a financial sector that is dynamic and experienced with navigating public funding opportunities. To support a strong environment for investment in clean ZEV technologies, the banks and financial institutions need to work with investors and technology companies in understanding the



available funding programs and have the appetite for investment in long term horizons for repayment. Furthermore, the insurance and risk management industry will play a key role in determining project viability, and they will need to collect data on the industry as it develops as early and often as possible for actuarial needs. These mechanisms have the effect of managing risk for future investment by other financial institutions.

### Community Benefit Organizations (CBOs)

CBOs, by their unique position, are designed to support the public interests, specifically the causes and interests of their community, and they can provide advocacy for initiatives that serve multiple stakeholders' needs. CBOs work with the industry to influence investment decisions and organize resources that serve the ZEV transportation industry while enhancing the lives of the nearby community. For instance, the growing industry will require job training and workforce development, and CBOs can direct those resources to the local community so that investment in transportation also results in economic growth and employment opportunities. The growth of the ZEV transportation industry brings inherent benefits to any community, so identifying CBOs with aligned goals and overlapping interests with clean vehicle technology adoptions in Kern County is a straightforward process. Because advocacy initiatives and consensus building activity on the part of CBO can take time, and communication can be a nuanced process, the early engagement of CBOs is very important. The sooner the overlapping interests can be determined between the community and the growing industry, the easier communication and symbiosis will be.

### Conclusion

Local governments and transportation industry participants that plan to create a transition to ZE technologies in any region must identify their economic and political ecosystems that impact and are impacted by any shift in transportation technology. The established goal within these spheres to foster ZEV development must account for the interest groups, affected communities, and the distribution of benefits and cost. Changes in transportation energy will increase costs for the transportation industry in the immediate term, but they bring industry opportunities for the economy and tremendous environmental benefits to the local community. The replicable strategies for adoption accommodate the equitable distribution of benefits in their region and account for the nuances and various differences through engagement, inclusion, and communication across stakeholder groups. When consensus and agreement of the stakeholder groups concur on the industry benefits and the support that is required to foster a growing ZEV



industry, it then creates a successful market apparatus. A successful market apparatus will have successive adoptions and reach critical mass that supports a network of ZEVs and infrastructure. Regional governments that use an equitable and replicable process of building both an inventory of stakeholders, and consensus amongst them regarding the appropriate tasks involved in the industry transition, will thereby create a support structure for the MD/HD ZEV industry that benefits all stakeholders.



## Stakeholder Engagement

Engagement with a range of stakeholders throughout the Blueprint development process helped to minimize the risks and uncertainties surrounding the design, permitting, planning, and financing of the ZEV infrastructure that will be installed at the high priority sites, and garners lessons for the long-term planning for the deployment of ZEV infrastructure in Kern County. This engagement with stakeholders allowed for an opportunity to align on community needs and infrastructure deployment opportunities, evaluating which projects will have the most positive impact on public health and which will increase access to zero emission technologies.

Kern COG and GNA connected with a variety of stakeholders who had relevance to the critical projects and the broader planning effort for Kern County. These stakeholders included fleet and facility owners, community benefit organizations, local businesses, and other planning organizations.

### Informal Working Group (IWG)

From late 2021 to early 2022, GNA began developing the Kern Council of Governments (Kern COG) Blueprint informal working group (IWG). The IWG is comprised of stakeholders such as site representatives, utilities, and air districts and interest groups with ties to zero emission transportation in Kern County that could inform the Blueprint development process by engaging with other stakeholders and non-project participants. Though the IWG was first outlined in the Narrative section of the project proposal, IWG were contacted to confirm their commitment, and in several instances tapped members were replaced with more suitable personnel, and new members recommended by Kern COG were added to the group.

Through introductory emails, phone calls, and meetings the team disseminated information on the Blueprint project and solicited interest in project participation. The project details and objectives were presented and discussed at Kern Council of Governments Transportation Technical Advisory Committee (TTAC) and Regional Planning Advisory Committee (RPAC) meetings to engage fleets and other relevant agencies to participate in the discussions.

The final IWG roster was established in December 2021. Alongside the IWG, GNA developed a stakeholder engagement roster comprising different stakeholder groups, including, regional businesses, local jurisdictions, utilities, community benefit organizations (CBOs), and financial institutions. The IWG meeting was slated for March 3,

2022, via Zoom, and invitations for this meeting were distributed to IWG members in January 2022.

GNA began preparation of content for the IWG meeting in February 2022. This included drafting an agenda and slides to share with IWG members during the meeting. GNA's project team for the meeting included Mark Conolly, Jazlyn Guerrero, Christian Hosler, Karen Mann, and Catherine Smith. Kern COG's project team for the meeting included Linda Urata. Seventeen IWG members attended the meeting, representing the cities of Arvin, Bakersfield, Shafter, and Tehachapi, Advance Beverage Company, Frito Lay, Tactical Transport, Trillium, WattEV, and Tejon Ranch Commerce Center.

The purpose of this meeting was to gather intelligence from site representatives, utilities, and air districts that could inform the Blueprint development process and provide feedback on the criteria GNA and Kern COG developed to evaluate prospective infrastructure deployment sites. This meeting comprised of an overview of the Blueprint, who is included in the IWG and what those members have access to, the Blueprint site selection process and criteria, and additional stakeholder engagement opportunities slated for the duration of the project.

The project team developed a preliminary list of site selection criteria that would be used to capture the most relevant data for evaluation for projects that would provide the best basis for a MD/HD ZEV Infrastructure network in Kern County.

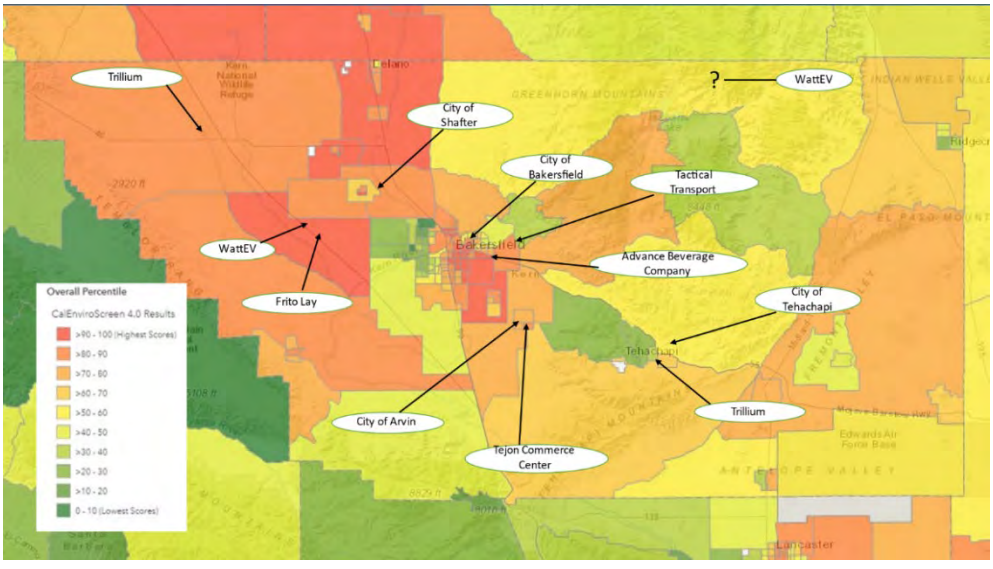



*Figure 2: A slide showing the identified potential sites at the IWG meeting.*

Presentation materials were sent along with an invitation for interested parties to attend the Informal Working Group (IWG) initial meeting to discuss the initial criteria for site selection.

Following the presentation of the selection criteria at the IWG meeting, the IWG discussed and evaluated the merits of the listed criteria and submitted questions and recommendations to the project team. Following the IWG meeting, the project team sent out the revised list of criteria to the IWG and requested that they evaluate and provide a numerical score on a 0-3 scale (0 being this criterion has no value, 3 being this criterion has high value) for each criterion. Additionally, we requested that they send any other questions or qualitive feedback to be incorporated into the criteria selection.

Post meeting, the GNA team followed up with attendees on March 10, 2022, with a copy of the presented slide deck, a recording of the meeting, and a draft of the site selection criteria for IWG members to provide feedback on. GNA shared a finalized version of the site selection survey in April 2022 and requested feedback by April 22, 2022.

By May 2022, GNA had received feedback from 5 IWG members on the draft site selection criteria. Upon receipt of site selection surveys from IWG members and stakeholders, GNA refined their stakeholder engagement plan to encompass outreach efforts that targeted identified site locations. The identified site locations represented the cities of Arvin, Bakersfield, Shafter, and Tehachapi, Advanced Beverage Company, Tejon Ranch Commerce Center, Trillium, and WattEV. Additional information on the Site Selection Criteria and the Survey process is detailed is section 3.1.

### Stakeholder Engagement Meeting

GNA began preparing for a secondary stakeholder engagement opportunity in August 2022. The purpose of this meeting was to target stakeholders outside of the IWG as an additional attempt to collect feedback on the Blueprint development process and supplement the content of the memoranda within the Blueprint. Invitations for this meeting were sent to identified stakeholders in September 2022. GNA and Kern COG hosted this Stakeholder meeting on October 12, 2022. Stakeholders from a variety of sectors, including but not limited to municipal and transit agencies, local businesses, CBOs, universities, and planning organizations were in attendance. The memorandum topics included planning tools, outreach strategy, workforce development, job creation, and benefits to disadvantaged communities (DACs) which were presented during the meeting.

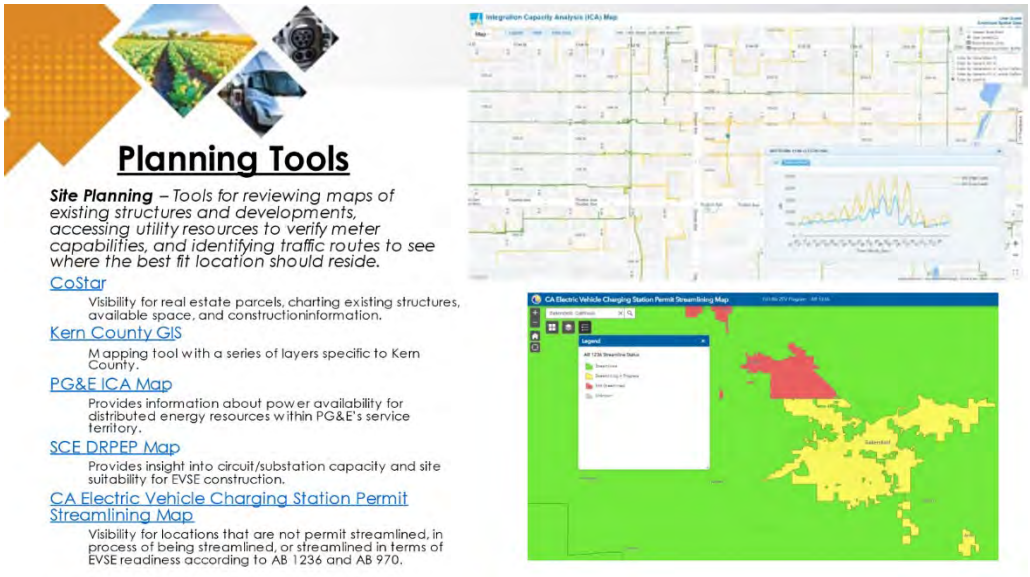



*Figure 3: An example of the content presentation at the Stakeholder Engagement meeting*

Receiving feedback was crucial to the development and fine tuning of the memoranda our team has drafted. Rather than taking a one-size-fits-all approach, the project team tried to incorporate needs and suggestions from those that this blueprint will impact. We wanted to develop a strategy that works for the community, but also remain aware that this blueprint should be replicable for other communities.

Post meeting, GNA followed up with attendees via email, sharing the presentation slide deck, and let attendees know that they could request meeting notes and the meeting recording.

| **Organizations Represented at the October 13, 2022 Stakeholder Meeting** |
|---|
| Bakersfield College |
| Caltrans |
| City of Bakersfield |
| City of Wasco |
| Eastern Kern APCD |
| Grimmway |
| Kern COG |
| Kern County Public Works |

| |
|---|
| San Joaquin Valley Clean Cities Coalition |
| SJVAPCD |
| WattEV |

GNA conducted outreach to stakeholder engagement meeting attendees in late October to early November 2022. The purpose of this outreach was to receive additional feedback on the memoranda and other relevant Blueprint content presented during the October stakeholder engagement meeting. Responses were requested to be submitted by November 14, 2022. Aside from the October stakeholder engagement meeting attendees, GNA engaged with additional interested parties to supplement content throughout the Blueprint, such as recommended planning tools and changes to the Technology Analysis memorandum. These interested parties included environmental justice (EJ) and community groups, relevant local businesses, and electric vehicle industry experts. GNA also connected with utilities and financial institutions during this time to assess the investment landscape for infrastructure, complementing previous outreach attempts conducted for the stakeholder engagement deliverable.

After collecting feedback, GNA engaged with site hosts to conduct site analysis conversations in mid-November through early December 2022. The site analysis conversations were a preliminary step in conducting physical site visits and assessing each site host's progress in the infrastructure deployment process. The site analysis conversations were followed by additional engagement attempts via phone and email to establish a schedule for conducting physical site visits through the end of December 2022 and into January 2023.



## Identifying Infrastructure Sites

The Blueprint Plan features five shovel-ready ZE infrastructure projects selected for inclusion in the Blueprint based on their high-impact and innovative qualities. The Blueprint describes each infrastructure project's use case, emission reduction potential, community benefit, and innovative features. Projects are feasible and have backing (e.g., property secured and committed site host or operator). The project team worked with the Informal Working Group to develop a shared and agreed upon methodology for site selection and assessed all potential sites. The project team relied on the involvement and collaboration of community partners as they were instrumental in helping to identify and vet for the most high-impact and transformation projects which have been included in the final Blueprint Plan. The project team assessed the projects through site visits. Site analysis helped identify items that impacted project timelines and commissioning, as well as cost estimates. Required actions and milestones needed to deploy the charging infrastructure were laid out.

### Criteria to Rank Site Locations

Kern COG and GNA assembled a working list of stakeholders including project participants, project owners, and regional businesses and interest groups with ties to ZE transportation in the county. Through introductory emails, phone calls, and meetings, the team disseminated information on the Blueprint project and solicited interest in project participation. The project details and objectives were presented and discussed at Kern Council of Governments Transportation Technical Advisory Committee (TTAC) and Regional Planning Advisory Committee (RPAC) meetings to engage fleets and other relevant agencies to participate in the discussions. The project team developed a preliminary list of site selection criteria that would be used to capture the most relevant data for evaluation for projects that would provide the best basis for a MD/HD ZEV infrastructure network in Kern County. Presentation materials were sent along with an invitation for interested parties to attend the Informal Working Group (IWG) initial meeting to discuss the initial criteria for site selection.

Following the presentation of the selection criteria at the IWG meeting, the IWG discussed and evaluated the merits of the listed criteria and submitted questions and recommendations to the project team. Following the IWG meeting, the project team sent out the revised list of criteria to the IWG and requested that they evaluate and provide a numerical score on a 0-3 scale (0 being this criterion has no value, 3 being this criterion has high value) for each criterion. Additionally, the team requested that they send any other questions or qualitive feedback to be incorporated into the criteria selection.



GNA and Kern COG evaluated the questions and comments and took them into consideration to create the final site survey questions that would be sent to the project participants. Given the importance of understanding infrastructure demand in the region, the input from the participants who have potential infrastructure project ambitions was very important. Furthermore, it is critical to have a common understanding of project feasibility and an agreed upon definition of a successful infrastructure ecosystem, with the end goal of creating a robust network of charging and fueling for the greatest market penetration for ZE MD and HD vehicles (primarily trucks) in Kern County and addresses all of the community's needs. Therefore, it is paramount to have the discussion of selection criteria with agencies, utilities, and fleets in the same forum.

As a result, the following draft list of criteria were presented to the IWG (see attached Draft List of Criteria Form for detailed subcategories). The following categories were used as the basis for organizing the specific criteria.

### Criteria Categories

1. EVSE/refueling – existing and future fueling station attributes
2. Vehicle usage – maximizing throughput
3. Location
4. Accessibility
5. Emissions and health
6. Preparation
7. Economics/costs
8. Long-term results
9. Potential knowledge transfer, scalability
10. Other recommendations

Throughout March and the beginning of April 2022, the GNA team received valuable feedback on the draft criteria from IWG members, including potential site hosts and other key stakeholders. Other key stakeholders, including the electric utility, PG&E, and other fleets, provided feedback. This was used to create a second iteration of the criteria. In mid-April the project team used the feedback to create the site selection survey. Each criterion was presented in survey form and sent to the prospective project partners who had volunteered their projects as a part of the Blueprint initiative.

Given the nature of the responses from the IWG, the methodology requires a dynamic evaluation of the responses from the pool of projects. For instance, when considering the hydrogen fueling element of the blueprint, it is important to measure the potential

hydrogen projects against one another. Furthermore, we maintain the importance of having at least one project include hydrogen, and this is influenced by the resulting responses from the prospective project participants. Additional infrastructure classification considerations include at least one site to have publicly accessible charging on-site, and one public sector project participant. Finally, the dynamic evaluation of the distribution of infrastructure also depends entirely on the geographic locations of the proposed projects. For instance, though it is anticipated that there is a large interest for projects that will be located near the high traffic volumes of Bakersfield's commercial and industrial areas, the Blueprint should consider the geographic diversity of Kern County and ensure that site selection serves a wide range of community interests and key industries, such as agriculture.

### List of High Priority Projects

The following five sites were selected as the priority medium- and heavy-duty zero-emission vehicle infrastructure projects in Kern County.

| Ranking | Site Owner | Score (%)- cutoff for selected sites at 50% |
|---|---|---|
| 1. | Wonderful Industrial Park | 78% |
| 2. | Tejon Ranch Commerce Center | 56% |
| 3. | PepsiCo | 55% |
| 4. | WattEV | 53% |
| 5. | City of Arvin, Public Works Department | 51% |

These projects represent a diverse set of operations; from a small private-access station to service a local municipal fleet, to a 24/7/365 public-access station to service hundreds of over-the-road trucks. Key to regional planning efforts, the projects also entail geographically dispersed public-access facilities. As illustrated in Figure 4, Wonderful Industrial Park, WattEV and Tejon Ranch are strategically located along major corridors.

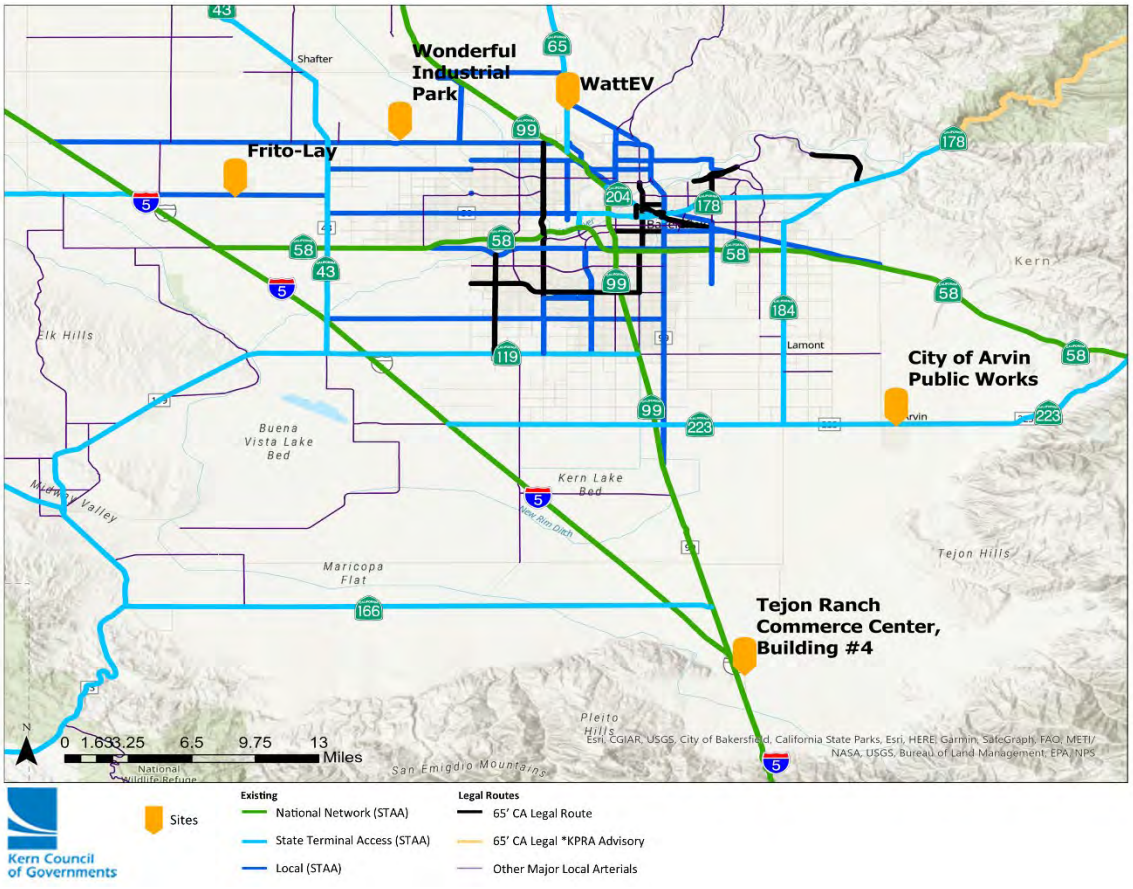



*Figure 4: Location of High Priority ZEV Infrastructure Projects Along Existing Transportation Routes*

Key to the Blueprint development, the region must adopt supporting fueling and charging infrastructure that aligns with the economic features and goals of the community. Kern County is leading the planning for ZEV infrastructure development in part because of the high volume of traffic that travels through this corridor. As discussed further in subsequent sections, the reliance the trade industry has on Kern County means there already are, and always will be, high truck volume carrying loads, needing Kern to provide supporting fueling infrastructure. The KARGO study projects that the number of MD/HD truck trips are expected to double in some parts of the county in the next two decades. Figure 5 below confirms that as Kern County expands transportation routes, the high priority locations will remain relevant to providing public-access ZEV infrastructure to the growing fleet of ZEV trucks transiting through the region.

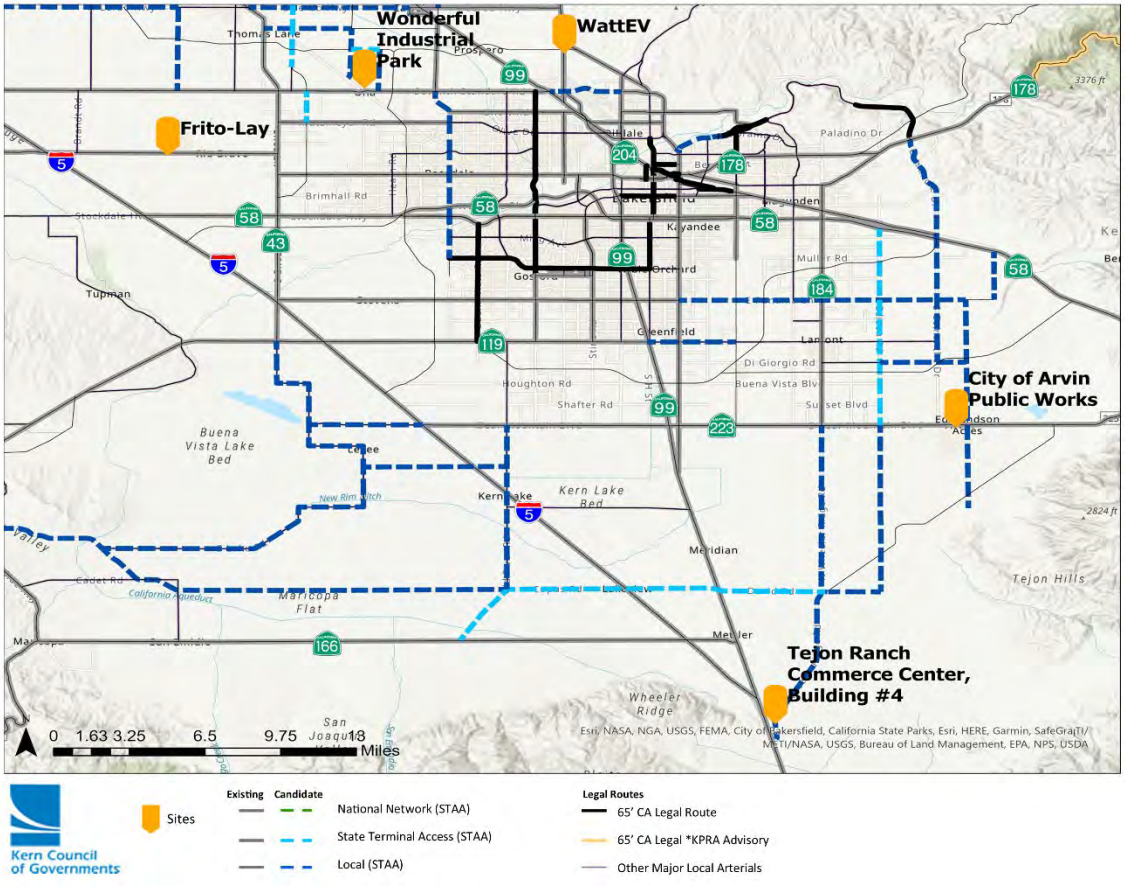



*Figure 5: Location of High Priority ZEV Infrastructure Projects In Relation to Identified Future Transportation Routes*

# Analyzing Sites and Developing Site Implementation Plans

## Implementation Plans

**Site Implementation Plan**
**Wonderful Industrial Park**
**MD/HD Zero-Emission Vehicle Infrastructure**

**Project Summary:** Wonderful seeks to develop public-access zero-emission vehicle infrastructure to support the private heavy-duty fleets transiting to and around their 600-acre industrial park. Located at the heart of central California, Wonderful Industrial Park is ideally situated, an experienced developer, and owns properly zoned vacant property.

**Operational Model:** Full-public access charging and hydrogen refueling at existing commercial / industrial park.

**Location:** Fanucchi Way, Shafter, CA
**Land Use:** Industrial/Commercial
**Current Use:** Vacant

**Estimated Costs:** Equipment $1,445,000
Site Upgrades/ Construction Costs $1,737,000
Total $3,182,000

**Utility:** PG&E
1.5-2.0 MW Line

**Vehicles:** Estimated market of heavy-duty trucks increases from 12 to 35 charging connections per day over the initial five (5) years of operation.

**Equipment:** 4 DCFC @ 150 kW each and 4 MCS
- Potential to expand based on market demand.
- Potential to expand to hydrogen for fuel cell trucks once truck product is fully commercialized.
- Potential to develop DER if cost-effective.

**Estimated Schedule:** Operational by 2025.

**Community Benefits:** Estimated emission reductions at full deployment 8.86 tons NOx/yr. and 100% diesel PM reduction.

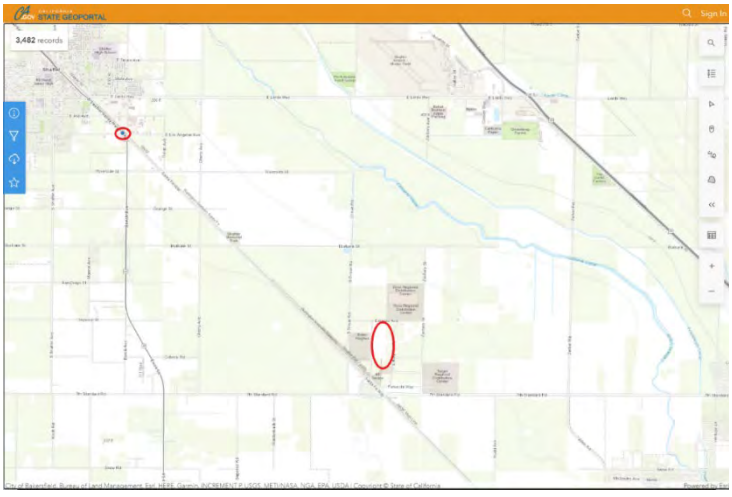
**CalEnviroScreen Percentage:** 87%

# California State Geoportal Truck Volumes - Annual Average Daily Traffic (AADT) – Wonderful Industrial Park

### Truck Annual Average Daily Traffic (AADT)

Route 43 at Beech Avenue

| | |
|---|---|
| OBJECTID | 1103 |
| RTE | 43 |
| RTE_SFX | null |
| DIST | 6 |
| CNTY | KER |
| POSTMILE_PFX | null |
| POSTMILE | 15.89 |
| POSTMILE_SFX | null |
| LEG | B |
| DESCRIPTION | CENTRAL VALLEY HWY |
| VEHICLE_AADT_TOTAL | 3,800 |
| TRUCK_AADT_TOTAL | 836 |
| TRK_PERCENT_TOT | 22 |
| TRK_2_AXLE | 443 |
| TRK_3_AXLE | 67 |
| TRK_4_AXLE | 25 |
| TRK_5_AXLE | 301 |
| TRK_2_AXLE_PCT | 53 |
| TRK_3_AXLE_PCT | 8 |
| TRK_4_AXLE_PCT | 3 |
| TRK_5_AXLE_PCT | 36 |
| EAL | 129 |
| YEAR_VER | 15 |
| EST | E |



| Weight Class | Mi/yr. | MPG | Annual DGE |
|---|---|---|---|
| Class 4/5 | 15,250 | 7 | 965,107 |
| Class 6 | 14,500 | 6.5 | 149,461 |
| Class 7 | 32,000 | 6 | 133,333 |
| Class 8 | 58,000 | 5.25 | 3,325,333 |

***Source*** *: https://gis.data.ca.gov/datasets/c079bdd6a2c54aec84b6b2f7d6570f6d_0/explore?location=36.928104%2C-119.281950%2C7.00*

| Weight Class | Number of Units | Annual Miles | MPG | Total Annual DGE (diesel gallon equivalent) | kW/mile | Time to Charge (hrs.) | Annual kWh per Unit | Total Annual kWh |
|---|---|---|---|---|---|---|---|---|
| Class 4/5 | 443 | 15,250 | 7 | 965,107 | 1.25 | 0.41 | 19,063 | 8,444,688 |
| Class 6 | 67 | 14,500 | 6.5 | 149,462 | 1.25 | 0.39 | 18,125 | 1,214,375 |
| Class 7 | 25 | 32,000 | 6 | 133,333 | 1.75 | 0.85 | 56,000 | 1,400,000 |
| Class 8 | 301 | 58,000 | 5.25 | 3,325,333 | 2.25 | 1.55 | 130,500 | 39,280,500 |
| TOTAL | 836 | | | 4,573,235 | | | | 50,339,563 |

The above numbers represent the maximum potential ZEV infrastructure energy demand potential based on the AADT vehicle counts, and the estimated annual miles and fuel economy for each weight class. This was then converted into potential electric demand based on existing vehicle efficiencies and infrastructure charging at an average of 120 kWh.

Utilizing the ZEV fleet milestones by group and year replacement requirements from the Advanced Clean Fleet Regulation, which is schedule for adoption on April 28, 2023[18], the estimated full ZEV population calculated year over year. This number was further refined based on CARB's finding that 50% of the regulated fleets fuel their vehicles onsite. From there, the estimated market share of public charging was estimated based on the location of the proposed facility and the truck population domiciled in the immediate vicinity.

**Estimated Market Capture**

| | |
|---|---|
| Vehicles that Fuel Offsite | 50% |
| Selection of Wonderful Site | 40% |
| Total | 20% |

**From ACT Large Entity Fleet Reporting - Aggregated Statewide*

**Projected Wonderful Usage**

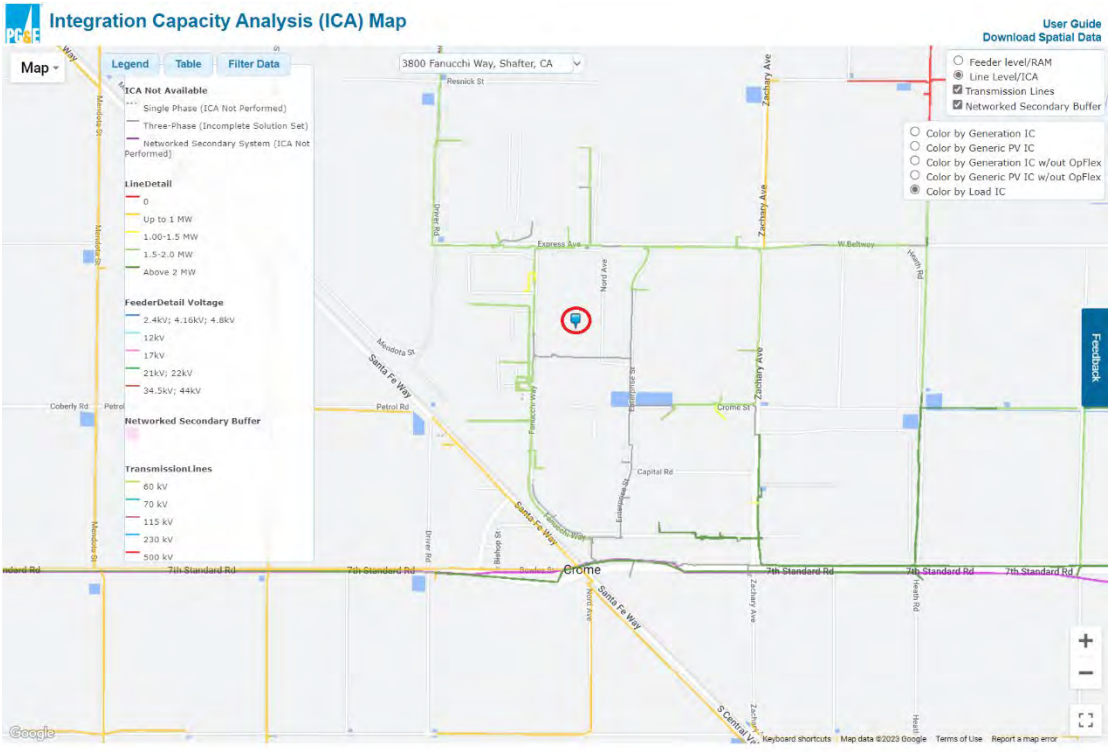
| | | | | | |
|---|---|---|---|---|---|
| Daily Charger Connections | 12 | 14 | 18 | 34 | 35 |
| New Fuel Demand (dge) | 15,317 | 29,102 | 41,509 | 52,675 | 62,725 |

[18] https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/acf22/acf15da2.pdf

| | | | | | |
|---|---|---|---|---|---|
| Max Charge Time (hrs.) | 2 | 2 | 2 | 2 | 2 |
| Hours in Demand | 12 | 12 | 12 | 12 | 12 |
| Buffer | 25% | 25% | 25% | 25% | 25% |
| Minimum Chargers | 3 | 3 | 4 | 8 | 8 |

| | |
|---|---|
| Recommended Number of Chargers (5-year Projection) | 8 |
| MCS | 4 |
| DCFC | 4 |
| L2 | 0 |

## PG&E's Integration Capacity Analysis (ICA) Map – Wonderful Industrial Park




## Development Cost Estimate for Wonderful

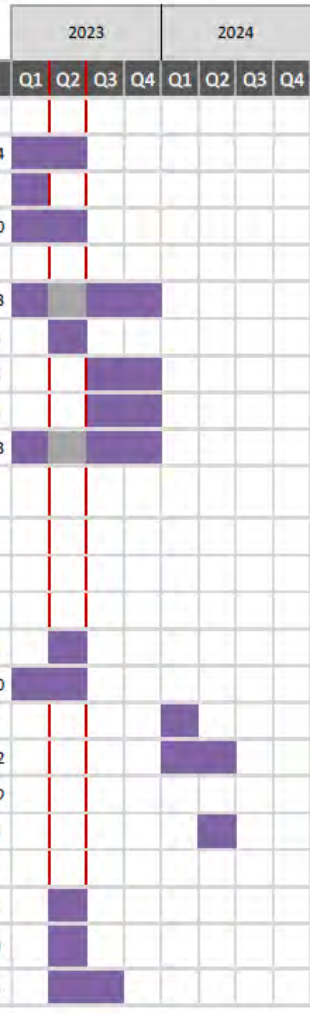
| | |
|---|---|
| Equipment Costs | $ 1,445,000 |
| Site Upgrade/ Construction Costs | $ 1,737,000 |
| Total Cost | $ 3,182,000 |

## List of Quantitative Goals and Timelines for Installation and Implementation

### Wonderful Industrial Park - MHD ZE Infrastructure

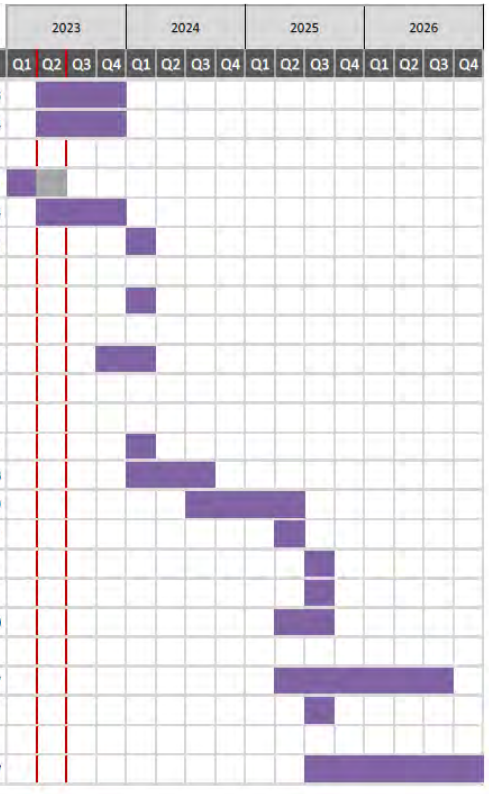

The Wonderful Company
Project Lead: Jed Hwang

| TASK | Quantitative Goal/Deliverable | PROGRESS | EST START DATE | EST END DATE | |
|---|---|---|---|---|---|
| **Site Selection** | | | | | |
| Evaluation of Preliminary Site Options | | 30% | 1/17/23 | 4/30/23 | 104 |
| Zoning/General Plan Confirmation | | 100% | 1/17/23 | 1/17/23 | 1 |
| Final Site Selection | *Site Implementation Plan* | 30% | 1/17/23 | 6/15/23 | 150 |
| **Vehicle Baseload Confirmation** | | | | | |
| ZE Vehicle Technology Identification | | 60% | 2/1/23 | 10/1/23 | 243 |
| Survey Interest with Regional Fleets | | 0% | 6/1/2023 | 6/15/23 | 15 |
| Discuss Project Specifications and Timing with Regional Fleets | | 0% | 7/1/2023 | 10/1/23 | 93 |
| Finalization of Equipment Specification with Regional Fleets | | 0% | 7/1/2023 | 10/1/23 | 93 |
| Finalize ZE Vehicle Energy Requirement Deter | *Load Profile* | 25% | 2/1/23 | 10/1/23 | 243 |
| **Concept Design** | | | | | |
| EVCS Preliminary Site Plan | | 0% | | | |
| EVCS Equipment Specification | *Final Specification* | 0% | | | |
| **Permitting** | | | | | |
| Preliminary Meeting with Planning and Permitting Departments | | 0% | 5/1/23 | 5/31/23 | 31 |
| Develop List of Permitting Requirements | *List of Permits* | 0% | 2/1/23 | 6/30/23 | 150 |
| Submit Project Drawings for Permitting | | 0% | 1/31/24 | 2/1/24 | 2 |
| AHJ Permit Review and Entitlements | | 0% | 2/1/24 | 6/11/24 | 132 |
| Obtain Condtional Use Permit (if necessary) | | 0% | *TBD* | *TBD* | *TBD* |
| Permits Obtained | *Completed Permits* | 0% | 5/11/24 | 6/12/24 | 33 |
| **Utility Coordination** | | | | | |
| Apply for Make Ready Program | | 0% | 5/1/23 | 5/31/23 | 31 |
| Utility Site Visit | | 0% | 6/1/23 | 6/30/23 | 30 |
| Utility Infrastructure Evaluation | | 0% | 6/1/23 | 9/1/23 | 93 |



The Wonderful Company
Project Lead: Jed Hwang

| TASK | Quantitative Goal/Deliverable | PROGRESS | EST START DATE | EST END DATE | |
|---|---|---|---|---|---|
| Utility Design and Cost Estimates | | 0% | 6/1/23 | 10/1/23 | 123 |
| Utility Final Determination of Cost and Timing | *Utility Estimate and Timeline* | 0% | 6/1/23 | 11/1/23 | 154 |
| **Secure Grant Funding** | | | | | |
| Grant Funding Identification | | 80% | 2/1/23 | 5/1/23 | 90 |
| Grant Application Development and Submittal | | 0% | 6/1/23 | 12/31/23 | 214 |
| Grant Award/Contracting | *Grant Contract* | 0% | 1/1/24 | 2/1/24 | 32 |
| **Procurement** | | | | | |
| Design/Build; Procurement | | 0% | 1/1/24 | 1/30/24 | 30 |
| **Infrastructure Design** | | | | | |
| Prepare Construction Drawings | | 0% | 12/3/23 | 1/31/24 | 60 |
| | *Final Design* | | | | |
| **Construction & Commissioning** | | | | | |
| Order Long Lead Equipment | | 0% | 2/1/24 | 2/26/24 | 26 |
| Site Improvements | | 0% | 2/1/24 | 7/2/24 | 153 |
| EVSE Upgrades | | 0% | 7/3/24 | 4/27/25 | 299 |
| Station Commissioning | | 0% | 4/28/25 | 6/28/25 | 62 |
| CO/Final Inspection | | 0% | 7/1/25 | 7/9/25 | 9 |
| Project Close Out | | 0% | 7/2/25 | 7/9/25 | 8 |
| OEM Collaboration for Interoperability | *Commissioning Report* | 0% | 4/1/25 | 7/9/25 | 100 |
| **Outreach & Communications** | | | | | |
| OEM Coordination for Market Outreach | | 0% | 4/1/25 | 7/1/26 | 457 |
| Ribbon Cutting Ceremony | *Press Release* | 0% | 8/1/25 | 8/2/25 | 2 |
| **Operations** | | | | | |
| Operations and Maintenace | | 0% | 8/2/25 | 12/31/26 | 517 |




The remaining projects have similar quantitative goals and timelines with the primary difference being the start and ending dates from project construction. To minimize redundancy within the Blueprint, the timing for the remaining projects are represented at the bottom of the site implementation plan summary on the first page of each site.

## Site Implementation Plan
## Frito-Lay Bakersfield
## MD/HD Zero-Emission Vehicle Infrastructure

**Project Summary:** Frito-Lay seeks to develop private-access electric vehicle charging infrastructure to support their heavy-duty over-the-road tractors and yard tractors operating from an existing fleet terminal. Frito-Lay is an experienced ZEV fleet that has already significantly progressed in the planning and implementation of the ZEV infrastructure.

**Operational Model:** Private-access charging at existing commercial facility.

**Location:** 28801 CA-58, Bakersfield, CA
**Current Use:** Existing Frito-Lay Plant

**Estimated Costs:** Equipment $1,390,000
Site Upgrades/ Construction Costs $1,582,000
Total $2,972,000

**Utility:** PG&E
500 kV

**Vehicles:** Internal fleet of 16 over-the-road trucks and 2 yard trucks with 25 daily connections at start-up increasing to 50 charging connections per day over the initial five (5) years of operation.

**Equipment**:

- 4 Mega Chargers (MCS)
- 2 DCFC @ 100 kW each
- Potential to include onsite energy storage.
- Substantial paving for revised driveway, parking, and sidewalk

**Estimated Schedule:** Operational by 2024.

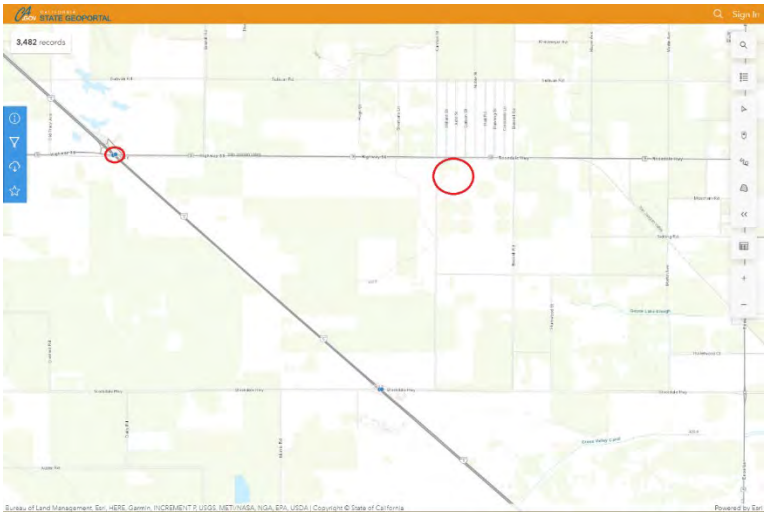
**Community Benefits:** Estimated emission reductions at full deployment at 0.94 tons NOx/yr. and 100% diesel PM reduction.

**CalEnviroScreen Percentage:** 96%

# California State Geoportal Truck Volumes - Annual Average Daily Traffic (AADT) – Frito-Lay Bakersfield

**Truck Annual Average Daily Traffic (AADT)**
Route 58 at I-5 Junction

| | |
|---|---|
| OBJECTID | 320 |
| RTE | 5 |
| RTE_SFX | null |
| DIST | 6 |
| CNTY | KER |
| POSTMILE_PFX | null |
| POSTMILE | 52.145 |
| POSTMILE_SFX | null |
| LEG | A |
| DESCRIPTION | JCT. RTE. 58 |
| VEHICLE_AADT_TOTAL | 36,000 |
| TRUCK_AADT_TOTAL | 9000 |
| TRK_PERCENT_TOT | 25 |
| TRK_2_AXLE | 1620 |
| TRK_3_AXLE | 270 |
| TRK_4_AXLE | 180 |
| TRK_5_AXLE | 6930 |
| TRK_2_AXLE_PCT | 18 |
| TRK_3_AXLE_PCT | 3 |
| TRK_4_AXLE_PCT | 2 |
| TRK_5_AXLE_PCT | 77 |
| EAL | 2499 |
| YEAR_VER | 18 |
| EST | E |




| Weight Class | Mi/yr | MPG | Annual DGE |
|---|---|---|---|
| Class 4/5 | 15250 | 7 | 3,529,286 |
| Class 6 | 14500 | 6.5 | 602,308 |
| Class 7 | 32000 | 6 | 960,000 |
| Class 8 | 58000 | 5.25 | 76,560,000 |

*Source:* *https://gis.data.ca.gov/datasets/c079bdd6a2c54aec84b6b2f7d6570f6d_0/explore?location=36.928104%2C-119.281950%2C7.00*



| Weight Class | Number of Units | Annual Miles | MPG | Total Annual Diesel (gal) | kW/mile | Time to Charge (hrs.) | Annual kWh per Unit | Total Annual kWh |
|---|---|---|---|---|---|---|---|---|
| Class 4/5 | 1620 | 15,250 | 7 | 3,529,286 | 1.25 | 0.41 | 0.05 | 30,881,250 |
| Class 6 | 270 | 14,500 | 6.5 | 602,308 | 1.25 | 0.39 | 0.05 | 4,893,750 |
| Class 7 | 180 | 32,000 | 6 | 960,000 | 1.75 | 0.85 | 0.19 | 10,080,000 |
| Class 8 | 6930 | 58,000 | 5.25 | 76,560,000 | 2.25 | 1.55 | 0.46 | 904,365,000 |
| TOTAL | 9000 | | | 81,651,593 | | | | 950,220,000 |

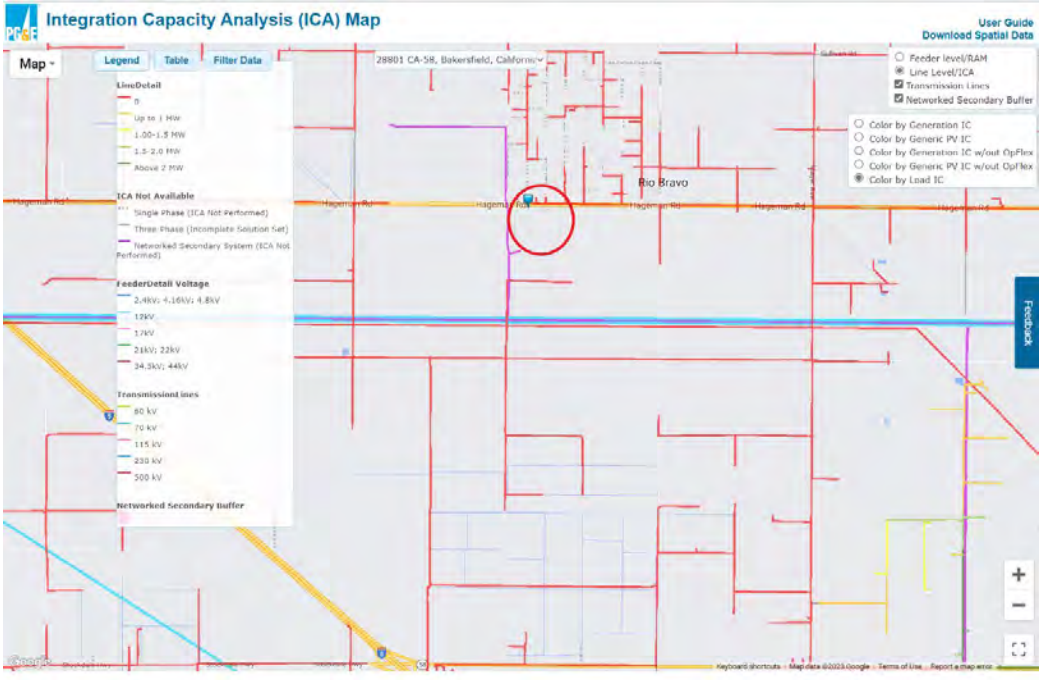
While there is significant truck traffic around the location, Frito-Lay determined that public-access infrastructure is not possible at the location. The charging infrastructure is therefore designed to provide charging for the fleet domiciled onsite.

**Projected Frito-Lay Usage**

| | | | | | |
|---|---|---|---|---|---|
| Daily Charger Connections | 25 | 50 | 50 | 50 | 50 |
| New Fuel Demand (dge) | 1,918,600 | 3,837,200 | 3,837,200 | 3,837,200 | 3,837,200 |

| | |
|---|---|
| Recommended Number of Chargers (5-year Projection) | 6.00 |
| MCS | 4.00 |
| DCFC | 2.00 |
| L2 | 0.00 |

## PG&E's Integration Capacity Analysis (ICA) Map – Frito-Lay Bakersfield




## Development Cost Estimate for Frito-Lay Bakersfield

| | |
|---|---|
| Equipment Costs | $ 1,390,000 |
| Site Upgrade/ Construction Costs | $ 1,582,000 |
| Total Cost | $ 2,972,000 |

## Site Implementation Plan
## City of Arvin
## MD/HD Zero-Emission Vehicle Infrastructure

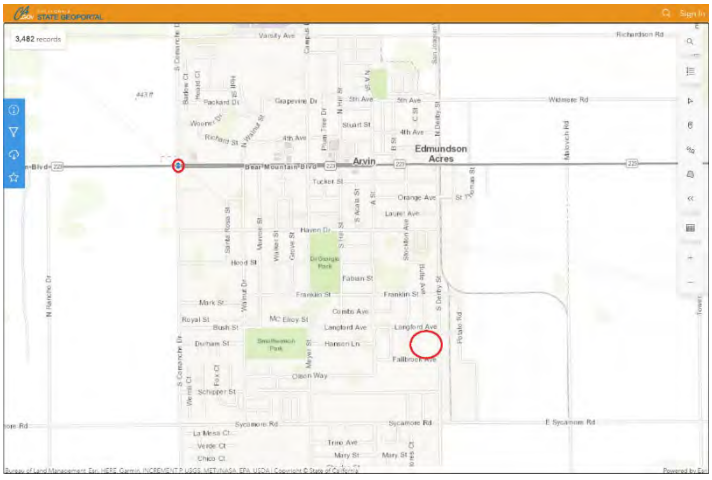
| | |
|---|---|
| **Project Summary:** City of Arvin seeks to develop private-access zero-emission vehicle (ZEV) infrastructure to support the City's replacement of conventional gasoline and diesel fleet with ZEVs. The City is experienced in leading the development of ZEV infrastructure for public-access and investigating the feasibility of installing infrastructure to support their internal fleet at the existing municipal yard.<br>**Operational Model:** Private-access charging at existing municipal yard. |  <br>**Location:** 205 1/2 S. Langford Ave. Arvin, CA. 93203<br>**Current Use:** Municipal Yard |
| **Estimated Costs:** Equipment $34,000<br>Site Upgrades/ Construction Costs $172,000<br>Total $206,000 | **Utility:** PG&E<br>Up to 1.0 MW Line |
| **Vehicles:** City owns 11 vehicles, including one street sweeper, that are domiciled at the location. Due to limited space onsite, charging will be limited to the City of Arvin's fleet vehicles only. | **Equipment**: One (1) DCFC @ 150 kW and two (2) Level 2<br>• Potential to expand for off-road equipment when technology develops.<br>• Potential to develop DER for resiliency if cost- effective. |
| **Estimated Schedule**: Operational by 2025. | **Community Benefits**: Estimated emission reductions at full deployment 0.59 tons NOx/yr. and 100% PM reduction.<br>**CalEnviroScreen Percentage:** 87% |

# California State Geoportal Truck Volumes - Annual Average Daily Traffic (AADT) – City of Arvin

## Truck Annual Average Daily Traffic (AADT)

Route 223 at Comanche Drive

| | |
|---|---|
| OBJECTID | 3014 |
| RTE | 223 |
| RTE_SFX | null |
| DIST | 6 |
| CNTY | KER |
| POSTMILE_PFX | R |
| POSTMILE | 20.15 |
| POSTMILE_SFX | null |
| LEG | B |
| DESCRIPTION | ARVIN, COMACHE DR. |
| VEHICLE_AADT_TOTAL | 7,900 |
| TRUCK_AADT_TOTAL | 1009 |
| TRK_PERCENT_TOT | 12.77 |
| TRK_2_AXLE | 353 |
| TRK_3_AXLE | 111 |
| TRK_4_AXLE | 61 |
| TRK_5_AXLE | 484 |
| TRK_2_AXLE_PCT | 35 |
| TRK_3_AXLE_PCT | 11 |
| TRK_4_AXLE_PCT | 6 |
| TRK_5_AXLE_PCT | 48 |
| EAL | 199 |
| YEAR_VER | 15 |
| EST | E |




| Weight Class | Mi/yr | MPG | Annual DGE |
|---|---|---|---|
| Class 4/5 | 15,250 | 7 | 769,036 |
| Class 6 | 14,500 | 6.5 | 247,615 |
| Class 7 | 32,000 | 6 | 325,333 |
| Class 8 | 58,000 | 5.25 | 5,347,048 |

*Source:* *https://gis.data.ca.gov/datasets/c079bdd6a2c54aec84b6b2f7d6570f6d_0/explore?location=36.928104%2C-119.281950%2C7.00*



| Weight Class | Number of Units | Annual Miles | MPG | Total Annual Diesel (gal) | kW/mile | Time to Charge (hrs.) | Annual kWh per Unit | Total Annual kWh |
|---|---|---|---|---|---|---|---|---|
| Class 4/5 | 353 | 15,250 | 7 | 769,036 | 1.25 | 0.41 | 0.05 | 6,729,063 |
| Class 6 | 111 | 14,500 | 6.5 | 247,615 | 1.25 | 0.39 | 0.05 | 2,011,875 |
| Class 7 | 61 | 32,000 | 6 | 325,333 | 1.75 | 0.85 | 0.19 | 3,416,000 |
| Class 8 | 484 | 58,000 | 5.25 | 5,347,048 | 2.25 | 1.55 | 0.46 | 63,162,000 |
| TOTAL | 1009 | | | 6,689,032 | | | | 75,318,938 |

While there is significant truck traffic on the major corridor and City of Arvin is willing to host public charging, the site location and layout is not conducive to safe and effective public-access infrastructure. The charging infrastructure is therefore designed to provide charging for the fleet domiciled onsite.

### Projected Arvin Usage

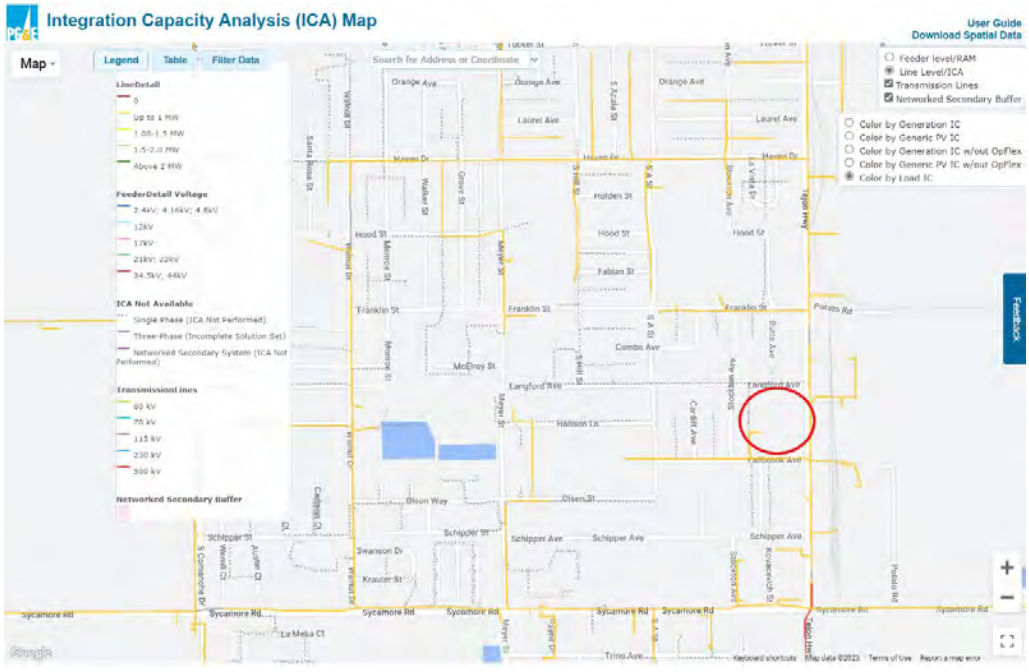
| Weight Class | Number of Units | Annual Miles | MPG | Annual DGE total | kW/mile | Time to Charge | Annual kWh per Unit | Total Annual kWh |
|---|---|---|---|---|---|---|---|---|
| F-150 | 4 | 11,500 | 21.0 | 2,190 | 0.56 | 2.30 | 6,389 | 25,556 |
| F-250 | 2 | 10,000 | 13.5 | 1,481 | 0.75 | 2.00 | 7,500 | 15,000 |
| F-350 | 3 | 10,000 | 12.5 | 2,400 | 1.00 | 2.00 | 10,000 | 30,000 |
| F-450 | 1 | 8,000 | 10.7 | 748 | 1.25 | 1.60 | 10,000 | 10,000 |
| Street Sweeper | 1 | 8,000 | 9.0 | 889 | 1.75 | 1.60 | 14,000 | 14,000 |
| TOTAL | 11 | | | 7,709 | | | | 94,556 |

| Daily Charger Connections | 2 | 4 | 6 | 8 | 10 |
|---|---|---|---|---|---|
| New Fuel Demand (dge) | 17,192 | 34,384 | 51,576 | 68,768 | 85,960 |

| | | | | | |
|---|---|---|---|---|---|
| Max Charge Time (hrs) | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| Hours in Demand | 10 | 10 | 10 | 10 | 10 |
| Buffer | 25% | 25% | 25% | 25% | 25% |
| Minimum Chargers | 1.00 | 1.00 | 2.00 | 2.00 | 2.00 |

| | |
|---|---|
| Recommended Number of Chargers (5-year Projection) | 3.00 |
| MCS | 0.00 |
| DCFC | 1.00 |
| L2 | 2.00 |

## PG&E's Integration Capacity Analysis (ICA) Map – City of Arvin




## Development Cost Estimate for City of Arvin

| | |
|---|---|
| Equipment Costs | $ 34,000 |
| Site Upgrade/ Construction Costs | $ 172,000 |
| Total Cost | $ 206,000 |

# Site Implementation Plan
# WattEV Bakersfield
# MD/HD Zero-Emission Vehicle Infrastructure

**Project Summary:** WattEV's 21st Century Truck Stop is currently under development along Highway 65 and will be the nation's first dedicated zero-emission truck stop. The project will incorporate distributed energy resources (DER) into a demonstration site that will be used to support both an initial fleet of ten Class 8 battery electric trucks as well as a larger public access fleet.

**Operational Model:** Full-public access charging for both a dedicated fleet of membership-based "trucking as a service" and 24/7/365 access.

**Location:** 18836 CA-65, Bakersfield, 93308
**Land Use:** Industrial/Commercial
**Current Use:** Vacant

**Estimated Costs:**
Equipment $4,150,000
Site Upgrades/ Construction Costs $1,700,000
Total $5,850,000

**Utility:** PG&E
1.0 MW Line

**Vehicles:** Dedicated in-house fleet owned by WattEV for "trucking as a service" with ten Class 8 battery electric vehicles capable of 565 kWh and 250-mile range. These vehicles will have a CCS1 connector and will be deployed in regional haul duty cycles. Also servicing local fleets engaged in regional distribution, municipal services, transit, and agricultural applications.

**Equipment:**
- **Charging Hardware:** 12 high powered DCFC
- **Solar:** 3.85MW
- **BESS:** 4.5MWh second life batteries
- **Inverter:** 3.5MW output

All technology has been commercially deployed and is modular, allowing easier scaling as demand for the site and charging increases.

**Estimated Schedule:** Operational by 2023.

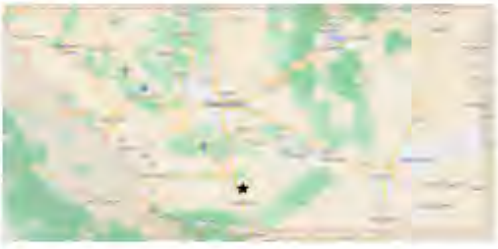
**Community Benefits:** Estimated emission reductions at full deployment 1,060 tons NOx/yr. and 27 tons of PM/yr. reduction.

**Current CalEnviroScreen Percentage:** 88%

## Site Implementation Plan
## Tejon Ranch Commerce Center
## MD/HD Zero-Emission Vehicle Infrastructure

**Project Summary:** Tejon Ranch seeks to develop public-access zero-emission vehicle infrastructure to support the private heavy-duty fleets travelling the I-5. The 38-acre industrial parcel is specifically designed for distribution and is within the 1,450-acre Tejon Ranch Commerce Center. The location gives fleets immediate access to the west coast's principal north-south goods movement corridor, and an easy connection via State Highway 58 to both the I-15 and I-40 east-west corridors.

**Operational Model:** Full-public access charging and hydrogen refueling at existing commercial / industrial park.



**Location:** 5151 Wheeler Ridge Rd Tejon, California 93243
**Land Use:** Industrial/Commercial
**Current Use:** Vacant

**Estimated Costs:** Equipment $3,169,000
Site Upgrades/ Construction Costs $3,051,000
Total $6,220,000

**Utility:** PG&E
1.0-1.5 MW Line

**Vehicles:** Estimated market of heavy-duty trucks increases from 50 to 130 charging connections per day over the initial five (5) years of operation.

**Equipment**: 9 MCS and 6 DCFC @ 150 kW each
- Potential to expand based on market demand.
- Potential to expand to hydrogen for fuel cell trucks.
- Potential to charge full range of vehicles due to passenger vehicle traffic.

**Estimated Schedule**: Operational by 2025.

**Community Benefits**: Estimated emission reductions at full deployment 31 tons NOx/yr. and 100% diesel PM reduction.

**Current CalEnviroScreen Percentage:** 79%

# California State Geoportal Truck Volumes - Annual Average Daily Traffic (AADT) – Tejon Ranch Commerce Center

**Truck Annual Average Daily Traffic (AADT)**
Route 99 at I-5 Junction

| | |
|---|---|
| OBJECTID | 1911 |
| RTE | 99 |
| RTE_SFX | null |
| DIST | 6 |
| CNTY | KER |
| POSTMILE_PFX | L |
| POSTMILE | 0.748 |
| POSTMILE_SFX | null |
| LEG | A |
| DESCRIPTION | JCT. RTE. 5 |
| VEHICLE_AADT_TOTAL | 43,000 |
| TRUCK_AADT_TOTAL | 10939 |
| TRK_PERCENT_TOT | 25.44 |
| TRK_2_AXLE | 4731 |
| TRK_3_AXLE | 307 |
| TRK_4_AXLE | 189 |
| TRK_5_AXLE | 5711 |
| TRK_2_AXLE_PCT | 43.25 |
| TRK_3_AXLE_PCT | 2.81 |
| TRK_4_AXLE_PCT | 1.73 |
| TRK_5_AXLE_PCT | 52.21 |
| EAL | 2192 |
| YEAR_VER | 19 |
| EST | V |

| Weight Class | Mi/yr | MPG | Annual DGE |
|---|---|---|---|
| Class 4/5 | 15,250 | 7 | 10,306,821 |
| Class 6 | 14,500 | 6.5 | 684,846 |
| Class 7 | 32,000 | 6 | 1,008,000 |
| Class 8 | 58,000 | 5.25 | 63,092,952 |

*Source:* *https://gis.data.ca.gov/datasets/c079bdd6a2c54aec84b6b2f7d6570f6d_0/explore?location=36.928104%2C-119.281950%2C7.00*



| Weight Class | Number of Units | Annual Miles | MPG | Total Annual Diesel (gal) | kW/mile | Time to Charge (hrs.) | Annual kWh per Unit | Total Annual kWh |
|---|---|---|---|---|---|---|---|---|
| Class 4/5 | 4,731 | 15,250 | 7 | 10,306,821 | 1.25 | 0.41 | 0.05 | 90,184,688 |
| Class 6 | 307 | 14,500 | 6.5 | 684,846 | 1.25 | 0.39 | 0.05 | 5,564,375 |
| Class 7 | 189 | 32,000 | 6 | 1,008,000 | 1.75 | 0.85 | 0.19 | 10,584,000 |
| Class 8 | 5,711 | 58,000 | 5.25 | 63,092,952 | 2.25 | 1.55 | 0.46 | 745,285,500 |
| TOTAL | 10,938.00 | | | 75,092,620 | | | | 851,618,563 |

### Estimated Market Capture

| | |
|---|---|
| Vehicles that Fuel Offsite | 50% |
| Selection of Tejon Ranch Site | 20% |
| Total | 10% |

**From ACT Large Entity Fleet Reporting - Aggregated Statewide*

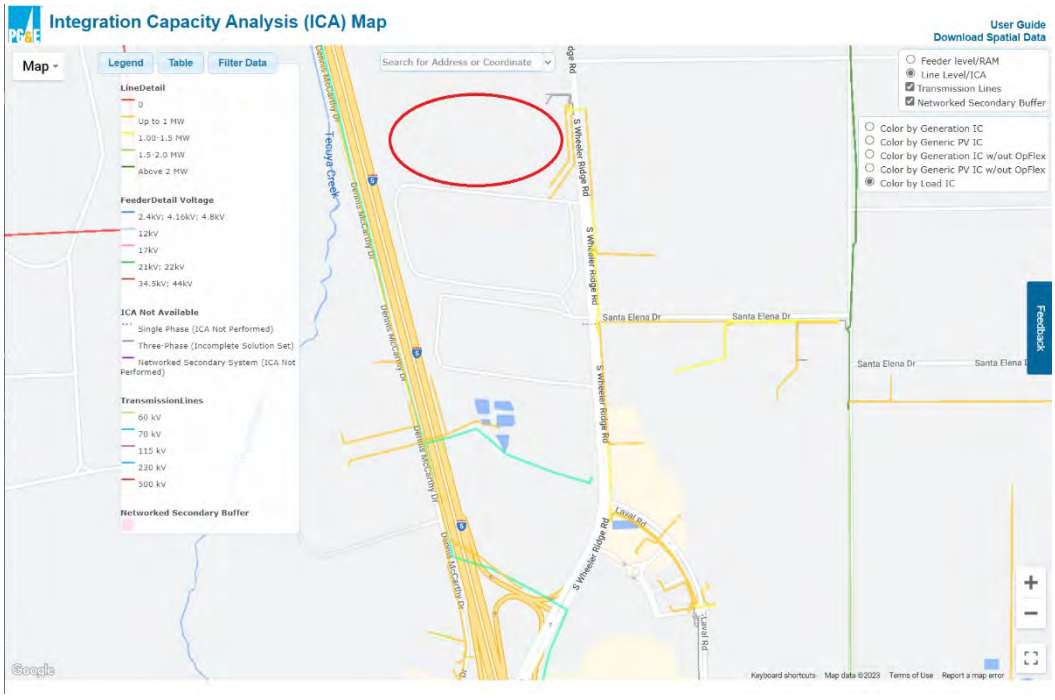
### Projected Tejon Ranch Usage

| | | | | | |
|---|---|---|---|---|---|
| Daily Charger Connections | 49 | 50 | 56 | 128 | 129 |
| New Fuel Demand (dge) | 9,611 | 18,262 | 26,047 | 33,054 | 39,360 |

| | | | | | |
|---|---|---|---|---|---|
| Max Charge Time (hrs) | 2 | 2 | 2 | 2 | 2 |
| Hours in Demand | 24 | 24 | 24 | 24 | 24 |
| Buffer | 25% | 25% | 25% | 25% | 25% |
| Minimum Chargers | 6.00 | 6.00 | 6.00 | 14.00 | 14.00 |

| | |
|---|---|
| Recommended Number of Chargers (5-year Projection) | 14.00 |
| MCS | 9.00 |
| DCFC | 6.00 |
| L2 | 0.00 |

## PG&E's Integration Capacity Analysis (ICA) Map – Tejon Ranch Commerce Center




### Development Cost Estimate for Tejon Ranch Commerce Center

| | |
|---|---|
| Equipment Costs | $ 3,169,000 |
| Site Upgrade/ Construction Costs | $ 3,051,000 |
| Total Cost | $ 6,220,000 |



# Technology Analysis

### Electric Charging and Hydrogen Fueling Options

The different types of MD/HD transportation that operate within Kern County can be grouped together into the following four categories:

- Long-haul trucking and goods movement
- Local transit
- Middle- and last-mile transport
- Yard tractors

Each of these applications will have different needs and operational restrictions that will impact the type of charging infrastructure that suits them best.

EVSE delivers power at one of three basic charging levels: Level 1, Level 2, and Level 3 (commonly known as direct current fast charge, or DCFC). Level 1 is the slowest charging option available, typically delivering power at a rate of 1.4 kilowatts (120 volts) in alternating current (AC) form. Level 2 delivers power at up to 20 kilowatts (240 volts), also in AC form. DCFC refers to charging rates of at least 25 kilowatts using direct current (DC), although commercial charging products today can provide power at rates in excess of 300 kilowatts. The electric grid transmits and delivers power to consumers in AC format, yet batteries only accept power that is transmitted in DC format. Therefore, charging a BEV from the grid requires that AC power be converted to the DC format using power electronics, which may be located inside or outside of the vehicle.

Currently, MD/HD BEVs in the U.S. are equipped with at least one of three standard plug-in charging interfaces. For lower power AC charging (less than 20 kilowatts), the Society of Automotive Engineers (SAE) J1772 AC interface is typically specified. For higher power levels, between 20 and 50 kilowatts, vehicles may be equipped with either a Combined Charging System Type 1 (CCS-1) or CHAdeMO DC charging interface. Above 50 kilowatts, most vehicles will be equipped with a CCS-1 DC charging interface. These interfaces are summarized in Table 3**.**

The CCS-1 plug is a combination plug that includes a J1772 AC interface (the large round portion at the top of the connector) and a DC interface (the two large pins at the bottom of the connector). In theory, vehicles equipped with a CCS-1 interface could use either AC or DC chargers. In practice, most vehicles that are equipped with a CCS-1 plug only



support DC charging; this should be clarified with the vehicle manufacturer before assuming that a CCS-1 equipped vehicle can use a J1772 AC charger.

As previously noted, a few manufacturers have developed their own proprietary charging systems. Additionally, some vehicles may use interfaces based on the Chinese GB/T 20234 standard or European versions of the CCS standard.

SAE recently adopted a new charging interface standard known as J3068 that is intended to replace the CCS-1 interface in North America. J3068 is compatible with the CCS standard used in Europe and harmonizes standards between the two regions. The standard is new and very few vehicles are currently equipped with this interface, but future vehicles will likely begin to adopt it.

As the demand for HD BEVs grows, different groups are working to develop charging standards for heavy-duty vehicles capable of supporting charge rates up to three megawatts. In October 2022, the Charging Interface Initiative (CharIN) — an association of automakers — presented the Megawatt Charging Standard (MCS) that supports power rates as high as 3.5MW. Unfortunately, this new standard is not backwards compatible with CCS standards, meaning that current vehicles equipped with CCS charging ports will not be able to operate using the MCS charger, and vice-versa. An alternative standard — called the North American Charging Standard (NACS) — is in development by Tesla and is projected to offer both AC and DC charging with power rates up to 1MW. However, the NACS has not yet completed the necessary steps to be considered a standard in the U.S. At this time, there are no clear steps to define a universal charging standard for vehicles sold in the U.S. despite the industry strongly indicating the need for one.

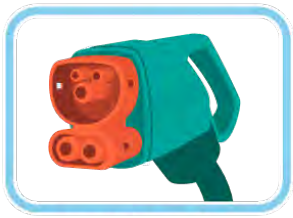
| | AC | DC | AC + DC |
|---|---|---|---|
| SAE J1772 |  **SAE J1772 AC**<br>**Charging Rate:** Up to 20 kW<br>**Supply Voltage:** 120/240V/208V<br>**Supply Amperage:** Up to 80A |  **Combined Charging System**<br>**(CCS Type 1)**<br>**Charging Rate:** Up to 350 kW (DC)<br>**Supply Voltage:** 480V<br>**Supply Amperage:** Up to 500A |  **Combined Charging System**<br>**(CCS Type 1)**<br>**Charging Rate:** Up to 20 kW (AC) or 350 kW (DC)<br>**Supply Voltage:** 480V<br>**Supply Amperage:** Up to 500A |
| SAE J3068 |  **SAE J3068 $AC_6$**<br>**Charging Rate:** Up to 133 kW<br>**Supply Voltage:** 208-480V 3P<br>**Supply Amperage:** Up to 160A |  **SAE J3068 $DC_8$**<br>**Charging Rate:** Up to 200 kW (DC)<br>**Supply Voltage:** 480V 3P<br>**Supply Amperage:** Up to 200A (DC) |  **SAE J3068 $AC_6$/$DC_8$**<br>**Charging Rate:** Up to 133 kW (AC) or 200 kW (DC)<br>**Supply Voltage:** 208-480V 3P<br>**Supply Amperage:** Up to 160A (AC) or 200A (DC) |
| CHAdeMO |  **NOT AVAILABLE** |  **CHAdeMO**<br>**Charging Rate:** Up to 400 kW (DC)<br>**Supply Voltage:** 208-480V 3P<br>**Supply Amperage:** Up to 500A |  **NOT AVAILABLE** |
| GB/T 20234 |  **GB/T 20234 AC**<br>**Charging Rate:** Up to 40 kW<br>**Supply Voltage:** 240V/480V<br>**Supply Amperage:** Up to 63A |  **GB/T 20234 DC**<br>**Charging Rate:** Up to 238 kW<br>**Supply Voltage:** 480V 3P<br>**Supply Amperage:** Up to 300A |  **NOT AVAILABLE** |

*FIGURE 2: EVSE Connection Standards. While the DC and AC+DC connector nozzles look identical in the SAE category, the AC pins are only installed in the AC+DC version.*



The following are general rules of thumb to consider when selecting EVSE for fleet applications.

- AC chargers are less expensive than DC chargers and are supplied by 240V single phase or 208V three phase circuits commonly available in most commercial facilities. Where AC charging is sufficient for a fleet's needs, it is generally the most cost-effective option.
- Specifying EVSE charge rates that are greater than the calculated average required charge rate will help avoid incomplete charging cycles. Regardless of the charge rate, most batteries currently available in BEVs charge more slowly (approximately 20% of their typical charge rate) when they are nearly depleted or nearly full.
- Keeping charge rates below 150 kilowatts will increase available DC charging equipment options, reduce equipment and electricity costs, and allow greater flexibility with respect to cable lengths.
- Rightsizing (neither under- nor over-sizing) a fleet's charging scenario for the fleet's specific application may also optimize the lifetime of the BEV's battery and energy storage system.
- Ambient temperature affects BEV charging rates and range. Fleets that may operate in cold environments with sustained average daily temperatures at or below freezing should account for extended charging times and shorter vehicle ranges during seasonal cold periods.
- Fleet/facility operators must meet with their electrical utility early in the process to understand the site's power supply options, and where chargers can be sited. The utility may also be able to advise on available funding programs.

Hydrogen fuel cell vehicle (FCEV) technology presents a valuable opportunity for the MD/HD transportation markets. Currently, BEV technologies lack the range necessary to provide uninterrupted service for long distance transportation, especially when it comes to long haul trucking where the heavy loads further reduce operational range. FCEV technology can provide operational ranges in excess of 600 miles — comparable to the ranges available from diesel internal combustion engines (ICEs) — thus negating the need for long stops mid-journey that BEV vehicles currently require.

Hydrogen fuel cells are rather similar to batteries in their construction and operations. They consist of two electrodes — a positive cathode and a negative anode — surrounding an electrolyte. Hydrogen is fed to the anode while air is fed to the cathode. The electrolyte membrane separates hydrogen atoms into proton and electrons, which take different paths to the cathode. The electrons are sent through an external circuit, creating the flow of electricity that powers the machine, in this case a vehicle. Hydrogen fuel cells do not require recharging like batteries do and will continue to operate as long as there is fuel being supplied to the anode[19].

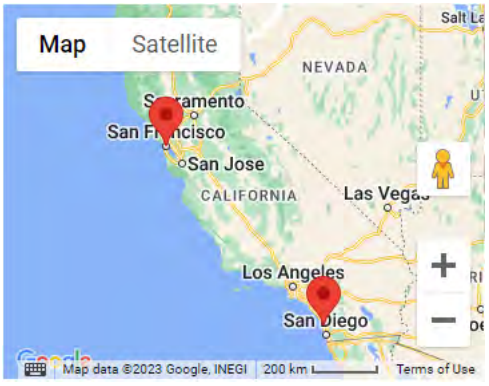


Figure 3: Map Showing Hydrogen fuel production sites in California.

One of the largest gaps in hydrogen technology is the fuel supply chain. There are several ways of producing hydrogen clean enough to power fuel cells, with the main two being steam-methane reformation (SMR) and electrolysis. Currently, SMR is the most cost-effective solution, which utilizes natural gas and steam to generate a hydrogen and carbon monoxide mixture. While cost effective, SMR generates greenhouse gases which can be counterproductive to hydrogen applications. Electrolysis creates hydrogen by splitting water into hydrogen and oxygen with an electric power source. When this power source is renewable it generates what is referred to by the industry as green hydrogen. The issue is still that it is not more cost effective or efficient than its SMR counterpart. Until green hydrogen can be scalable, hydrogen production will not be as beneficial to the environment compared to its potential. With the proper infrastructure to support vehicles, hydrogen provides an excellent alternative to diesel or gasoline equivalents. Currently, there are 2 hydrogen production locations in California: Chai Energy in Del Mar, and Golden Bridge Strategies in San Francisco[20]. While hydrogen fuel could be transported from either of these locations to serve stations in the Kern County area, it is unlikely to be a cost-effective solution. According to the National Renewable Energy Laboratory (NREL), prices for hydrogen range from $7.29/gasoline gallon equivalent (GGE) to $13.70/GGE (before incentives/rebates), depending on the source and method of fuel generation.

[19] Fuel Cell Basics | Department of Energy
[20] Hydrogen | Open Energy Information (openei.org)

FCEV's require high quality, near-pure hydrogen to operate, which can be expensive to produce. An alternative currently in development by engine manufactures such as Cummins is a hydrogen powered ICE. While not currently available in the market, hydrogen ICE's present a potential mid-way solution for fleets looking to convert to ZE technologies. Hydrogen ICEs function in the same way that a traditional gasoline or diesel ICE operates, only with hydrogen acting as the fuel source being burnt in the piston chamber. This reaction produces no GHG emissions and the only tailpipe outputs are water, nitrous oxide (NOx) and particulate matter. While this is a substantial improvement over traditional fuel engines, NOx and particulate matter emissions are still of great concern as they contribute directly to air quality and public health issues, especially in densely populated areas.

There are also three basic types of EVSE that are most applicable to MD/HD BEVs: plug-in, overhead, and wireless. Each EVSE type is briefly described in Table 2 with supporting details provided in the paragraphs below. Figures 2 and 3 summarize the key features as well as the pros and cons of each type.

| | Plug-in | Overhead | Wireless |
|---|---|---|---|
| *Activation* | Manual | Automated | Automated |
| *Connection* | Conductive  | Conductive  | Wireless (Inductive)  |
| *Power Range* | Up to 350 kW | Typically 350-500 kW | Up to 250 kW |
| *Voltage Type* | AC, DC, and AC + DC | DC | AC |

Figure 4: Table depicting the three basic types of EVSE.

As the term implies, each **plug-in EVSE** is equipped with a charging cord that is manually plugged into a BEV's charging receptacle (see Figure 11). Plug-in charging is by far the most common interface used today. These are considered "conductive" systems because power is transferred to the vehicle by conductors in the plug and receptacle. There are many different plug-in interfaces based on various standards (e.g., SAE J1772, CHAdeMO, SAE Combo CCS). In addition, some BEV manufacturers (e.g., Tesla) have adopted their own proprietary standards.

*FIGURE 5: THE EVSE PLUG CONNECTS WITH THE EV RECEPTABLE TO TRANSMIT POWER OVER A CONDUCTIVE SYSTEM.*

Plug-in EVSE offers the lowest installation and construction cost of all three types of infrastructure. Since they can be installed in places to serve existing parking spaces, there is no need to design and construct specialized charging station arrangements that are required for overhead and wireless charging options. The drawback to this is that plug-in chargers require more manual operation than either alternative and often require vehicles with HD cycles to be parked for extended periods to charge.

**Overhead systems** are another type of conductive interface that provide power by connecting a BEV to a DCFC using an overhead connector, or pantograph. Because the pantograph can handle large conductors that would be difficult for an individual to physically move and adjust, overhead systems can charge at higher power levels than plug-type interfaces. Currently, overhead charging is mostly used in certain transit bus applications. However, it could eventually be used to provide rapid charging for trucks and other heavy-duty applications (e.g., cargo-handling equipment).

Pantograph systems are most useful in applications where high-speed charging is necessary or preferred and there is sufficient space available to support the pull-in/drive-off style of charging afforded by the technology. Most existing installations of this technology type take the form of a drive-through charging station, similar in design to that of traditional gasoline and diesel fueling stations used across the country.

**Wireless charging** is a non-conductive interface that transfers power from a ground-mounted transmitter coil to a receiving coil mounted to the bottom of a vehicle. In practice, it is like wireless cell phone charging. The power received by the receiving coil is provided to the vehicle's AC charging electronics, as if the vehicle was connected to a plug-in AC charger or is used to directly charge the battery using additional power



electronics on the vehicle. Wireless charging systems with power levels as high as 250 kilowatts have been demonstrated, but lower power levels down to 3 kilowatts are also possible. Wireless charging typically requires retrofitting the receiving coil to a BEV because MD/HD vehicle manufacturers do not currently offer wireless BEV charging interfaces as an integrated option.

While there are some live applications for wireless inductive charging of transit buses, most MD/HD vehicles are not currently equipped to support this type of charging infrastructure as standard.

Future applications for wireless charging would likely benefit transit fleets the most, as the opportunity for fast charging during numerous short stops works well with those type of operations. Other market segments, such as long-haul transit, local (middle- and last-mile delivery), and yard tractors may be able to utilize inductive charging systems, but the high installation and construction cost as compared to plug-in alternatives makes this option less cost effective for those applications.

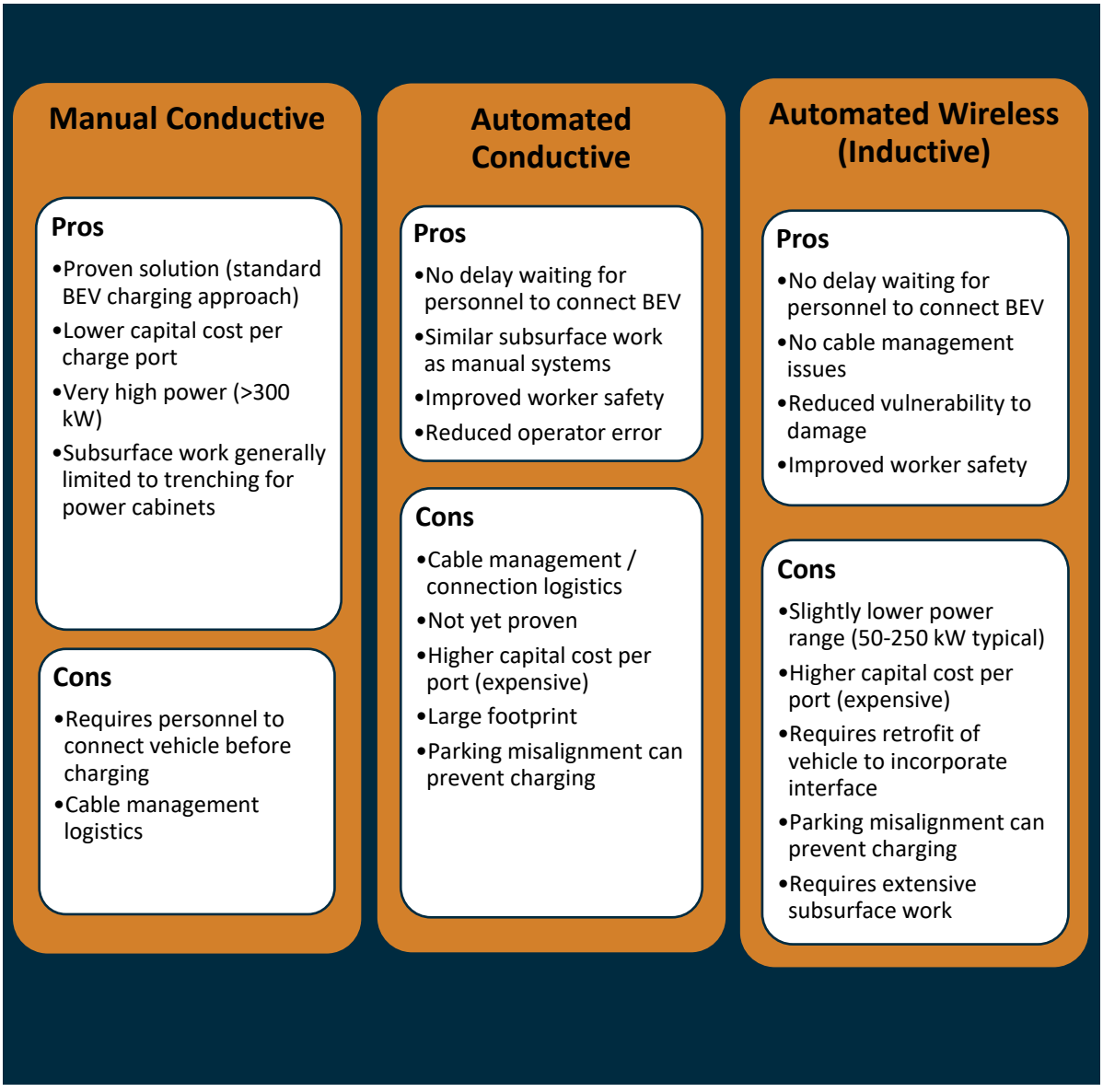



Figure 6: Pros and Cons of the three major types of EVSE

Many charging types are now available with advanced communications software allowing users and charging station managers to monitor and even manage charging activity over their computer or mobile phone. Chargers equipped with this software are often defined as networked chargers.



**Mobile charging solutions** are currently in development by several companies. Freewire Technologies has recently revealed its Mobi EV Charger, a level 2 AC charger that operates on batteries rather than from direct grid connection, enabling it to be moved to wherever it is needed. However, this technology is not suitable for use on MD/HD vehicles as they require a higher power DC connection than this unit can provide. The need for charging rates higher than 50 kilowatts is the biggest barrier to having mobile charging solutions for MD/HD vehicles.

In addition to the physical interface types described above, EVSE are further divided into AC and DC charging. AC EVSE essentially pass power from the utility to the vehicle. On board the vehicle, electronics convert the AC power to the DC power that is required to charge the battery. AC charging is typically limited to power levels of 20 kilowatts or less, because vehicles may not have space for the larger electronics required to support higher power levels at these relatively low voltages. There are some exceptions, particularly on large transit buses and some off-road equipment where space is less constrained. Above 20 kilowatts, the electronics required to convert power from AC to DC are placed outside the vehicle, and the DCFC provides DC power to the BEV. These chargers are currently capable of supplying power up to approximately 350 kilowatts, and future product forecasts indicate that power supply could be as high as 3 megawatts.

DC chargers are available in a range of sizes and power capacities, with maximum power ratings currently ranging from 25 kilowatts to over 350 kilowatts. They are commonly offered as wall boxes, integrated cabinets/dispensers, and modular systems. Wall box or pedestal-mounted units are typically available in the lower end of the power range while integrated cabinets/dispensers are available up to approximately 100 kilowatts. Modular systems use one or more power cabinets to supply one or more dispensers and can supply up to 350 kilowatts to a single dispenser, or they can split power among multiple dispensers. A DC charger that delivers power at a rate greater than 150 kilowatts typically requires liquid cooling of the cable assembly. While these systems exist, they require additional equipment and typically have a shorter cable length. Keeping charging power levels below 150 kilowatts will increase a fleet's charging options, reduce equipment costs, and allow greater flexibility with respect to cable lengths.


Figure 7: EVSE Equipment Configurations for DC Fast Chargers.

## Interfacing with Utilities

### Opportunities of Utility Interfacing

The opportunity that exists with the partnership of electric utilities and the transportation industry, beyond extending the potential for zero-emission transportation energy, is the resiliency provided by Vehicle-to-Grid Integration (VGI) technologies, also known as Vehicle-to-Grid (V2G). While these technologies are in their infancy, and the transportation industry--fleets and OEMs--are still several stages away from basic adoption of vehicles, there will co-evolve a dire need for alternative sources for power, storage, reliability, and resiliency. VGI technologies appear to be on the verge of offering real solutions as more electricity power is sent to the road. Kern County fleets require much greater rates of adoption before the batteries on moving vehicles offers greater resiliency, the technologies are recognized as being viable and worthy of standards and protocols, which will require several layers of oversight as electricity is distributed in such a novel fashion.

The protocols begin with Open Charge Point Protocol (OCPP). OCPP is an open protocol used to facilitate communication between electric vehicles, charging stations, and back-end systems. It provides an interface for charging station operators, allowing them to remotely monitor and control their charging stations. The V2G Standard is used to facilitate the ability of electric vehicles to provide ancillary services to the grid, such as



load balancing and peak-shaving. It provides a common protocol for communication between electric vehicles, grid-side services, and other stakeholders. VGI standards are used to define the connection and communication between electric vehicles and the grid. These standards provide specifications for the types of communication protocols, communication interfaces, and data formats required for the exchange of information between electric vehicles and the grid. Examples of VGI standards include the International Electrotechnical Commission (IEC) 61851-21 standard for electric vehicle supply equipment (EVSE) to vehicle communications, the International Organization for Standardization (ISO) 15118 standard for vehicle-to-grid communications, and the Society of Automotive Engineers (SAE) J2836 standard for vehicle-to-grid communications.

Open standards-based network communications are used to enable the exchange of information between electric vehicles and the grid. Examples of open standards-based network communications include the Open Smart Grid Protocol (OSGP) for communication between electric vehicles and the grid, the Open Automated Demand Response (OpenADR) protocol for communication between electric vehicles and the grid, and the OpenADR Alliance's OpenADR 2.0a for communication between electric vehicles and the grid. This standard enables electric vehicles to provide ancillary services to buildings, such as providing back-up power or energy storage. It provides a common protocol for communication between electric vehicles, building systems, and other stakeholders.

Having large storage assets on the grid, or accessible to the grid in the form of large MD/HD vehicle batteries, can provide grid resiliency that offers benefits to all communities and industries outside of the transportation industry.

### Challenges – timelines and adequate power

As mentioned above, the planning and strategy for MD/HD electric charging is inextricably linked with the electric utility providers. As the transportation industry moves forward with electrification, there will be immense challenges and incredible opportunities. In the early stages, there is the matter of sheer necessity of fleets with domiciled MD/HD electric vehicles to have an adequate amount of power at their locations. The challenges involve infrastructure spending on the part of the fleets as well as the utilities that operate as custodians of the public good of electricity—hence utility. There are further challenges with creating long-term development timelines that must harmonize the charging capability and commissioning with the delivery of new electric vehicle technology.



As the experience of the site hosts and of other industry stakeholders and contacts referenced for this Blueprint, Transitioning the transportation sector to electricity is a huge undertaking, just to have the right amount of electricity available to each site to be able to charge multiple vehicles in a short amount of time, as evidenced by the implementation plans. Furthermore, for the utility companies to be able to plan for their future development and power supply needs, they need to have accurate prediction from the fleets and charging service companies as to the amount of power will be demanded for electric vehicle transportation.

Kern County has seen infrastructure challenges with both SCE and PG&E in terms of communicating timelines and the feasibility for installing charging stations with adequate power. The experience of the early EV stakeholders in Kern County further instills the importance of establishing communication and partnership with the utilities in planning a Blueprint. Some of the findings from stakeholder feedback regarding utility coordination create additional context for the current challenges and opportunities that the transportation industry is facing:

- Stakeholder experienced pushback or no action from utilities regarding electrification.
- Extensive lead times for grid upgrades that will make charging deployments possible (Wonderful and WattEV). On the contrary, PepsiCo has had successful communication with utilities.
- Both PepsiCo and WattEV are interested in deploying MCS charging. This will take additional investment and longer timeline consideration from the charging infrastructure providers.
- WattEV explored Distributed Energy Resources (DER) with solar at their Bakersfield site to improve grid resiliency.
- Wonderful targets to deploy MCS and hydrogen charging at their site.



# Memoranda

## Actions Taken by Local Jurisdictions and Results

### Introduction

This chapter reviews the regional actions taken and planned by local jurisdictions to further ZEVs and infrastructure to combat air quality impacts due to transportation. It highlights the key role of local jurisdictions as they are often the only entities in the position to gather local interests and information to develop early growth industry plans. Local jurisdictions are in the best position to provide impartial guidance for problem-solving and fostering burgeoning industries. Identifying the localized problems, creating the local goals for implementing innovative technology solutions, and establishing rules and parameters for implementation, such as permitting are all ways that local jurisdictions can provide support. Reviewing the actions taken or planned by local jurisdictions is crucial to the development of this Blueprint as it provides a base of understanding to learn from and to build upon. Regional public agency resources such as the 2019 Kern County EV Charging Station Blueprint, the Kern 2022 Regional Transportation Plan, and the Kern Area Regional Goods-Movement Operations Sustainability Study Phase I: Integrated Circulation Study are reviewed here, in addition to the California Transportation Plan and local planning documents from Kern County cities.

### Local Jurisdiction Plans

The plans and actions presented in this section describe ways local jurisdictions are taking action to further the adoption of ZEVs and development of supporting infrastructure. The local jurisdiction plans evaluated included considerations for EV charging, but there were no established plans for hydrogen infrastructure. Most of these plans were developed with light-duty vehicle charging in mind, but these plans could be applied to MD/HD vehicle charging. Many of the nearby regional plans offer crucial preliminary steps such as building out highways and street systems to support the continuation of trucking within the region and managing circulation and mitigating congestion. Actions in the reviewed plans that specifically focused on supporting electrification and supporting electric vehicle infrastructure include incentivizing electric vehicle deployment and charging stations, creating building codes for retrofitting buildings to better support electric vehicle charging stations, and supporting the development of electric vehicle charging parking.



**2019 Kern County Electric Vehicle Charging Station Blueprint:**

In May 2019, Kern COG accepted the 2019 Kern County Electric Vehicle Charging Station Blueprint (the Blueprint) that is focused on light-duty vehicles. The Blueprint was supported through funding from the California Energy Commission. The Center for Sustainable Energy partnered with Kern COG on the EV Ready Communities Challenge Grant, serving as the plan-development consultant. The Blueprint identifies high-impact transportation electrification projects and implementation strategies that will support Kern County in reaching greenhouse gas emission goals. In 2021 and 2022, Kern COG and its partners were awarded a CEC EV Ready Communities grant to implement the Blueprint. The Blueprint implementation plan addresses seven strategies under four goals in four distinct programs. The scope of work includes the installation of charging stations at "high impact" sites with regional distribution, workforce development at Kern Community College District, expansion of Miocar electric carshare to Bakersfield and Ridgecrest, the development of an eBike Pilot conducted by Bike Bakersfield, California Walks, and the County of Kern Library, outreach efforts, and data collection and case studies to publicize as community resources. The results from these efforts will not only advance the availability of ZE charging; ZE transportation will become more available in disadvantaged communities. The experience gained from these efforts will lead to a five-year update to the Kern Electric Vehicle Charging Station Blueprint, extending the plan life to 2030.

The Blueprint reviews several statewide building codes for EV infrastructure. The 2016 California Green Building Standards Code (CALGreen Code), established codes for EV infrastructure for new residential and commercial buildings that include charging guidelines and parking space requirements (CALGreen Code Section 4.106.4), new commercial construction codes and charging configurations (CALGreen Code Section 5.106.5.3), and a mandatory code for residential location that require attached garages meet requirements for future EV infrastructure and be labeled as EV ready (CALGreen Code Section 4.106.8). Additionally, AB 970 and AB 1236, codified in Government Code Sections 65850.71 and 65850.7, require cities and counties to create processes for EV charging station permitting, develop application checklist(s), and require the approval of applications for charging station installation through specified permits. The Governor's Office of Business and Economic Development (GO-Biz) has shared best practices that cities and counties can use to create a streamlined permitting process for electric vehicle



charging stations.[21] The EVSE Permit Streamlining Map[22] shows how streamlined a city or county's permitting process is, which is determined by scores from the Permitting Electric Vehicle Charging Stations Scorecard. Most areas of Kern County have completed the steps to be listed as streamlined for EV charging station permitting.

The Blueprint also delineates regional policies that influence Kern County's transition to ZE transportation. In 2018, CARB adopted the Innovative Clean Transit Regulation (ICT), requiring all California Transit Agencies to purchase zero-emission buses beginning in 2029. This regulation requires all large transit fleets begin transitioning 25% of their fleet to ZE buses by 2023 except for small transit fleets who have until 2026 to meet the same threshold. Kern COG began hosting the annual *TRANSITions* Transit Symposium in 2018 to provide information about the regulation to San Joaquin Valley based transit operators, school districts and shuttle bus operators. The annual Symposium offers attendees valuable information to assist fleets with updates on the ICT from CARB, insights into ICT plan development, zero-emission bus purchases including information about charging infrastructure and incentives programs for zero-emission buses.

The Blueprint described the Valley GO Pilot Project in Kern County, demonstrating Kern's efforts to implement a transition to ZE transportation. The Valley GO Pilot evolved into the membership-based EV carsharing service, Miocar, which offers 24/7 access to EVs on an hourly to daily basis with an approved membership[23]. The eight Miocar locations were established near affordable housing complexes, accommodating residents of the housing complexes and the surrounding community who may be subject to inconvenient public transportation service and costly rideshare services. Due to the Chevrolet Bolt recall and impacts caused by the 2019 COVID pandemic, Miocar operations have reduced to five locations in Kern County, but efforts towards improved technologies and increased OEM availability hope to restore the three previously listed locations.

The Blueprint highlights several public entities within Kern County that have taken actions to invest in EVs and supporting infrastructure. Examples include the City of Shafter which owns and operates four electric MD shuttle buses, a $2.25 million dollar multi-modal shared-mobility pilot program lead by the San Joaquin Valley Air Pollution Control District

[21] https://business.ca.gov/industries/zero-emission-vehicles/plug-in-readiness/permitting-electric-vehicle-charging-stations-best-practices/

[22] CA Electric Vehicle Charging Station Permit Streamlining Map: https://california.maps.arcgis.com/apps/webappviewer/index.html?id=5b34002aaffa4ac08b84d24016bf04ce

[23] https://miocar.org/locations-and-cars/



(SJVAPCD), the City of MacFarland, which is transitioning their transit fleet to electric, and the Cities of Arvin, Taft, and Tehachapi who have installed EV charging stations.

The Blueprint is currently in the process of being implemented through the 2021-2022 CEC EV Ready Communities grant, slated for completion in 2024. Aspects of workforce development at Kern Community College District, the development of the eBike Pilot conducted by Bike Bakersfield, California Walks, and the County of Kern Library, outreach efforts, data collection, and case studies will remain in progress through the end of 2023 and into 2024. The outcomes of this work will be reflected in the forthcoming 2024 Kern COG EVCS Blueprint.

### Kern 2022 Regional Transportation Plan

The Kern 2022 Regional Transportation Plan[24] (RTP) discusses strategies to implement the 2035 emission reduction targets set by CARB for Kern County. The RTP aims to improve the mobility, accessibility, sustainability, equity, livability, efficiency, and reliability of transportation in the county. To accomplish these goals, the plan includes several policy actions related to emissions such as a policy action to investigate funding opportunities that may be used to preserve transportation development and to support transportation enhancements such as electrification and clean fuel technology that reduce emissions (Policy Action 15). Additional policy actions have been taken to encourage clean trucking technology by revising building codes to require electric charging stations during new construction (Policy Action 26.1). In brief, additional policy actions included promoting alternative modes of transportation, supporting transit with replacement of fossil fueled vehicles with ZEVs, assisting the development of clean truck technologies, encouraging revisions to building codes to require electric charging stations, and pursuing funding to support strategies for emission reduction in DACs.

[24] https://www.kerncog.org/category/docs/rtp/

### Kern Area Regional Goods-Movement Operations (KARGO)

The Kern Area Regional Goods-Movement Operations (KARGO) Sustainability Study Phase 1: Integrated Circulation Study[25] discusses strategies to improve the sustainability of goods movement. One of the strategies is to support the Utilization of Clean Technology on the Highways through funding and incentives to reduce the total cost of ownership for cleaner fueled vehicles. Another strategy discussed in the KARGO study was implementing changes to building codes that mandate electrical infrastructure be in place for all new commercial and industrial buildings.

### City of Shafter General Plan, Transportation Program

The City of Shafter General Plan,[26] Transportation Program (2005) highlights the critical ties between land use and circulation. One of the objectives of the Transportation Program was to find a balance between managing vehicle circulation and protecting environmental and aesthetic resources. The program's policies aimed at optimizing design and usage of established roadways and driveways and requirements for new street and roadway designs to accommodate for efficient traffic flow, reducing vehicle emissions from traffic congestion and vehicle idling. The General Plan's Environmental Management Program, Air Quality section, included policies to increase land use patterns that allow for alternative modes of transportation and reduce vehicle trips, to encourage trip reduction programs, and for the development of an intermodal railyard to reduce emissions from long-haul trucks. The plan focuses on improvements to transportation system and land use designs that improve efficiency and connectivity. The City of Shafter operates electric vehicles for its Dial-A-Ride service. Through the Shafter Transit Connect Electric Dial-A-Ride Project,[27] the city is leading Kern County with its use of electric service shuttle vans.

While published in 2005, the City of Shafter General Plan emphasized roadway design and efficiency regarding traffic flows, but only touched on emissions reductions. Based on the growing need to address air quality and emissions reductions, the City of Shafter joined with community members to develop and complete the City of Shafter Community Emissions Reduction Program[28] (CERP) in 2019. This AB617 program funded by the California Air Resources Board and managed by the San Joaquin Valley Air Pollution

[25] Kern Area Regional Goods-Movement Operations (KARGO) Sustainability Study Phase 1: Integrated Circulation Study: https://www.kerncog.org/wp-content/uploads/2021/01/KARGO_P1_2021.pdf

[26] City of Shafter General Plan: https://www.shafter.com/DocumentCenter/View/5042/Shafter-General-Plan

[27] Shafter Transit Connect Electric Dial-A-Ride Project https://ceqanet.opr.ca.gov/2011098271

[28] https://community.valleyair.org/media/1515/01-finalshaftercerp-9-19-19.pdf

Control District, convenes a Community Steering Committee (CSC) at address community air quality concerns. Through meetings and regular communication, the CSC becomes educated on emissions sources and how the topography of the region amplifies the impacts of transportation emissions on public health. CERP provides information on how grant funding supplements efforts to improve air quality in Shafter and strategies to reduce emission exposure. The CERP identifies one major source of emissions as heavy-duty mobile sources and elaborates on ways to address their impact, such as rerouting vehicles to less trafficked areas away from schools and housing, pursuing incentives to replace internal combustion heavy-duty vehicles and locomotives with ZE alternatives or technologies, and deploying the necessary infrastructure to operate the replaced vehicles. While the CERP does not replace the 2005 City of Shafter General Plan, the program builds off the General Plan's transportation strategies to accommodate changes such as air quality disparities that have increased in the region since it's publishing.

### Bakersfield Metropolitan Area General Plan (2002)

One of the goals of the Bakersfield Metropolitan Area General Plan[29] (2002) was to support air quality by reducing vehicular travel and controlling point sources. Two of the policies outlined in the General Plan to achieve this goal included policies focused on participating in alternative fuel programs and encouraging the use of alternative fuel and low or ZE vehicles. To implement these policies, the plan recommends administering a program to expand use of alternative fuel and low or ZE vehicles in the area to 10% usage and administering another program to create infrastructure to support alternative fuel vehicles. These plans and goals were created in 2002 and are undergoing an update, due Winter 2024.

### City of Arvin General Plan (2012)

The City of Arvin General Plan (2012),[30] Air Quality Element, addresses the air quality issues resulting from elevated levels of air pollution in the area. The goals laid out in the plan are to minimize exposure to air pollution, increase education on air pollution programs, coordinate with the county on air quality improvement programs, promote energy conservation, integrate land use policies with air quality and transportation planning and lastly, encourage the use of low-emission vehicles by the city and within the community. To support the use of low-emission vehicles, the plan offers three policy actions. One is to encourage improvements to the street system, such as grid

[29] Bakersfield Metropolitan Area General Plan (2002) https://content.civicplus.com/api/assets/37a2e20d-e610-431f-a222-9f4f2ecd2ddd
[30] City of Arvin General Plan: https://arvin.org/DocumentCenter/View/437/General-Plan-Update-PDF

modernization, to support electric vehicles and second is to replace city fleet light duty vehicles with low-emission alternatives, such as battery-electric, natural gas, propane, or biodiesel sedans and trucks.

**The California Transportation Plan (CTP) 2050**

The California Transportation Plan (CTP) 2050[31] developed by the California Department of Transportation explores the state's transportation challenges and offers recommendations for addressing those challenges. One of the areas of focus in the CTP is the improvement of the goods movement system and infrastructure while also reducing its impacts on local communities. To increase the resiliency and sustainability of the California freight system, one of the actions recommended in the CTP is to support the implementation of clean technologies and alternative fuel infrastructure. Furthermore, the CTP recommends several key actions to advance ZEVs and infrastructure in the state. These actions include expanding California's designated Alternative Fuel Corridors that critically entail the CA-58, CA-99, and I-5 which are all classified as "Ready" EV-Corridors within Kern County. Additional ZEV actions from the CTP include strategically planning ZEV charging stations, coordination across agencies to support ZEV charging infrastructure development, ZEV charging networks, and incentivizing adoption by expanding rebate programs.

## Additional Actions Taken

### Assembly Bill 1236

In October 2015, Assembly Bill 1236 (Government Code Section 65850.7) established requirements for EV charging stations was approved. The bill requires that a city or county approve an application for the installation of EV charging stations through specified permits, given there is not substantial evidence the installation would cause adverse public health and safety impacts.

### Transportation Gaps

These plans are amongst the first in the region working to solve the issues created by transportation such as congestion, connectivity, and pollution. Plans to solve these

[31] California Transportation Plan (CTP) 2050 https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/ctp-2050-v3-a11y.pdf



complex issues will require iterations of plans to enhance the policies and actions to provide adequate solutions. Preliminary steps that focus on building out highways and street systems to support the continuation of trucking within the region and managing circulation and mitigating congestion are important. However, there is a need to develop more elaborate and focused plans on how to support the move to zero-emission (battery-electric or hydrogen fuel cell technologies) in the MD/HD trucking sector. There is a gap in transportation plans that prioritize this sector of transportation with specific steps to support the buildout of infrastructure that expand past supporting or encouraging alternative fuel vehicle usage.

### Recommendations

Previous actions taken by local jurisdictions provide impartial analysis and solution-orientated steps for improving transportation and infrastructure. Documents such as regional transportation plans, sustainability studies and other EV Blueprints are important to developing a well-informed Medium- and Heavy-Duty Electric Vehicle Infrastructure Blueprint. Building off of the actions and recommendations of existing transportation plans, studies, and policies, it is recommended that MD/HD EV charging and hydrogen fueling stations be located along transportation corridors; key stakeholders (environmental organizations, community benefit organizations (CBOs), infrastructure providers, utilities, air districts, school districts, etc.), community members, and regional government agencies be kept informed throughout the blueprint development and be given multiple opportunities for input and feedback; host meetings with community members and groups, both in-person and virtual, to gather input and feedback as well and inform on the future plans; identify high-priority sites for MD/HD charging infrastructure; and conduct educational training and workforce development meetings and workshops for fleet operators and workplaces.



# Safety Plan for Hydrogen Infrastructure

## Executive Summary

Transportation fuels inherently contain concentrated energy for conversion into motive power. As such, they pose safety risks and challenges. Each fuel has unique properties that dictate how it will be safely produced, refined, stored, transported, dispensed, and consumed. Hydrogen is an emerging ground transportation fuel because it produces zero emissions when used in FCEVs. While relatively new as a fuel for public transportation and personal mobility, hydrogen has been safely used for decades in industrial, military, and aerospace applications. Robust government-industry collaborations have addressed hydrogen safety, across its full "fuel cycle" from production to end use in vehicles. In sum, hydrogen is clearly different than conventional (petroleum-based) transportation fuels, but it is not more dangerous.

However, as with any emerging transportation fuel — especially one intended for use by the public — it is important to develop and implement specific protocols and procedures that will help ensure safe use of hydrogen. Safety plans are dynamic tools for identifying and evaluating hazards for specific projects and activities to minimize potential risks. Safety Plans are important parts of ZEV Blueprints, which seek to enable wide-scale use of hydrogen FCEVs, as well as BEVs. Among other goals, local safety plans help ensure that people know how to safely use hydrogen stations when they refuel FCEVs, including MD/HD trucks.

To successfully design and implement a local hydrogen safety plan within a ZEV Blueprint, government authorities team with organizations and individuals having proven expertise in permitting, building, operating, and maintaining hydrogen stations. The end goal is to ensure that safe new facilities are deployed that incorporate critical readiness steps, designed to prevent hydrogen emergencies, and include plans and training for the response should emergencies occur. As outlined in the following sections, successful planning for hydrogen safety is like other transportation fuels. It requires knowledge of the fuel properties, industry-wide design standards, and the thoughtful development of local and site-specific safety plans from the inception of project design.

## Key Resources

The hydrogen and fuel cell industries have a long history of collaboration to establish design criteria, safety regulations, training protocols, and sharing best practices. This section highlights the agencies and organizations that will be helpful for municipalities in the development of Blueprints that include hydrogen. While the industries and the

resources are ever evolving, the following entities are long-standing members of the hydrogen community that invested decades in compiling the experience and resources necessary to develop effective safety plans.

The Hydrogen Safety Panel (HSP) h2tools.org was established in 2003 and is led by the Pacific Northwest National Laboratory (PNNL). HSP is widely recognized as the central repository for best practices and tools related to hydrogen safety. In addition to leading industry-wide design and safety practices, HSP is also extremely active in the successful development of site-specific hydrogen safety plans. HSP provides a pivotal role in hydrogen infrastructure projects including safety planning guidance, design and safety plan reviews, site visits, participation in incident fact finding and sharing learning. HSP shares safety knowledge through their H2 Tools Portal, including the Safety Planning for Hydrogen and Fuel Cell Projects manual.

The California Fuel Cell Partnership (CaFCP) cafcp.org was founded in 1999 and is an innovative collaboration of private industry and public agencies that came together to expand the market for hydrogen fuel cell electric vehicles. CaFCP draws on the expertise of the varied member organizations to promote technology advancement. The partnership's website provides a comprehensive set of resources for all elements of FCEV projects, including infrastructure safety. Municipalities within California may want to include the CaFCP as part of the safety plan development process particularly as it relates to first responder education.

The U.S. Department of Energy (DOE) Hydrogen and Fuel Cell Technologies Office (HFTO) hydrogen.energy.gov is part of the Office of Energy Efficiency and Renewable Energy (EERE). HFTO is the federal level agency responsible for research and development in hydrogen production, delivery, infrastructure, storage, and fuel cells for transportation. HFTO actively participates in the development of safety codes and standards, technology validation, education, and workforce development. Municipalities developing hydrogen safety plans may be interested in DOE's safety research and development (R&D) activities on developing hydrogen sensors for detecting hydrogen leaks. The DOE also has a specific set of safety guidelines for federally funded projects including review by DOE's Hydrogen Safety Review Panel to ensure safety in the operation, handling, and use of hydrogen systems.

The hySafe International Association for Hydrogen Safety (hySafe) hysafe.info acts as the worldwide depository for information on hydrogen safety related issues. Founded in 2009, and based in Brussels, Belgium as an international nonprofit institution, hySafe facilitates coordination, development and sharing of hydrogen safety research, education, and training. Safety plan development by municipalities may be informed by



hySafe's comprehensive Biennial Report on Hydrogen Safety which contains detailed information on the fundamentals of hydrogen, production technologies, transportation techniques, end uses, elements of hydrogen incidents, risk assessment, safety measures, and legal requirements.

American Institute of Chemical Engineers (AIChE) headquartered in New York City, is a global community of chemical engineering professionals contributing their knowledge and skill to create a compilation of educational materials and resources. This community has delegated a section of their organization to host courses, webinars, and videos aiche.org/academy. Leading experts of the industry assemble these materials to address all skill levels; beginner through the highest levels. They offer several materials about hydrogen with emphasis on fundamental knowledge, operation and safety. Also, under AIChE, is the Center for Hydrogen Safety (CHS) aiche.org/chs, a global nonprofit that provides resources and guidance to promote the safety of hydrogen. Safe handling and operations have been the core focus of this organization since their establishment in 2018. CHS facilitates access to hydrogen safety experts; develops comprehensive safety guidance, outreach and education materials and activities; and provides a forum to partner on worldwide technical solutions. Provision of their services is also available for design reviews, site reviews, and hazard analysis.

The successful implementation of Blueprints requires municipalities to gain the local expertise to both safely permit new facilities and to complete the critical readiness steps for responding to an emergency involving hydrogen. Kern COG also recognizes the value of partnership with organizations experienced with hydrogen fuel to be brought in for collaboration on a safety plan. Sunline Transit Agency developed the West Coast Center of Excellence in Zero Emission Technology to ensure industry knowledge capture, investment in the workforce, and outreach efforts to help commercialization of ZE technologies. The safety plan yields great value when it incorporates the experience of organizations that have put wheels on the ground to communicate with fleets and organizations that plan to do so imminently. UC Irvine Transit has in-use examples of hydrogen mobility, and Kern's own Golden Empire Transit is in the process of deploying hydrogen buses.

### Training and Documents

One of the most useful resources available amongst the hydrogen community is the H2tools Best Practices report h2tools.org/bestpractices. This manual provides an extensive overview of the different recommendations for working with hydrogen. It includes the basics of establishing a safety-centered environment and recommended training for understanding the fundamental risks of this fuel. Procedures on preventing



incidents, handling incidents, design considerations, compatible materials, operation, and maintenance are all provided. While all relevant to this the development of a Blueprint, the refueling of hydrogen powered industrial trucks overview will be critical to success of the infrastructure.

Another useful guide developed by HSP is their safety plan manual Hydrogen Safety Plan Guide that can be referenced for developing project specific safety practices. Safer research, design, and operation are the core focus of this tool by providing a procedural approach to generating a plan for managing potential hazards for hydrogen and fuel cell equipment. HSP also includes an example of a safety plan for reference Hydrogen Safety Plan Example. This tool should be used once a general understanding of site-specific hydrogen risks are identified; commencing the creation of a safety plan is a key starting point in the design process.

HSP has created a Hydrogen Safety Considerations Checklist to serve as a tool when developing hydrogen systems that have an outdoor hydrogen supply system for indoor usage. The guide serves to ease the process of risk analysis and identify general principles of hazard assessment for hydrogen systems of all types and sizes. This tool greatly simplifies the complex task of design with failure points in mind but should only serve as an aid and not official compliance. If possible, personnel familiar with the safety regulations should be using this resource as well as those designated for technical aspects of the project.

A list of hydrogen incidents has been compiled by the HSP to provide insight into the types of situations being targeted for prevention. The Hydrogen Incident Examples list captures events that have occurred across the industry that serve as lessons learned for the community. With access to this knowledge, developing a safety plan can prevent this history from repeating itself.

Sandia National Laboratories created an open-source model to assess the risk of using hydrogen and other alternative fuels titled HyRAM+. This tool features detailed models of hazardous thermal and mechanical scenarios for hydrogen, methane, and propane's material properties. HyRAM calculates risk metrics for unique systems using public data and component specifications. This permits the user to generate analyses for code and standards development, safety basis development, facility safety planning, and stakeholder engagement. This tool is the first of its kind providing computer-predicted behavior models and data for a variety of users.

A critical aspect of safety is the ability to respond promptly. PNNL has developed a Hydrogen Emergency Response Training to educate hydrogen workers on procedures in

the event of an emergency. This training is an interactive online course that analyzes everything from the basic properties of hydrogen to safety precautions for pressurized and cryogenic systems. The modules include quizzes to verify information retention and provide the user with their level of understanding of the material.

Specially tailored education programs with in-person training, such as AFV Educate (afveducate.org) also provide necessary training for first responders and other public sector employees through safety workshops. New technologies by nature bring new experiences to the roads, and the public lacks the knowledge and intuition to handle unforeseen events safely. First responder and second responder trainings are aimed at firefighters, law enforcement, and emergency medical services, but they also provide additional training that is required for a robust safety network, to include automotive technicians, tow truck operators, and vehicle collision specialists. The San Joaquin Valley Clean Cities Coalition partners with AFVEducate to offer first responder trainings once per year on a variety of fuels, dependent upon funding.

### Codes

Industry codes and standards provide the minimum requirements for the development of hydrogen infrastructure. There are many sources of code that dictate the necessary compliance when working in this field such as the International Fire Code (IFC) and the National Fire Protection Agency (NFPA) 2 Hydrogen Technologies code. Due to the nature of hydrogen technology, there are not always compliance standards for operations, meaning that multiple parties may need to come together and create justified alternative safety approaches to these nuanced scenarios. Below are frequently updated codes and standards that serve as design constraints and compliance procedures. A more extensive list that is kept current beyond the release of this Blueprint can be found at fuelcellstandards.com for referencing project specific regulations.

- NFPA – National Fire Protection Association
  - 2, Hydrogen Technologies Code
  - 55, Compressed Gases and Cryogenic Fluids
  - 70, National Electrical Code
- ASME – American Society of Mechanical Engineers
  - B31.3, Process Piping
  - B31.12, Hydrogen Piping and Pipelines
  - Boiler and Pressure Vessel Code (BVP)
- ISO – International Organization for Standardization
  - TC 197, Hydrogen Technologies
- IEC – International Electrotechnical Commission

  - TC 105, Fuel Cell Technologies
- IFC – International Fire Code
  - Section 2309, Hydrogen Motor Fuel-Dispensing and Generation Facilities
  - Chapter 50, Hazardous Materials - General Provisions
  - Chapter 53, Compressed Gases
  - Chapter 58, Flammable Gases and Flammable Cryogenic Fluids
- IFGC – International Fuel Gas Code
  - Chapter 7 – Gaseous Hydrogen Systems
- IBC – International Building Code

### Certifications & Signage

Industry-wide standardization of certifications and signage is important for confirming functionality and safety across all projects. The image below depicts the typical ATEX and IECEx markings for hydrogen which appear on certified components. These symbols verify the safe performance of a product making it optimal for assessing risks throughout a system. The local Fire Department is generally the party that would conduct inspections to assess signage and certifications necessary to operate hydrogen components.

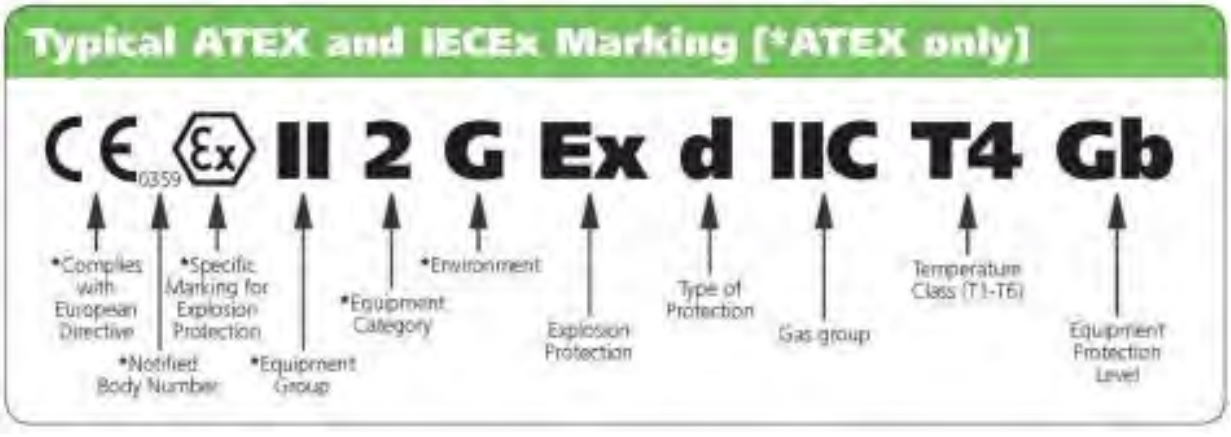



Image 2.1: Typical ATEX and IECEx Marking

### Safety Plan Development

The site-specific safety plan will serve as the guide for properly developing transportation infrastructure for hydrogen transportation, storage, and dispensing. These plans currently are used throughout industrial and commercial projects to protect those pioneering into a cleaner world. These plans are also critical to the design process due to the risks of working with unfamiliar technology. While hydrogen may be new to a specific location, significant operations have occurred globally which have helped generate best practices.



As detailed above, there are numerous resources which provide materials to increase hydrogen safety awareness and familiarity with the fuel's capabilities. Local jurisdictions of all sizes benefit from starting the hydrogen safety plan process early and utilizing these references.

### Process Overview

The process for developing a safety plan begins with identifying the project scope. Who, what, when, where, how, and why are the high-level details that must be known before the design process can commence. The project cannot proceed without understanding the contributors, locations, technologies, systems, and goals. As the project is initiated, begin by outlining these items and as the safety plan development progresses further elaborate each element and provide a complete assessment of the risks. When the contributing parties are known, a description of their work can be outlined to assign responsibilities based on qualifications and experience. Contributors with existing hydrogen experience should provide their history with related work to document the qualifications of the safety plan team. Similarly, individuals with safety expertise should be identified at this stage of the process to ensure best practices will be implemented by all stakeholders. Knowing planned location(s) is essential for contacting municipalities and other necessary entities that will have a role in the project's development. Components and systems need permits and certifications for the locations they operate in, making identification of the location and technology a priority. The capability of the technology will affect the goals for the project, requiring a cohesive effort to ensure the project meets its performance requirements. Sorting through these details prior to design will generate thorough safety procedures and result in optimal practices.

### Planning Team Members

For hydrogen transportation applications, specifically refueling infrastructure, there are several team members that are essential to a hydrogen safety plan's design and implementation.

A designated **project manager (PM)** will be responsible for knowing all details about the project. They will be the facilitator of every aspect of the project, ensuring that tasks are completed, timelines are met, and all details are accounted for. Their role in safety is to understand and communicate all vulnerabilities and maintain a log of the solutions that will become the risk reduction log.



The **agency having jurisdiction (AHJ)** will be the local entity approving the project's initiation and completion. There is no definitive agency or government for all projects, meaning it could vary from the city to county, region, or state levels where they will be responsible for the review and approval of all plans. The likely entities are the county office of emergency services, and CalFire. They have the highest level of oversight and will determine the safety plan's compliance with their ordinance.

The **fire department** that provides oversight to the community (local or County) will need to be brought in to give their assessment of the site and approval. They will be a key consultant for compliance with applicable codes and standards throughout all stages of the project: design, construction, and operation. They will likely have the best understanding of the requirements for adopting the site to fire codes, zoning, and planning ordinances. They will also provide input on safety training topics, audiences, and cadence.

The **engineering and construction teams** will be key in identifying the construction and commissioning requirements of the infrastructure. Their site plans will need to comply with the building codes of the area, as well as zoning permits. They will play a similar but smaller role to the fire department in providing their knowledge of standards that must be followed before and during operation, but instead focus on the design and execution of the infrastructure.

**Equipment suppliers** will be responsible for the compliance and performance of their equipment. Understanding the details of the components they each contribute will be essential to developing proper handling documentation and minimizing the risks associated with operation. The equipment will likely be certified under national standards, which is the responsibility of the suppliers. Also, equipment suppliers are likely to have extensive experience participating in the development of hydrogen safety plans and can therefore be an important resource.

The **facilities manager** is responsible for the development and upkeep of the facilities. This could be a separate entity from the construction team or the same one. They will lead the effort on the design developments and validation of the site ensuring the safety regulations are met.

**Fleet managers** are responsible for logistics associated with their fleets. Their initial role is to communicate their needs with the PM to generate a feasible design. This includes ensuring that supply and demand can be met on all fronts to ensure operation during the project's lifetime. The fleet manager will also provide input on fueling and driver procedures and the related safety training.

**Subcontractors** and **labor representatives** may or may not play a role in the project. If involved, the safety plan development team should consider what role these contributors would play in the establishment or facilitation of safety requirements.

Any other **associations or stakeholders** looking to contribute through training, guidance, donations, or other means should also be noted as their efforts may need to be incorporated into the safety plan. This applies to Environmental Justice organizations or affected community members that should have a voice in the discussion of the project's implementation, and ramifications.

An **emergency response team** must be assembled to provide immediate action for any potential hazardous incidents that occur. Also, there are instances where these contributors have preexisting safety manuals for their area of expertise. It is important to gather these materials during the drafting stages so that implementation of relevant safety procedures will be executed efficiently and expeditiously.

It should also be understood that not all contributing entities will be known at the beginning of the project. These stakeholders will likely play a large role in the project but may not be limited to the aforementioned.

**Safety Plan Timeline**

Establishing a project timeline will be integral to the safety plan development. Outlining the stages of the project by tasks creates the opportunity for safety reviews, inspections, and testing to be incorporated into the schedule. In the diagram below, HSP has generated an outline of safety tasks that they recommend for incorporation throughout the project.

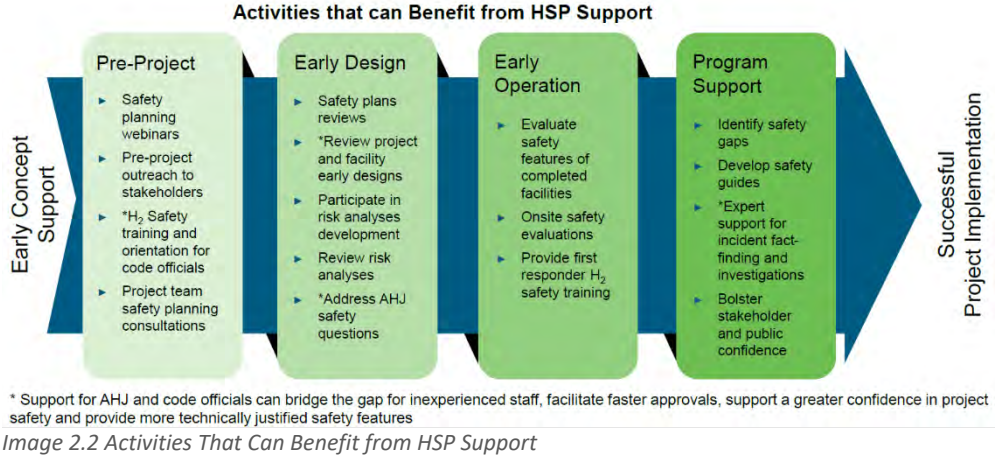



*Image 2.2 Activities That Can Benefit from HSP Support*

Elaborating on the activities mentioned above, this list emphasizes the order in which they should be completed. The bolded deliverables provide high level guides to developing a safety plan for hydrogen infrastructure.

1. The project begins with the **initial project meeting** where all stakeholders come together, introduce themselves, discuss their contributions, assign project tasks, and discuss high-level details that will formulate the goals of the project. During this meeting, **relevant training** should be provided to all collaborators to implement safety as a foundational strength of the project.
2. After the meeting, contributors must elaborate on their high-level tasks and **outline the subtasks** required to produce their deliverables. Generating these tasks requires collaborators to think through **potential points of weakness** within a system throughout the design process. These points of weakness will be further assessed and identified through safety review meetings and inspections. Codes and standards related to the project scope should be outlined in conjunction with the project and
3. With each task summarized, a **project schedule** can be developed, aligning updates and deliverables for each team. This schedule should include **safety reviews** corresponding to significant dates such as testing or inspections. It would also be important to **assign training** to be completed by each stakeholder based on their role before these important dates.
4. After the project schedule is developed, the next step toward creating a safety plan is to **establish methods for identifying vulnerabilities**. There is no singular correct method for analyzing risk making this a point of discussion unique to the project. This method will be the centralized risk assessment process among all stakeholders and will be the fundamental core of the safety plan. Some examples of common methods are HAZOP, FMEA, “what if?”, checklists, fault trees, event trees, and many more.
5. The purpose of the vulnerability detection method is to **develop a risk reduction plan** through safety reviews. As the project progresses, consistently updating new findings related to hazards and mitigation is critical. This plan will provide justifications for how the vulnerabilities of the project will be addressed and potentially be eliminated.
6. Once a plan has been developed, the project team can **reconvene to verify relevant codes and standards** that the safety plan follows. Ideally, these codes were generated through the discussion of design justification during the safety

meetings. This follow-up will verify the regulations and ensure that all comply with common consensus.

7. **Operational procedures** must then be formulated in accordance with the regulations. These procedures must be effectively communicated to all parties responsible for building, testing, operating, and maintaining the project.
8. Simultaneous to the procedure development, an **equipment compliance summary** should be created as well. This will be equally essential for the building, testing, operation, and maintenance of the project to ensure that the equipment is properly handled.
9. The team, led by the project manager, must keep **communicating updates** throughout the process for modifying any high-level components such as equipment, personnel, systems, and procedures. The team must maintain alignment with these changes because they may require revisions to the safety plan, affecting the design process for many contributors.
10. Ensuring all the materials above have been documented, the full **safety plan** can be drafted and finalized for **approval from the PM**. This would subsequently be reviewed by the AHJ before going under final review.
11. The last step is the project is **approval from the hydrogen safety panel** permitting the adoption and implementation of the Safety Plan.
12. The hydrogen safety plan is one aspect of the larger infrastructure project's safety plan. The infrastructure project is also a subproject to others meaning the **plans will always be growing and changing**, but the fundamental justifications should be accounted for.

### Communication Plan

As mentioned above, the process is not complete after safety plan approval. There will be continual updates regarding the project's performance and maintenance which will need to be absorbed into the project safety portfolio. Keeping the team updated minimizes risks and validates the current methodology used to prevent hazardous events.

Ensuring the team is all on the same page also extends to new members. It is crucial that new members are trained immediately by existing workers with the safety plan's core methods in mind. Operations and maintenance will continue with the expansion of the team from design to service. Generally, this implies that technical experience will decrease for those handling hydrogen, making the reception of safety knowledge the utmost priority.



Staying up to date on the newest regulations will also need to be communicated amongst contributors. Subscriptions to codes and standards organizations will continue to improve safety measures and keep the project in compliance with ordinances.

## Conclusion

No matter how thoroughly a safety plan is developed and written, it is only as good as its implementation. The success of the project depends on the accountability of the team to properly execute the preventative measures and provide the necessary updates. Collaboration, communication, and documentation are the driving factors for delivering an effective safety plan in the constantly evolving hydrogen industry.



# Tools/Data to Improve Infrastructure Planning Activities

## Executive Summary

Planning MD/HD ZEV infrastructure is a multi-faceted process that requires critical analysis of project components other than infrastructure design itself. While determining the most logical infrastructure to implement, elements such as site location, travelled ZEV routes and traffic patterns, existing infrastructure, future deployments, environmental impact, and job creation must be considered. Infrastructure needs will vary as fleet operations may be return-to-base fleets or over-the-road fleets. MD/HD ZEV infrastructure deployments will be unsuccessful with a one-size-fits-all approach; software, tools, and data are crucial to the planning process and vetting the most viable prospective projects. The following sections discuss applicable resources for the infrastructure planning process according to the following categories: site planning, routes and traffic patterns, existing ZEV infrastructure, and job creation. While not an exhaustive list and apt to change, the following resources are available to provide guidance and assist in developing a thorough, adaptable MD/HD ZEV infrastructure strategy.

### Site Planning

A major consideration to deploying MD/HD ZEV infrastructure is site selection. Entities interested in constructing EVSE must find an appropriate location and confirm if connectivity is possible and power supply is sufficient. These determinations involve reviewing maps of existing structures and developments, accessing utility resources to verify meter capabilities, and identifying traffic routes to see where the best fit location should reside. The following resources allow for this research.

CoStar | Commercial Real Estate Information Company – This database allows visibility for real estate parcels, charting existing structures and available space for prospective infrastructure locations. CoStar provides structure construction information such as amenities and physical attributes, leasing/sales information including current/previous ownership, prior/for-sale statuses and rents, performance analytics, and financial information relative to market trends and operating statements. CoStar is a subscription service, requiring a login to access the database. Pricing to subscribe to CoStar is not publicly available as each CoStar program is tailored to each client; CoStar recommends filling out their website's short form to initiate a demonstration of their platform for more details.

Kern County GIS – This online GIS tool maps Kern County to shows a series of layers, including engineering and surveys, transportation, counties and cities, districts and precincts, planning, assessor, places and culture, water resources, waste, elevation contours, and a variety of visual layers. Each layer has its own subsections that allow for data manipulation depending on set parameters. Plots on this GIS map can be selected to view additional details.

ICA Map (pge.com) – PG&E's Integration Capacity Analysis (ICA) online tool can help design distributed energy resources (DER), which are often a critical element of cost-effective EVSE projects. This GIS program provides information about power availability for DER energy resources within PG&E's service territory. Prospective project managers can determine feeder load profiles by selecting various points on the map, or by searching for a location by address. High and low loads will be displayed in kW by hour and month, allowing project managers to determine whether the site is suitable for EVSE construction. User guides are available for any questions related to components of the map. A PG&E ICA account is required for access.

Southern California Edison DRPEP (sce.com) - This GIS program, also known as Distribution Resources Plan External Portal (DRPEP), provides information about power availability for distributed energy resources within SCE's service territory. Prospective project managers can determine load profiles that will provide insight into circuit and substation capacity, and whether the site is suitable for EVSE construction or needs grid upgrades to match demand for the project. Sites may be searched by address or selected from charted points on the map. All layers must be removed, and the Grid Needs Assessment (GNA) Layer must be selected to reveal this information. User guides are available for any questions related to components of the map.

CA Electric Vehicle Charging Station Permit Streamlining Map (arcgis.com) – Guaranteeing the permitting process of new stations is critical in the site planning process. This GIS tool allows visibility for locations that are not streamlined, in process of being streamlined, or streamlined in terms of EVSE readiness according to AB 1236 and AB 970. AB 1236 outlines that EVSE ready sites must offer levels of electricity that support stations that are designed and in compliance with AB 625, inclusive of light and MD/HD vehicle charging, or AC system voltages ranging from 120 – 600 volts. This resource does not qualify or confirm compliance with the listed assembly bills but tracks the status of participating locations throughout California. Each area that is color coded on this map can be selected to view additional information and resources that relate to permitting status. While specific to electric vehicles, this could provide a baseline for permitting mapping tools that pertain to other ZEV infrastructure technologies such as hydrogen.

Geospatial Energy Mapper (GEM) (anl.gov) – Similar to SCE's DRPEP GIS program and PG&E's ICA Map, Argonne National Laboratory developed a Geospatial Energy Mapper (GEM) that provides information on power availability throughout the United States. Unlike DRPEP/ICA, GEM is not specific to any utility provider and allows the mapper to be filtered according to themes. Themes include EVs and charging infrastructure, displaying available stations in various statuses (planned, Tesla vs. non-Tesla, DCFC vs. Level 2), EV corridor readiness, traffic volumes, transmission lines, major roads, substations, and power plants. Although high level, this mapper can indicate where power availability needs lie and confirm where successful infrastructure projects may be deployed.

### Routes and Traffic Flows

Knowledge of existing routes is critical to planning EVSE deployments. Determination of where vehicles travel and need to recharge establishes effective infrastructure that is accessible and convenient to MD/HD ZEV drivers. In relation to site planning, understanding travelled routes will lend answers to where infrastructure should be located as deployments are best suited for locations along routes travelled. The following resources allow for this research.

https://kern511.org/ - This Google Map provides real time traffic data for Kern County that shows weather alerts, closures, accidents, and live camera streams along highways. Coupled with data from Google, there is a feature to map routes via transit or vehicle, which can provide context to what routes are viable in terms of time and total travelled distance.

Transportation Data Management System (ms2soft.com) – This interactive transportation map shows thousands of traffic counts on local roads throughout the Kern Region from the 1990s to today with NB/SB or EB/WB traffic flows. Each plotted point is a traffic count location with an estimated annual average of daily traffic (AADT).

Local Truck Routes | Caltrans – Maps and municipal codes by county are provided by the California Department of Transportation (Caltrans) to show city-approved truck routes. These images and descriptions provide visibility as to where infrastructure is best suited to be implemented, given that MD/HD trucks will most likely travel over these routes. Although these routes are city approved, there is potential that other routes are viable, especially because these routes are apt to change due to road closures or other unexpected setbacks. Coupled with CA Truck Network Maps | Caltrans, these route maps are a tell-all to where trucks are legally advised to drive (state/interstate routes), and indicate clearances, special route restrictions, and allowed truck lengths.

Truck Volumes AADT | Truck Volumes AADT | California State Geoportal – Provided as a layer for other GIS maps, the Truck Volumes AADT shows truck traffic averages throughout the California State Highway System. Knowing truck mileage, coupled with route information, can create informed decisions for infrastructure deployment. Higher truck traffic volumes indicate a greater need for ZEV infrastructure, while lower truck volumes demonstrate an opportunity to divert traffic towards areas, typically rural, that could benefit from access to ZEV infrastructure.

Traffic Census Program | Caltrans – Separated by county, Caltrans provides traffic census data in an Excel format, showing AADT, truck AADT, ramp volumes, and peak hour volume data. These datasets cover traffic counts across the state highway system only. While non-inclusive of surface streets, it is more likely that MD/HD trucks are travelling along highways, making the data an insightful tool to gauge where Infrastructure should be planned.

Medium- and Heavy-Duty ZEVs in California – Based on California Department of Motor Vehicle (DMV) registered vehicles, this interactive map provides insight of what ZEVs are on-road. Weight class, vehicle type, and county are all applicable filters that allow for increased visibility of where and what types of ZEVs are in California. Although not every county is represented, understanding where ZEVs are domiciled can indicate predictable routes and where and what type of infrastructure is needed, if not already available.

**Current Infrastructure**

Determining where infrastructure currently resides will allow for more informed, logical EVSE deployments. Using the existing data and mapping tools provided below will demonstrate what has been effective and what needs improvement. Data trends reveal where drivers recharge and where needs remain, whether for more plentiful stations/ports, or improved accessibility along consistent routes.

https://www.plugshare.com/ – This interactive map shows available charging infrastructure by location for light-duty vehicles. There is a search feature to enter an address to find charging locations or planning capability to search for locations by map. Each point shares the address, phone number, payment requirements, parking, hours of operation, power availability, and charging network per location. PlugShare allows consumers to plan trips to various charging infrastructure locations and add a station that are not already mapped. The resource is user friendly and clearly represents where charging infrastructure is concentrated.

Alternative Fuels Data Center: Alternative Fueling Station Locator (energy.gov) – This resource is like PlugShare because it compiles EVSE information but aggregates the

information into an Excel spreadsheet. This information includes addresses, phone numbers, payment methods, accessibility, hours of operation, and other parameters that are represented in PlugShare. While not as user friendly as PlugShare, which is more geared towards consumer light-duty vehicle EVSE, AFDC's Station Locator assists in fuel corridor planning that is beneficial to commercial MD/HD ZEV EVSE deployments. It is suggested to use the information with discretion, and to refer to Google Maps or call the location in question to confirm ample accessibility. The fuel corridor planning feature allows EVSE deployments to be planned according to FHWA criteria for corridors, while showing what stations already exist to optimize developments.

Transportation Analytics On Demand | StreetLight Data – Referred to as "big data," this collection of multimodal network data from consumer devices allows different transportation trends to be mapped. Places of frequency can be determined by tracking demographics, and these determinations can inform decisions on where to construct EVSE. StreetLight Data requires an account to access datasets.

EMFAC (ca.gov) – Focused on emissions inventories in California, this model shows vehicle data such as vehicle miles travelled (VMT), emissions generation, population densities, fuel types, vehicle classes, and many other factors. Vehicle activity can be customized, and scenario analysis can be performed to assist with project-level assessments. MD/HD ZEV EVSE deployments benefit from this data availability because it provides an indication of where EVSE is most needed, tracking emissions trends to show where pollution is most concentrated.

Stations Map | H2 Station Maps – California Fuel Cell Partnership developed an interactive map, similar to PlugShare and the AFDC Alternative Fuel Station Locator, which shows where hydrogen fueling stations are located throughout California. Each point on the map provides information relative to hours of operation, hydrogen source, online/offline status, who operates the station, and a station website, if applicable. With the given visibility of where hydrogen stations are located, infrastructure deployments can be planned in areas of most need, being layered with EV infrastructure maps to ensure that options are available along routes where MD/HD trucks would be travelling.

Electric Vehicle Chargers in California – CEC's interactive infographic displays public and private electric vehicle chargers throughout California by county and charger type. Each county can be selected to show the specific information that pertains to that region. Although not as specific as PlugShare, the AFDC Alternative Fuel Station Locator, and H2 Station Maps, the data gives an overview of current EV infrastructure and can influence what type of infrastructure to deploy in future developments.

Hydrogen Refueling Stations in California - CEC's interactive infographic displays light-duty and HD hydrogen fueling stations throughout California by county and whether the station is planned or operating. Each county can be selected to show the specific information that pertains to that region. Every point on the map will show an address and status for each station. Although not as specific as PlugShare, the AFDC Alternative Fuel Station Locator, and H2 Station Maps, the data gives an overview of current hydrogen infrastructure and can influence what type of infrastructure to deploy in future developments.

PEV ATLAS (ca.gov) – Southern California Council of Governments (SCAG) developed a BEV atlas that shows infrastructure locations, charging demands, land use destinations, and demand for charging infrastructure throughout the SCAG boundary. There are several layers to add to or remove from the map to manipulate the data, including disadvantaged communities, unsupported electric miles, charger by type, land use by type, and various heatmaps. Although this GIS tool pertains to counties specific to SCAG, it is a resource that can provide insight on MD/HD ZEV routes and existing infrastructure and create a baseline example for other councils of governments.

### Environmental Impact and Disadvantaged Communities

While aspects of implementing infrastructure are directly related to truck routes, existing stations, and where new sites will be located, amongst other factors, environmental considerations are equally important. When creating infrastructure plans, pollution burdens and demographic characteristics must be considered. A high-level view of where issues of pollution and health disparities are concentrated can be provided by the following resources.

CalEnviroScreen 4.0 | OEHHA – CalEnviroScreen 4.0 is an interactive map that combines pollution burden and population characteristics to indicate communities throughout California that are most burdened by air quality issues and adversities to health. As a visual tool, this map provides perspective of what areas are adversely impacted by a variety of issues, including but not limited to particulate matter, ozone, traffic impacts, poverty, unemployment, asthma, and cardiovascular disease.

Explore the map - Climate & Economic Justice Screening Tool (geoplatform.gov) – Similar to CalEnviroScreen 4.0, this mapping tool from the U.S. Council on Environmental Quality identifies disadvantaged communities, but identifies census tracts as disadvantaged according to factors including climate change, clean energy and energy efficiency, clean transit, sustainable housing, legacy pollution, clean water and wastewater infrastructure, health burdens, and workforce development, alongside specific subfactors that elaborate



upon each factor. The map identifies what main factors qualify each census tract as disadvantaged and provides a rank (in percentile) of each factor and subfactor. Visibility on the characteristics of each census tract will influence infrastructure placement, targeting the mitigation of issues related to traffic emissions, rate of fatalities resulting from natural hazards, disease, and other impacts of MD/HD traditional/diesel transportation.

California Nonattainment/Maintenance Status for Each County by Year for All Criteria Pollutants | Green Book | US EPA – Breaking down pollutants by National Ambient Air Quality Standard (NAAQS) type, this matrix demonstrates what years specific regions within California counties have been unable to achieve attainment requirements for pollutants. Each region is categorized by the severity of the status of pollution, what portion of the county is impacted, and what the population size is. Using this information, the regions in most need can be determined for appropriate infrastructure plans that will yield the most results in pollution reductions.

SB 535 Disadvantaged Communities | OEHHA (ca.gov) – Developed in 2012, SB 535 established requirements for a portion of state funding to be dedicated to disadvantaged communities based on geographic, socioeconomic, public health, and environmental hazard criteria. In partnership with CalEPA, the California Office of Environmental Health Hazard Assessment developed an interactive map that shows where the disadvantaged communities, according to SB 535 criteria, are located. Given that this map can determine areas where populations are disproportionately impacted by air pollutants, the map aides the decision-making process of whether or not to deploy infrastructure in those areas.

Datasets | Climate Data Online (CDO) | National Climatic Data Center (NCDC) (noaa.gov) – The National Oceanic Atmospheric Administration provides public data regarding weather patterns across the United States, ranging from hourly data to annual averages. Weather is an important aspect of infrastructure deployment as it can affect the performance of stations. Being aware of weather extremes, whether cold or heat, can prevent outages and prepare customers for unexpected power shutoffs that are typical of extreme weather events.

Argonne GREET Model (anl.gov) – Developed by Argonne National Laboratory, this analytical tool simulates life cycle assessments of vehicle and fuel technologies according to user inputs. This tool is downloadable in Excel format and has two series, both framed around well-to-pump and pump-to-wheels scenarios. GREET 1 Series focuses on inputs that generate fuel production, use, and disposal (fuel-cycle) and GREET Series 2 focuses on energy and emission effects that are associated with vehicle recovery, production, fabrication, assembly, and disposal (vehicle-cycle). Both are used in conjunction to

estimate energy-cycle outputs. Being able to compare the life cycles of ZEVs and non-ZEVs of all vehicle weight classes will determine environmental impacts of infrastructure projects, as different materials and processes with different affects occur in each. Knowing the environmental impact of one technology over another will provide intel into infrastructure siting, deeming locations appropriate or not for infrastructure depending on the use case.

**Job Creation**

MD/HD ZEV infrastructure deployment requires skilled workers to create functional stations for use by varying truck applications. Naturally, projects of this kind will create jobs, either through on-the-job training or through attracting workers that are already in the field of infrastructure development. The following resources will help determine existing skillsets and areas of opportunity to develop necessary skillsets to implement successful ZEV technology.

Employment by Industry DatamyTemplate (ca.gov) – The Employment Development Department of California (EDD) provides publicly available data sets of labor market information by county and timeframe. The data discusses unemployment rates, employment industries, and changes in employment on a month-to-month basis. Increased visibility of the current employment trends can influence deployment decisions, particularly in areas where unemployment is high and transportation jobs are low.

Kern COG MD and HD ZEV Infrastructure Blueprint Site Selection Survey – GNA authored this tool to help determine which locations would be the best fit for this project. Potential site locations are scored based on factors including access, existing stations, visits, capacity, vehicle usage, and other key criteria. This established review provides a well-rounded evaluation of suitable sites for ZEV MD/HD infrastructure, providing clarity to what would be successful at these sites, and where areas of opportunity lie. GNA results from this survey are discussed earlier in the Blueprint. Future blueprint authors for sites outside of Kern could use the site selection survey as a template to compare their prospective sites with proposed plans and frame infrastructure deployments around similar, if not the same parameters.

**Conclusion:**

Not all aspects of the MD/HD ZEV infrastructure planning process will be answered by these resources. Provided as a guide to making educated decisions towards implementation choices, the tools listed above may be more suitable than others not



mentioned for infrastructure applications. As the market develops and experience is gained amongst other metropolitan planning organizations, more tools will be readily available and enable streamlining the infrastructure planning process on a large scale. As stated above, this list is not exhaustive, and other applicable resources are available.



# Outreach Strategy

### Introduction

The Kern COG Medium- and Heavy-Duty Zero-Emission Vehicle Infrastructure Blueprint is informed by input from the local community members, stakeholders, and community organizations. The goal of the outreach strategy is to create communication channels tailored to the local communities that encourage participation in planning efforts and to provide information on projects and potential impacts. The components of the strategy proposed here were informed by both established policies and community outreach strategies employed by different transportation plans. The outreach strategy includes objectives, duration, and tactics to effectively communicate with the target audience.

## Outreach Strategies Targeted to Local Communities

### Target Audience

The outreach strategy calls for engaging with several different groups including the transportation industry, regional planning stakeholders, and the community. This diverse audience includes community members, community benefit organizations, working group members, and internal stakeholders. Community members include all residents interested in participating in the development or implementation of the Blueprint plan. Working Group members consist of representatives from charging site locations, fleets, cities, and air districts. Internal stakeholders include a diverse array of local businesses, utilities, financial institutions, and other planning organizations. The Working Group members and internal stakeholders were invited to a series of meetings and had significant opportunities to participate in the initial development and final review of the Blueprint. This outreach strategy is focused on communication specifically with local community members.

Understanding the demographic statistics was important in tailoring the outreach strategy to the local communities throughout Kern County. According to the 2021 census, Kern County is home to 917,000 residents, 52.4% of which are between the ages of 18 and 65 years of age. The percentage of the population identifying as white alone was 82.3%, 54.6% identified as Hispanic or Latino, 6.3% identified as Black or African American alone, 5.4% identified as Asian alone, 3.2% identified as two or more races and 2.6% identified as American Indian and Alaska Native alone. There were 43.9% of respondents that speak a language other than English at home, the most common language was Spanish, 41%, and then Asian or Islander, 2%. The percentage of Spanish-speaking population in Kern County is greater than in the state and in the country, at

33% and 15.6% respectively. The Kern County median household income in 2020 was $54,851 and the percentage of persons in poverty was 18.3%.

Part of the strategic outreach and engagement at the initial stages has been to engage with the AB 617 Community Steering Committees (CSC). A simple majority of residents comprise the CSCs along with city staff and council members, and public agency and private business representatives that are tasked with the same objectives of reaching the targeted stakeholder, specifically in AB 617 environmental justice communities. They offer the benefit of being recently and currently engaged, for the past three years, in the discussion of targeted outreach for the communities of Arvin and Shafter, in Kern County.

### Outreach Strategy

The community outreach strategy for the Blueprint is tailored to engage the public in planning efforts and to provide education on potential future impacts. The strategies outlined will be crafted to achieve the following objectives:

### Objectives:

- Comprehensive engagement and collaborative input from affected residents and businesses.
- Inform and educate local communities on Blueprint plans and environmental enhancements.

This outreach strategy incorporates the principles outlined in the Kern COG Public Involvement Procedures and Policies. The Public Information Policies and Procedures plan provides guidance on public and interagency participation in any regional plan development for Kern COG. The principles of the public involvement process that will be upheld in this strategy include providing citizens with early and timely opportunities to be involved in the planning process and providing citizens with education about needs and issues. Furthermore, this strategy aims to fulfill the requirements of SB 375, the Sustainable Communities and Climate Protection Act of 2008, which required an increase in the minimum level of public participation in regional transportation planning efforts. A few of the requirements from SB 375 that this strategy aims to include are conducting outreach efforts with a broad range of stakeholders to encourage active participation, establishing a process for the public to request information and updates, holding public workshops that provide sufficient information on the issues and policy choices,

The community outreach for Blueprint development began once Blueprint draft plans were initiated, allowing for multiple opportunities for public engagement and input on



Blueprint ideas. The Blueprint strategy consists of two engagement strategy types: meetings and informational materials and resources.

**Meetings:**

- Outreach includes regular, structured meetings, providing key talking points and toolkits and prepared social media kits. Establishing a structure, consistency and clear goals for meetings allows for greater participation and meaningful input. By providing key talking points, toolkits and prepared social media kits information about the Blueprint is easily shared.
- Presentations during regular meetings will be used to share maps, charts, and graphics whenever practical to help the public better understand the Blueprint.
- Include Blueprint in public meetings that are scheduled during the Planning Commission's regular hearings.
- Allow for evening meeting times with translation capability.
- Include Blueprint in continuous and structured meetings between regional transportation agencies Kern COG Regional Planning Advisory Committee (RPAC), Transportation Technical Advisory Committee (TTAC), and Kern COG Board to allow for transportation planning and interagency collaboration.
- Meeting notices emailed in advance to individuals who have expressed interest.
- Community workshops throughout the county hosted by local stakeholder groups that provide opportunities for input and collaboration on Blueprint project goals.

**Informational Materials and Resources:**

- Prior to each meeting, fact sheets will be distributed via email and social media.
- Social media advertisements geographically targeted specifically to affected communities to encourage involvement, inform on key points, and provide updates on documents. Spanish-language advertising will be included as deemed necessary by the agency in these non-traditional approaches.
- Creation of a landing webpage located on the Kern COG website to share announcements dealing with documents and/or meetings and workshops.
- An electronic mailing list of individuals who have expressed interest will be maintained and used as another resource for the distribution of Blueprint updates and meetings.
- As appropriate, outreach materials (i.e., advertisements, presentations, emails) will be translated into Spanish.



# Workforce Development

## Executive Summary

To establish and scale MD/HD ZEV infrastructure in Kern County and across California, developing a skilled workforce is crucial. A workforce can be cultivated through multiple pathways: training individuals on the job with the new skills they need to work with zero-emission technologies, providing educational opportunities at the primary school, high school, community college, trade school and university level, and recruiting or relocating skilled professionals into the industry. The following chapter will dive into each workforce development channel, providing examples of existing work occurring in the region or innovative efforts done outside the region that could be adopted for use within Kern County.

A workforce designed to support ZEV vehicle and infrastructure deployment is a key pillar of the Blueprint because a well-developed workforce can improve the speed and strength of ZEV adoption and create additional economic assets for Kern County. This sector growth will require additional vehicles and infrastructure, and it will demand services that keep the vehicles and infrastructure functioning and maintained.

Investing in the workforce for ZEV technologies helps to ensure the success of a regional ZEV network and reduces the cost and barriers to entry by making the core industries and support industries function more efficiently. When a well-trained, well-equipped, and well-designed workforce is available in a specific region, investment by manufacturers and support industries can be deployed faster, with greater sustainability and commitment. As the job growth rate for MD/HD ZEVs increases, it also grows the potential to create an incubator for high technology jobs in the transportation industry. The workforce requires standardized education at all levels, apprenticeships, certifications, and industry support organizations that can facilitate the changing education and training needs as the ZEV industry grows.

Most of the education efforts in Kern County and other regions is accomplished through environmental education efforts through schools, and community benefit organizations. The areas of focus are typically air quality and water quality with impacts to human and environmental health.

One such organization is Project Clean Air, a 501[c]3 non-profit organization based in Bakersfield, California that strives to enhance the community by improving air quality through education and collective action throughout the San Joaquin Valley and Eastern Kern County. Established in 1991, Project Clean Air (Project Clean Air - Working Together

to Clean the Air Project Clean Air) is home to the San Joaquin Valley Clean Cities Coalition, as designated by the United States Department of Energy Clean Cities Program.

## Workforce Development Channels

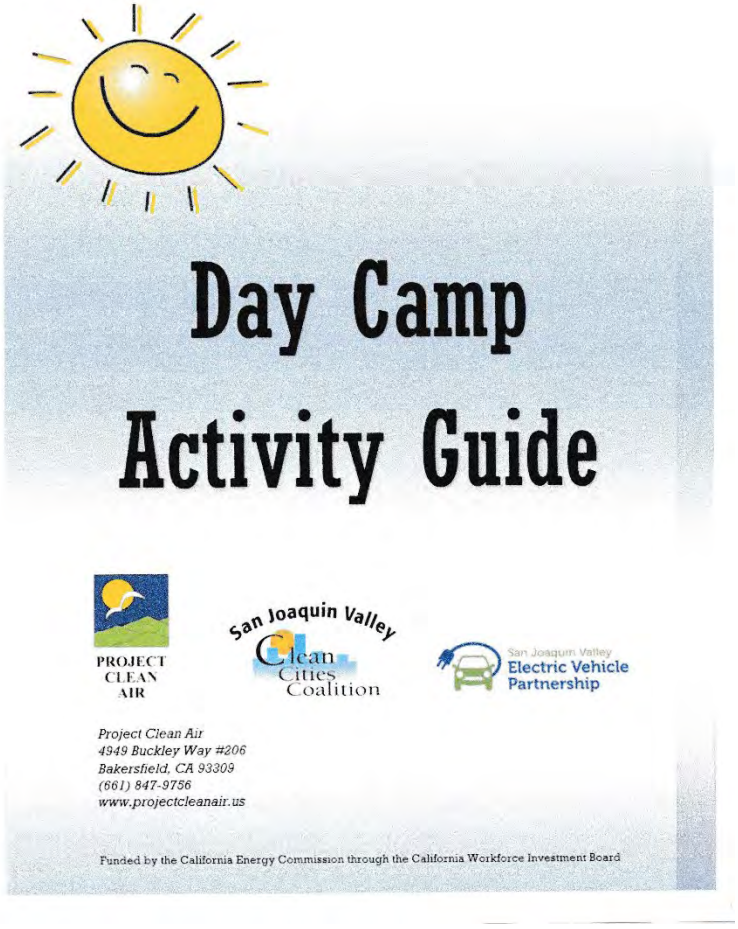



*Figure 8: Project Clean Air Day Camp Activity Guide for Clean Air Day in Kern, Kings, and Tulare counties.*

## Primary School

It is possible to begin to prime an advanced transportation workforce as early as Kindergarten. As part of a California Energy Commission funded workforce development

grant, Bakersfield, CA based Project Clean Air delivered Clean Air Day Camp Activities to K-5 students in Kern, Kings, and Tulare Counties.

The objectives of the K-5 activities are to have students investigate air as a concept and understand the importance of air by using their senses and appreciating how poor air quality impacts health, such as exacerbating asthma, or curtailing outdoor activities on 'bad' air days. Students also learn how their everyday life affects air pollution and how air pollution can be reduced. Students perform activities where they explore the properties of air, the impacts of human activity, and include activities to inform students about renewable energy. Project Clean Air often offers these activities for children attending with their families both Best. Drive. EVer community EV test drive events or other community events, such as Earth Day.

Kern Council of Governments received permission from the Air and Waste Management Association to create a lesson plan for grade 6 students titled "What Matters Most".[32] The lesson plan was enacted through direct instruction of participating classroom teachers in several Kern County school districts. Students were able to learn about the sources of particulate matter pollution through classroom discussions. They created particulate matter 'traps' and placed them in various locations at school or home, collected data and then analyzed the data, also taking note of local weather conditions. Kern COG posted the summarized data, so that schools in the various regions of Kern County could compare the results. This leads to additional classroom discussion on the reasons air quality may vary with location and pollution sources, including proximity to businesses, roads and vehicles. Project Clean Air has assumed the role of providing ongoing offerings of this course as funding allows.

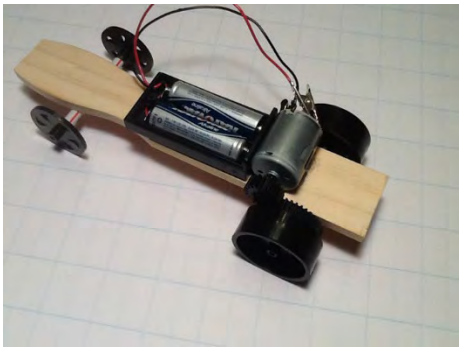


*Figure 9: Example of a battery powered curriculum car.*

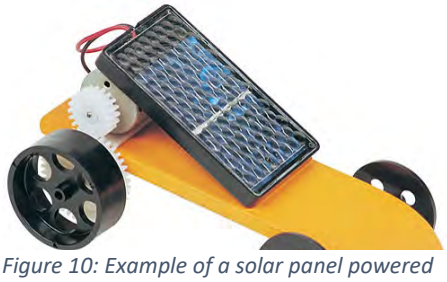


*Figure 10: Example of a solar panel powered curriculum car.*

Project Clean Air offers hands-on training over an engaging curriculum on air quality and health. This educational curriculum, an Electric Car Lesson Plan video,[33] meets California Common Core Standards, educates on the negative effects of poor air quality, and shows how clean energies like solar electric can help improve air quality. Teachers learn this

[32] https://www.youtube.com/watch?v=-A-w5Q_yPTU
[33] https://www.youtube.com/watch?v=O_rh54lbhWY

curriculum and build solar EV cars of their own! Teachers also receive solar EV car kits to take back to their classrooms for use during instruction of this curriculum. They also receive a thumb drive with the course curriculum, and PowerPoint presentations on air quality, and the curriculum with instructions from the course instructor. Providing the California Common Core Standards helps to ensure the class is offered in the classroom. To date, this course, the materials, and the classroom kits have been offered free to the teachers. Occasionally, a stipend has been offered through grants to Project Clean Air from local air districts and sponsorships from Kern COG and other businesses. The initial courses shown in the videos online used batteries to power the cars, and the recent courses have used solar panels. The one-day workshops were well-attended and well-received.

*Figure 11: (LEFT) Community members attending a Valley Fleet Support workshop and building solar panel powered cars; (RIGHT) Clean Air Program lesson plan in action. Teachers and students test battery and solar panel powered cars.*

Additional efforts across the Central Valley can also be analyzed to see examples of successful approaches. As part of a California Energy Commission funded grant, informally called Valley Fleet Support, Modesto Junior College's Great Valley Museum delivered clean air lesson plans to K-2 students, and a more advanced version for 3-5 grade students.

The objectives of the K-2 lesson plan were to have students investigate air as a concept and understand the importance of air by using their senses. Students were also to learn how their everyday life affects air pollution and how air pollution can be reduced. Students performed an activity where they had to identify "pollutants" and test their effects on air.

The lesson plan for grades 3-5 were enacted through a remote STEM workshop where students were able to learn about air quality and clean transportation, as well as air concepts and their importance. They also explored how they may be able to reduce air pollution and see the effects on $CO_2$ emissions. Students were given instructions to perform an at-home experiment to see the emissions of a gasoline-modeled "engine" and an electric-modeled "engine."

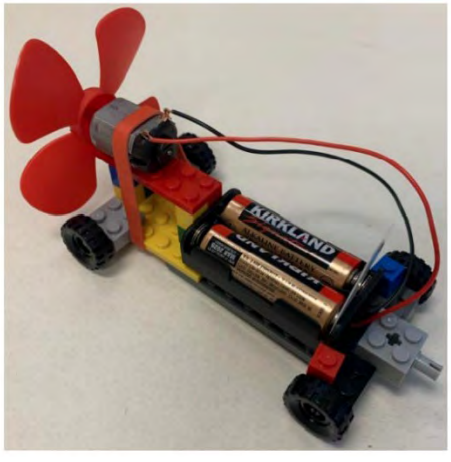



*Figure 12: A battery powered Lego car developed in the 5th grade lesson plan.*

As part of the same grant, the San Joaquin County Office of Education (SJCOE) created lesson plans for 6-8 grade students. Grade 6 focused on regional current and historical air quality in California. Students learned the most common sources of air pollution and their effects on people and the environment. Students were then assigned to develop short-term plans to monitor and reduce regional air quality. The goal of the lesson plan for Grade 7 was for students to best provide California citizens with transportation solutions that had minimal impact on the environment and human health. Grade 8 students learned about air pollution from agriculture in California's Central Valley, and the lesson pushed students to consider how an increase in human population would affect future generations.

Though this grant-funded program did not visit classrooms within Kern County, it occurred in Central Valley communities adjacent and similar to communities in Kern. These same types of lesson plans, perhaps with more of an emphasis on clean transportation technologies could be utilized within the county. One important aspect of the program was that at least a portion of the materials were produced in both English and Spanish. This ensures that students and their families are participants in an inclusive learning environment, and fully grasp the concepts being presented.



### High School

Establishing advanced transportation career pathways and generating interest for students in high school is crucial to establishing a future skilled workforce. Below are several examples of efforts that could be replicated within Kern County.

In 2008, Kern COG produced video interviews with individuals in a variety of careers impacting air quality, including clean transportation careers, requiring a variety of levels of education — from high school to masters and PhD, including bus technicians, up to a CARB division chief. The DVD[34] was distributed to local high school libraries and career centers and to public libraries.

### San Joaquin Valley Clean Transportation Center

There are several existing efforts which aim to develop local educational channels that set a clear path into clean transportation workforce development opportunities in the Central Valley. CEC collaborated with Southern California Gas Company to launch the San Joaquin Valley Clean Transportation Center (SJVCTC) in 2015. Led by CALSTART, the program was established to accelerate the use of clean vehicles and fuels to help the region meet its air quality targets. The program primarily did this by providing technical assistance and project development expertise to San Joaquin Valley vehicle owners, governments, and residents. The SJVCTC team made a significant effort to establish connections with high school technical education programs, particularly within disadvantaged communities. The director for the SJVCTC was invited to and participated in an advisory committee for Career Technical Education programs at Edison High School within the Fresno Unified School District, located in one of the most severely disadvantaged communities in California. This opportunity allowed teachers to learn the latest in clean transportation technology allowing them to share career path insights with their students.

### NOVA Advanced Transportation Program

As part of a series of California Energy Commission and California Workforce Development Board funded grants, NOVAworks, a nonprofit, federally funded employment and training agency in Silicon Valley, led an initiative to build a regional advanced transportation talent pipeline. Partnering with local community colleges and universities, including San Jose State University, as well as key industry employers (Tesla

[34] https://www.youtube.com/watch?v=eH2Ev6ZXlaY

Motors, Honda, Toyota, Nissan Research and Development and ChargePoint) the project team developed overview materials and training programs to inform, engage, and motivate the future workforce of the nascent clean transportation industry.

The first key outcome of this effort was the creation of a video designed to encourage Silicon Valley High School and college educators to prepare their students for careers in the advanced transportation industry cluster. This not only includes electric vehicles, but also self-driving vehicles, connected vehicles, and intelligent transportation systems. The video features industry and educational leaders touting advanced transportation careers as intellectually stimulating, socially beneficial and accessible to students. A link to the video can be found here: https://www.youtube.com/watch?v=ukRMeAV_P0w

The second opportunity that was provided through this program was a weeklong Advanced Transportation summer camp. Held onsite at Prospect Silicon Valley, a San Jose based clean transportation innovation hub, high school students (as well as a few 8th graders) were introduced to new transportation applications and to the innovators behind those technologies. Highlights included presentations from a representative from ChargePoint, a demonstration of a LIDAR enabled autonomous vehicle, and sessions in an automotive simulator. This curriculum provided students foundational skills, motivation, a sense of career direction and role models. Notably, it can inspire students considering multiple career pathways- one student might go to a four-year university to get an engineering job at ChargePoint, while another might attend a trade school to develop the skills to be an automotive technician on heavy-duty battery electric buses.

Though this program occurred in Silicon Valley, a similar effort could easily be integrated into existing activities in Kern County, and perhaps more broadly in the Central Valley as has been done by community colleges, the San Joaquin Valley Clean Cities Coalition, Project Lead-the-Way, and other efforts. In fact, as the end uses of many heavy-duty ZEV technologies will occur in the Central Valley, a program of this nature, with an emphasis on the high school to trade school/community college route would be particularly valuable to interested students in Kern County. The demand for skilled workers to operate and maintain ZEV and related charging infrastructure, not to mention utility and grid upgrades to accommodate deployment, will only continue to increase.

## Community College

### *Bakersfield College*

Training at the community college level will be essential to preparing a workforce suited to handle the on-the-ground operations of advanced transportation. As part of previously grant funded efforts in the light duty ZEV space, Kern COG is already collaborating with Bakersfield College (BC) on workforce training for incumbent workers and those entering areas of the ZEV infrastructure workforce, along with training for EV technicians and ZEV dealership sales employees through the Strong Workforce Program.[35] Bakersfield College offers over 70 associate degrees, more than 30 certificate programs, and has a service area approximately 143 miles wide which is larger than the states of Connecticut, Rhode Island, and Delaware combined. BC serves over 31,000 students annually — the majority of whom represent a high-need population with many hailing from surrounding rural communities. The following are several initiatives BC is working on to train the local workforce in the skills needed to participate in the advanced transportation economy.

### *Automotive Technology Training Facility*

On April 21, 2022, Bakersfield College opened its new Automotive Technology Training facility at the Bakersfield Auto Mall. This facility will provide students the opportunity to train and learn on trade-in vehicles which will then be auctioned with proceeds contributing financial support for the College's program.

Bakersfield College developed a comprehensive training curriculum, taught by Society of Automotive Engineers (SAE) and Automotive Service Excellence (ASE) certified instructors, which prepares automotive students to be hired into entry-level and intermediate automotive technician jobs. At the new facility, BC offers equipment from cutting edge industry leaders, such as General Motors, Snap-On Tools, Bosch Auto Parts, AES Wave, Integrated Supply Network, Hunter Engineering, and Chemical Guys.

This hands-on training opportunity is a fantastic experience for community college students looking to gain a sense of what a career as an automotive technician might be like. This type of program could be expanded to include access to HD ZEVs and charging/refueling technologies, perhaps in partnership with local transit agencies (Golden Empire Transit District), public works departments, or commercial fleets.

[35] https://www.bakersfieldcollege.edu/community-collaboratives/advancing-bcs-automotive-technology-programs

*Figure 13: A digital rendering of the automotive training facility.*

### *Electric Vehicle Repair Program*

Building on its existing automotive technology program, in 2021 BC launched its first course in EV and maintenance repair. The first course, *Introduction to Electric Vehicles*, was offered in Summer 2021. Curriculum is being developed in partnership with Valley Clean Air Now, using Electrify America (VW) funding. Both incumbent technicians and non-technical staff are allowed to participate, with invitations being given to local auto repair shops. The connection between community college programs and on-the-job training is an important one. Training programs will support transit, school transportation, EV infrastructure installation, EV technicians, and EV station maintenance and repair technician careers. A solar-powered mobile EV charging station and two Level 2 chargers are being installed at the BC campus to support training for careers in transit, school transportation, EVI installation, EV technician, and EV station maintenance and repair.

### *Valley Clean Air Now (Valley CAN)*

Valley Clean Air Now (Valley CAN), is a 501(c)(3) public charity committed to quantifiably reducing air emissions in California's San Joaquin Valley, the region with the worst air quality in the U.S. Valley CAN has partnered with community colleges and high schools throughout the San Joaquin Valley to develop an EV Workforce Training curriculum. Courses are designed to train students in the latest clean vehicle technology and equip them with the technical skills for careers in this fast-growing industry. Training is held Bakersfield College, directed by ValleyCAN and funded by Electrify

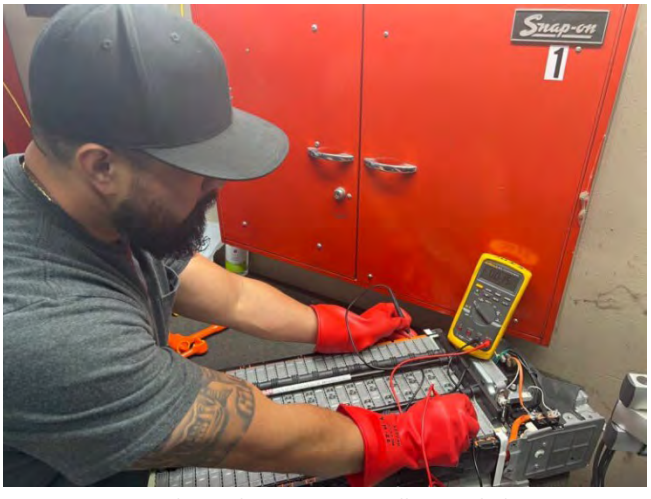



*Figure 14: A student taking part in a ValleyCAN led training program.*



America, ValleyCAN's partner in the EV Repair Program described above. Additionally, they are working with other colleges throughout the Central Valley, and two high schools in Visalia.

Current programs offered include a 40-hour Introductory Course to Electric Vehicle Maintenance, and a four-unit Basic EV Diagnosis and Repair course. Two four-unit courses will be offered in late 2022: Advanced Electric Vehicle Diagnosis and Repair and Hydrogen Fuel Cell.

The course offerings of ValleyCAN are terrific opportunities for students and existing workers to have hands-on experiences with new technologies and vehicles. The program has a broad reach across the Central Valley due to its partnerships with area educational institutions. It appears that the majority of the curriculum developed to date applies to light-duty vehicles. This is a great introduction that covers the basics of working with ZEVs. This presents an opportunity for the program to expand to work with EVSE (for both light and MD/HD), as well as with MD/HD ZEVs.

### Vocational Training

Understanding the expected size of the potential job market and the rate at which it will grow is an integral part of right-sizing the vocational training pipeline for a specific sector in a defined region. There are several factors expected to have an impact in the Kern transportation sector that indicate that ZEV technologies will grow in adoption over the next 20 years. As mentioned in the job creation section of the Blueprint, projections for increased goods movement activity in the Kern Region, combined with California state mandates for adoption of ZEVs, will not only create an opportunity, but a necessity, for increased jobs in the ZEV transportation and support sectors.

On-the job workforce training is essential to allow for deployment of ZEVs and the necessary charging and refueling infrastructure in a near-future timeframe. CARB estimates half of California's current workforce of 60,910 auto service technicians and mechanics would lose their jobs over the next two decades when Governor Newsom's 2020 Executive Order ordering the end of the sale of gas-powered cars in California beginning in 2035 goes into effect. While this impact won't be entirely mitigated, it can be offset by training existing workers (also called "incumbent" workers) on how to maintain and operate ZEV technologies. Publicly funded programs and efforts of industry employers must take a deliberate approach to on-the-job training to ensure employees who want to work with new, clean technologies have the appropriate training and skills to do so. Below are several examples of on-the-job training programs that should be of interest to workforce development in Kern County.



### *Electric Vehicle Infrastructure Training Program*

The Electric Vehicle Infrastructure Training Program (EVITP) is a brand-neutral, volunteer-based, non-profit organization that trains electricians in the electric vehicle infrastructure space in the U.S. and Canada. EVITP.org training includes site assessment, load calculations, National Electric Code, jobsite safety, personal protection equipment, and other installation and maintenance best practices. California Assembly Bill 841 which passed in 2020, requires at least a quarter of certified electricians on publicly funded or authorized projects to have participated in the 18-hour course. The Biden Administration is recommending electricians be trained in the program as part of the NEVI Program, which will fund 500,000 EV charging stations nationwide at a cost of $7.5 billion. It is therefore essential that fleets, facilities, utilities and charging manufacturers ensure they are partnering with are having their electricians complete EVITP certification. Kern COG has worked with the San Joaquin Valley Air Pollution Control District to secure access to their training grant funding, which will cover the cost of the online course fee. Kern COG promoted the training to increase participation from electricians located in the Central Valley.

### *Golden Empire Transit District*

Golden Empire Transit District (GET) is the primary public transportation provider for the Bakersfield Urbanized Area. GET is the largest public transit system within a 110-mile radius. A leading fleet in terms of sustainability, GET already operates nearly 90 transit buses using compressed natural gas (CNG). To meet the requirements of CARB's Innovative Clean Transit Regulation, GET is currently revamping its fleet and facilities to support ZE buses using hydrogen fuel cell vehicles and fueling, as well as BEVs and charging stations.

GET is adopting a "train the trainer" approach by which key operations and maintenance personnel, such as lead technicians and supervisors, will take part in the OEM and vendor training programs to bring technical expertise and knowledge in-house.

GET's training plans provide a great example of how on-the job training can efficiently and effectively be provided by the technology vendors, vehicle OEMs and infrastructure providers. This method of training is common throughout the transit industry. In this case, GET has selected Air Liquide and Air Products to provide permanent hydrogen fueling infrastructure training to the appropriate GET staff. Topics covered in the training include general hydrogen safety awareness training for onsite staff, operator specific training on safe fueling procedures, using the gaseous and liquid hydrogen equipment, and Emergency First Responder Training for fire department representatives as well as GET

onsite first responder staff. For their battery-electric bus charging infrastructure, training will be provided by selected vendors BYD and Proterra on how to maintain the charging infrastructure, as well as first responder training on battery-electric buses and infrastructure. There are separate training modules being developed specific to operations and maintenance of the H2 and battery-electric buses themselves. Additional training will be provided by other transit agencies and/or outside programs, such as the West Coast Center of Excellence in Zero-Emission Technology hosted by Sunline Transit Agency in Thousand Palms, California.

*West Coast Center of Excellence in Zero-Emission Technology*

The West Coast Center of Excellence in Zero Emission Technology (CoEZET), hosted by SunLine Transit Agency, provides education to transit agencies looking to establish or increase their ZE fleets and technologies. The center hosts hands-on training classes and events that will educate transit authorities on both battery-electric and fuel cell electric buses.

*Figure 15: CoEZET class in session*

*South Valley ZEV Talent Pipeline Project*

Kern COG is a partner to the Kern Community College District in a recently awarded Energy Commission project to work with industry, nonprofits, and government agencies to develop and conduct training to fill the talent pipeline for installing and maintaining EV charging infrastructure. The program will also provide incumbent workers with information needed during the ZEV transition. Bakersfield College is within the Kern Community College District, and its existing ZEV curriculum will be greatly augmented by the grant funding. Additional grant funding building out similar programs of this sort is essential for developing a skilled workforce capable of working with MD/HD ZEVs and related infrastructure.

### First Responder Training

Project Clean Air offers hands-on training for first responders on BEVs, CNG vehicles, and hydrogen fuel cell vehicles, funded by grants and sponsorships. Project Clean Air works with AFV Educate to provide the courses. Together, they added a module to the curriculum covering ZE motorcycles, used by some police departments in the Central Valley. Kern COG has sponsored these workshops, which have been attended by the Tehachapi Police Department and the Kern County Fire Department training chief, among others. There is value to showing local fire departments the types of ZEVs and hybrid EVs on the road in their areas including school buses, transit buses, light-duty vehicles as well as MD/HD trucks.

*Figure 16: Project Clean Air first responder training.*

## Conclusion

Kern County has robust potential to provide the workforce and meet the needs of the burgeoning MD/HD ZEV transportation sector and its support industries. Existing efforts across the state and locally in Kern County provide an excellent foundation on which to develop curriculum that will support the flourishing of a talent pipeline to install, operate and maintain MD/HD ZEV charging and refueling infrastructure. Additional funding should be provided by state, federal and local resources to develop specific MD/HD ZEV curriculum. Additionally, fleets and project managers vetting of technology providers should have a basis for selecting providers that provide on-the job workforce training materials, as this is the most effective way to train current employees on the specific technologies being implemented by the fleets, whether transporting people or goods.

## Future Job Types

### Executive Summary

The transition to clean transportation technologies will result in a significant number of jobs being created, particularly in California. One may correctly assume that many of these jobs will be created in urban areas such as Los Angeles and Silicon Valley due to the rise of ZEV and ZEV infrastructure manufacturing and related technologies already established in those locations. The deployment of these technologies will also have a positive effect on job creation and job transformation across the state. Many individuals, businesses, and agencies in Kern County recognize that because of several factors unique to the region it is a prime location for clean transportation jobs.

In the next eight years, according to one estimate, 2,609 California electrical workers, or 6.8% of the existing electrician workforce, will be employed installing EV chargers. Kern County has a 2,230-job deficit in the automotive repair/technician labor market, with these jobs earning an average annual salary of $43,500.[36] This industry is estimated to have a current total GDP for Kern County of $173 million. The Bureau of Labor Statistics projects growth of 69,000 openings in the United States for automotive service technicians each year through 2030, with an advanced technician with proper certifications earning $100,000 or more.[37]

Many of the clean transportation jobs have similarities to existing automotive career pathways, though training and certifications will be required to acclimate workers to new technologies. With proper planning and policies, jobs can be created in DACs, which are disproportionately affected by emissions from the current transportation system and most in need of the creation of good paying jobs. The following memo will highlight the sectors of the economy that make Kern County unique, and that stand to experience growth from the advent of MD/HD ZEV infrastructure technologies.

### Context for Sector and Regional Job Growth

In 2019, Kern County had the highest GDP of any county in the Central Valley, and this production, barring agricultural issues from water shortages, shows no signs of slowing down. Rising population, increased freight movement, and increased, continual growth

[36] https://www.bakersfieldcollege.edu/community-collaboratives/advancing-bcs-automotive-technology-programs
[37] https://www.bls.gov/ooh/installation-maintenance-and-repair/automotive-service-technicians-and-mechanics.htm

of the agricultural industry will create demand for on-road MD/HD vehicles and jobs in Kern County.

The transition to clean transportation technologies will continue to expand, driving job growth in this sector. According to the 2022 U.S. Energy and Employment Report (USEER) released by the US Department of Energy (DOE), California gained 11,050 new jobs in low or zero-carbon motor vehicles.[38] Specific to MD/HD EVs, a 2021 report estimates that growth in this sector will generate ~9,100 additional job-years from 2021 to 2030 in California (job-years is a precise unit of measurement indicating one year of work for one person, used because there may be a variance in the amount of time a job will last).[39]

California has numerous incentives in place that support the deployment of ZEVs. Current and upcoming funding for ZEV infrastructure has expanded, from a research and development emphasis to also include deployment, which bolsters the prospects for additional job opportunities. President Biden has signaled that at the heart of the clean energy transition are good paying union jobs, and policies have been laid out to ensure the benefits of government investments in the clean economy accrue to disadvantaged communities. As is detailed in other chapters of this Blueprint, Kern County has a disproportionate number of disadvantaged communities relative to its population compared to the rest of the state. This signals an incumbent increase of investment and activity to occur in Kern County over the next few decades.

## Sectors

Kern County finds itself in a unique position in the state, national, and world economy. Close to most of the population of California and readily accessible to the American West, it is also the logistics hub for goods coming across the Pacific Ocean from Asia, due to its proximity to the Ports of Los Angeles and Long Beach, the largest ports complex in the nation.

### Goods Movement/Logistics

The City of Shafter is the geographic center of population — the single point that is closest to all people in California. As a result, major corporations have set up their West Coast distribution hubs in Shafter. Kern County is home to more than 50 distribution centers, due to its proximity to major population centers in the U.S. (10 million in the Bay

[38] US DOE, https://www.energy.gov/articles/doe-report-finds-energy-jobs-grew-faster-overall-us-employment-2021

[39] Energy and Environmental Research Associates, LLC https://etcommunity.org/assets/files/Workforce-ProjectionstoSupportBatteryElectricVehicleChargingInfrastructureInstallation-Final202106082.pdf

Area/Sacramento and 22 million in SoCal). Major distribution centers tenants include Amazon, FedEx, Frito-Lay, Target, and Walmart. Most of these companies are being driven by their own sustainability commitments, as well as state regulations and market dynamics to begin to transition to ZEVs for on-road transport of their products, as well as moving said goods around their distribution facilities. In the community of Mojave, the Mojave Inland Port will be located at the southeast corner of State Route 14 and 58. The expected capacity will be up to 3,600 trucks per day and 3 million containers per year once operational in 2024.[40] Jobs will be created via this industry in many different categories: drivers, vehicle operation and maintenance, ZEV infrastructure providers and maintenance, electricians, and utility workers. As evidenced by the 2022 supply chain issues induced by the COVID-19 pandemic, there is going to be an increased demand for labor across all transportation job categories.

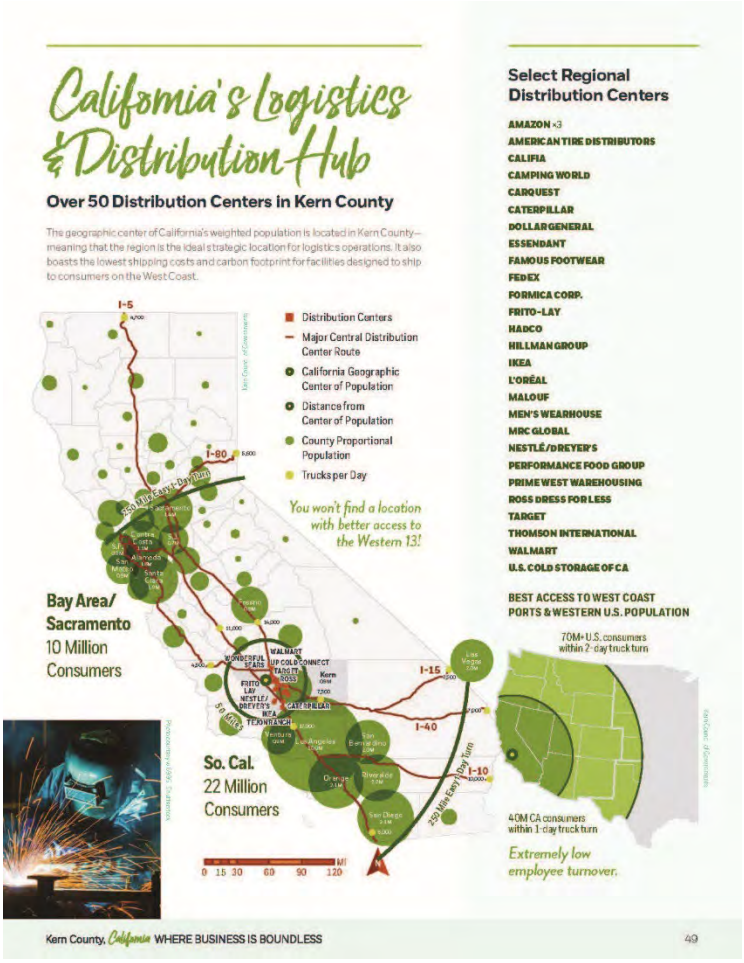



*Figure 17: Map Showing Major Distribution Hubs in the Central Valley.*

## Agriculture

In Kern County, food and beverage manufacturing accounts for 88% of all manufacturing jobs. Kern County has been the national leader in agricultural production for over five years, representing 19% of the county's employment. The 2020 gross value of all agriculture commodities produced in Kern County is $7.67 billion.[41] Many of the large

[40] https://www.freightwaves.com/news/mojave-inland-port-aims-to-speed-up-seaport-freight-flows
[41] 2020 Crop & Livestock Report. Kern County. http://www.kernag.com/caap/crop-reports/crop20_29/crop2020.pdf



agricultural companies rely heavily on MD/HD vehicles to harvest, transport, and distribute their products. As more than 250 crops are grown in the region, agriculture related transportation represents a large portion of the local economy. Furthermore, the adjacent counties, Fresno, Kings, Merced, San Joaquin, Stanislaus, and Tulare are the six of the top seven agriculture producing counties in the U.S. Movement of fresh and processed agricultural products through the region represents a significant amount food-related transportation for the nation. Looking at current and upcoming regulation as well as the improving economics, many agricultural companies are considering shifting their fleets to ZEVs. The types of vehicles that can be utilized include off-road equipment, captive fleets, and fleets for hire.

### Transit

Bakersfield will be the fastest growing major metropolitan region in the U.S., predicted to grow by 111% from today's level to 1.8 million in 2060. As population rises in Kern County and the Central Valley generally, moving people will place greater demands on the transportation system. Though it may be tertiary to commercial transportation and agriculture-related transportation in terms of the sheer potential for ZEV penetration, transit is a key industry in terms of job creation because of the immediacy of the transition. California based transit agencies are mandated to transition to ZEV technologies (BEVs and hydrogen fuel cell buses) prior to the mandated transition that will be required for commercial fleets. Additionally, transit buses offer operational profiles that are conducive to the adoption of battery-electric buses.

Transit employers in Kern County include Golden Empire Transit District (GET) and Kern Transit. GET is the primary transit provider for the Bakersfield Urbanized area. Since 2005, nearly the entire bus fleet has run on CNG. GET has begun investing in ZEV technologies, receiving an award from the competitive Federal Transit Administration's Low or No Emission Bus Program to add a hydrogen fueling station and 12 fuel cell electric buses to its fleet. These efforts have been planned to meet 2030 ZE transition goals and a full transition to ZEV technologies by 2040 per California's Innovative Clean Transit (ICT) regulation. GET currently operates close to 90 CNG buses but plans to replace each on a one-to-one basis with zero-emission buses, whether hydrogen fuel cell or battery-electric depending on what is applicable to existing routes. The deployment of these ZEBs will create new employment opportunities, inclusive of but not limited to drivers, technicians, electricians, and other transit occupations.

Kern Transit, the transit provider for unincorporated communities through Kern County, serves the same number of routes (16) as GET and remains a crucial resource to rural citizens in Kern County. Kern Transit has made strides towards ZE transition and emissions

reduction goals, partnering with the State of California and Antelope Valley Transit Authority to trial a battery-electric bus. This test-run occurred towards the end of 2019, and since has been adopted by Kern Transit as a regularly routed bus. Like GET, these adopted ZEV technologies will open numerous opportunities for job creation, spurring new transportation occupations in Kern County where public transit participation is continually on the rise.

### Other

Though demand for the installation of DC Fast Chargers will be driven by captive fleets, logistics companies, transit agencies, and by the deployment of publicly accessible DC Fast Chargers for light-duty passenger vehicles, significant investments at the federal and state level will add to ZEV EVSE market growth. Hydrogen fuel will experience this phenomenon, but in a different regard. As hydrogen fuel is useful for hard to decarbonize areas such as manufacturing, aviation and rail, jobs are expected to be created in hydrogen fueling for HD vehicles in response to the surge of hydrogen as a fuel in each of these end uses. Additionally, a few companies have expressed interest in Kern County and the Central Valley to locate Green Hydrogen production facilities, such as San Joaquin and Tehachapi. This could significantly reduce the price of hydrogen fuel in the region and accelerate fleet conversions to MD/HD ZEVs. Kern County and the City of Bakersfield were both awarded Communities Local Energy Action Program grants from the U.S. DOE in 2022. These grants will provide technical assistance from experts at NREL, who will work with local community partners such as Kern Community College District, to develop advanced clean energy projects while also creating new jobs. The Kern County award would have NREL assist with the planning of 30-million-square-foot park on 4,000 acres.[42]

## Job Types Created

### Planning and Design

Developing charging stations, especially those for MD/HD ZEVs in a commercial setting, requires a lot of preparation, and a skilled workforce to do said preparation. A licensed electrical contractor must perform an initial evaluation to identify electrical lines and other infrastructure (such as transformers, electrical panels, lighting) that will determine where the chargers should be located. Utilities will require workers to design or to review plans. Permitting is also a necessity, especially for installation that will be of a larger capacity. If vehicles are providing V2G services, that entails additional jobs to design software and hardware systems that communicate between the utility, EVSE provider,

[42]Kern County https://www.kerncounty.com/Home/Components/News/News/660/34810



and the vehicle owner. Fire departments are frequently engaged to review plans during the permitting phase and the inspection phase of a high-voltage project.

### Construction and Installation

Perhaps the largest field in which jobs will be created from MD/HD ZEV infrastructure is in construction and installation of EVSE. Site preparation will typically be required for projects involving MD/HD ZEV infrastructure installation, as these larger installations (compared to projects for light-duty vehicles) will not be able to operate off of existing power at the site. Therefore, a panel upgrade will be required. This will typically require trenching and the laying of electrical conduit. If utility infrastructure needs to cross roadways in order to connect to EVSE at the site, additional road construction workers may be engaged.

### Electricians

Properly trained electricians are essential to not only complete the construction and installation of EVSE, but also to perform the ongoing maintenance of the equipment. As referenced in the Workforce Development Strategy Memorandum, a number of jobs will be created or revitalized with the need to install and maintain and service ZEVs and their corresponding infrastructure. EVITP training will mandate that the future workforce of electricians will be adequately skilled to work on MD/HD ZEVs and the EVSE and refueling infrastructure required to supply them with energy. MD/HD ZEVs will be charged with high-powered DC Fast Chargers, which are more complex than Level 2 chargers and will require more electricians to both install and maintain.

### Drivers

Though not specific to infrastructure, there will be a need for existing drivers to learn how to operate ZEV trucks and buses. There is a national shortage of truck drivers, and new entrants to the field will be enticed by the promise of driving a new, clean, comfortable, and advanced electric or hydrogen fuel cell truck. Significant recruitment efforts are being undertaken to hire and retain new truckers, as autonomous trucking is still decades away from mainstream adoption. Specialized ZEVs such as forklifts, agricultural tractors, electric truck refrigeration units (eTRUs) may require minimal training specific to the vehicles and operations.

### Maintenance/Technicians

Near-zero emission (NZE) infrastructure requires technicians that are skilled in maintenance operations to upkeep reliability and quality of performance. Unlike diesel fueling stations, ZE infrastructure typically requires being connected to a network,



allowing station providers the ability to use telematics to track the performance and usage of the infrastructure. Possessing the skillset to maintain this network and address any wiring issues or outages is vital to ensuring that ZE infrastructure is functional and accessible to its consumers. These positions can be filled by on-the-job training candidates, or those attracted to the work who already hold the credentials to perform necessary tasks.

### Fleet Operations and Management

Jobs will require significant on-the-job training to accommodate the transition to BEVs and FCEVs. In some cases, fleets will hire new personnel to manage ZEV elements. Additionally, fleet operations must incorporate skillsets that emphasize the ability to manage charging, as charging schedules take on a higher priority with the charging of BEVs. Assessment of both vehicle operation data and charging data is essential for proper ZEV operation and continued expansion within a fleet and is also a requirement of state and federally funded grants, which are often needed to help fund ZEV infrastructure projects. Criteria that need to be considered are the charging status, charging sessions, and charging behavior of drivers. ZEV fleet managers and infrastructure operators must possess the technical skills to interpret, manage and report on this data and will need to be trained in how to operate new software and/or be hired with that existing skillset.

### Infrastructure Providers

The regional utilities will need to increase their workforce to accommodate the rise in MD/HD ZEV infrastructure. The three major utility infrastructure providers in the county are Pacific Gas and Electric (PG&E), Southern California Edison (SCE) and Southern California Gas Company. More electric utility employees will need to be hired to accommodate the increasing number of sites that are pursuing the installation of EVSE. This will occur over all utility jurisdictions at commercial locations, both publicly accessible and used exclusively by private fleets — essentially anywhere within utility service areas. This is especially true due to both PG&E and SCE having MD/HD Make Ready Programs for commercial fleets that at least partially cover the costs intrinsic to these projects. The specific operational characteristics of HD BEVs can mean they have more fixed charging schedules than light duty vehicles, require special consideration and more deliberate planning from utility engineers. Power demands are likely to be large at many sites, upwards of several megawatts. There will likely be a need for increased generation, transmission, and storage of electricity, leading to a need for jobs in these sectors.

With the addition of nascent hydrogen as a fuel source, an entirely new section of the energy economy may emerge. Jobs will be created in the distribution of hydrogen via



truck tankers, or even potentially from pipelines, to fuel long-distance HD trucks bound for the East Coast. Hydrogen produced by electrolysis may utilize solar power (requiring renewable energy developers and electricians) and be transported to refueling stations across Kern County and statewide. Hydrogen refueling stations and the hydrogen supply industry will require technicians and maintenance providers to provide service.

### Emergency Services

Emergency personnel will need to be properly trained in how to respond to incidents with ZEVs — both BEVs and FCEVs. As emergency personnel will need to be trained, there will also be an increased demand for personnel trainers, creating an additional emergency services job type. Considerations for BEV and FCEVs emergencies include fire suppression, disposal of damaged vehicle components, and use of suitable protective equipment. HFC emergencies must also consider asphyxiation when exposed to hydrogen, leakage from storage sources, and storing hydrogen properly to prevent chemical mixing that may generate adverse reactions. Chemical, electrical, and thermal hazards must be addressed according to the size and composition of the vehicle battery, and the same hazards must be addressed according to hydrogen properties, whether in gaseous or liquified forms. These procedures are reinforced by code and regulation mandated by the National Fire Protection Association (NFPA) and the International Fire Code (IFC), alongside others, which must be thoroughly understood by the personnel administering mitigation to these emergencies.

### Additional Job Impacts

Job creation will not be limited to vocations in vehicle and infrastructure deployment, operations, and maintenance. Kern County will also benefit from the creation of jobs in the MD/HD ZEV and ZEV infrastructure manufacturing space. Rio Tinto, a leading global mining group, found a potential large source of lithium for electric car batteries in Boron, California in 2019. The company started production in 2020, and this plant is expected to produce an estimated 10 tons of lithium-carbonate/year.[43] Kern County also harvests some of the highest solar energy gains in California. In early 2022, work began on a 100MW solar project in the eastern part of the county, expected to generate over 300 union construction jobs[44]. Jobs will continue to grow in the renewable energy space,

[43] Resource World Magazine https://resourceworld.com/rio-tinto-achieves-battery-grade-lithium-production-at-boron-plant-from-waste-rock/
[44]Cox, Bakersfield.com https://www.bakersfield.com/news/work-starts-on-100-megawatt-solar-project-in-eastern-kern/article_e135ea22-700f-11ec-8fcc-e7aa8f3d631f.html



which will be an indirect but essential element to powering regional haul and drayage battery electric trucks making their way back and forth from the ports to Kern County.

### Induced Jobs

Job creation will also occur through services supporting the workers that come into the region to install, maintain, or operate ZEV infrastructure. Induced jobs are those that are created indirectly as employees in one sector buy goods and services (such as lodging, food, entertainment, etc.). In the US, the transportation and warehousing field creates 162.3 induced jobs for every 100 direct jobs.[45] It is therefore reasonable to project that this will have a large economic benefit to Kern County businesses.

## Impact on Communities

Job creation will be especially important in the disadvantaged communities within the Central Valley. The residents of these communities are the ones who bear the brunt of the negative air quality impacts created by diesel used in goods-movement trucking, transit, waste hauling, and agricultural production.

Residents will have ample opportunities to be brought into a burgeoning economy- talent pipelines are being fortified and established at the local, state, and federal levels. Furthermore, job creation is specifically being targeted toward those who are currently or formerly employed in jobs in the fossil fuel economy. With Kern County being one of the highest volume oil production counties in the nation, and having a large number of truck drivers, there is a massive opportunity to transition a workforce in legacy industries to careers of the future, which could include autonomous vehicles.

### Need for Equity

Barriers to the uptake of EVs are much more significant in DACs. Barriers include low income, high unemployment, language, lack of outside investment in infrastructure and services, and lack of access to education needed to increase skills and/or knowledge to enter into clean transportation careers. The disadvantaged populations lack the access and ability to reach the resources necessary to access clean vehicles and clean vehicle jobs; meanwhile, the agencies that provide the necessary resources remain underfunded for expansion when the industry is poised to grow. Public funding is increasingly aimed at disadvantaged communities; however, public agencies move relatively slowly compared to technology adoption in well-funded ecosystems. The private sector is guided by

[45] Bivens, Economic Policy Institute https://www.epi.org/publication/updated-employment-multipliers-for-the-u-s-economy/



optimal revenue conditions, which is a natural barrier for disadvantaged communities. There are companies, such as Miocar and Green Raiteros, that specialize in providing access to electric vehicles and the EV experience for low-income communities, but these companies remain underfunded relative that that required for significant deployment for the same reasons.

Many Central Valley communities continue to lag in access to broadband, limiting access to online information regarding funding programs, station locations, and other important ZEV related information. The low-income and immigrant communities experience language barriers and access to communication resources such as cell phones and internet. Furthermore, a steady rise in the technology costs places electric vehicles purchases further out of reach lower income communities. Supply chain issues have had an impact here recently as well, with a lack of cars being available for many low-income buyers. Tools and access for the community to approach EV adoptions is one side of the issue, while the other side is for governments and agencies to invest in outreach efforts to aid environmental justice communities. Even if the tools exist, low-income residents are less likely to know that resources are available because of the novelty of the technology. For these reasons, it is no surprise that the penetration of ZEVs in DACs is currently very low. There are several policy interventions in place to address this issue, such as the Justice40 Initiative, Senate Bill 535, and Assembly Bill 1550. The Justice40 Initiative is a requirement from Executive Order 14008 that ensures the delivery of at least 40% of the overall benefits from certain federal investments to disadvantaged communities.[46] Senate Bill 535 established initial requirements for minimum funding levels to be allocated to disadvantaged communities, giving CalEPA responsibility to identify and designate disadvantaged communities.[47] Assembly Bill 1550, a product of Senate Bill 535, included CalEPA's final identification and designation of disadvantaged communities, while establishing minimum funding levels to low-income and disadvantaged communities.[48] As demonstrated by federal and California regulation, these programs prioritize the installation of EVSE in DACs, which will increase the number of jobs created in these locations.

It is useful to point out that for public works projects, prevailing wage requirements are required in California, meaning wages must not be less than wages for similar classifications of work elsewhere in the area. Additionally, workers joining the sector will

[46] https://www.energy.gov/em/justice40-initiative#:~:text=The%20Justice40%20Initiative%20is%20a%20requirement%20of%20Executive,benefits%20from%20certain%20federal%20investments%20to%20disadvantaged%20communities.
[47] https://calepa.ca.gov/envjustice/ghginvest/
[48] https://calepa.ca.gov/envjustice/ghginvest/

enjoy higher wages than those not taking part in the ZEV transformation. A Los Angeles Economic Development Corporation (LAEDC) study in 2020 found that Southern California jobs in the EV Industry pay much better than average, $80,900 compared to an average annual wage of $60,400.[49]

## Conclusion

Kern County stands to benefit greatly from the transition to MD/HD ZEV infrastructure. The County's unique location serves key economic sectors critical to the local and state GDP. Sectors like goods movement, agriculture, and transit will be driven by state regulations, market dynamics and internal sustainability goals to transition their fleet vehicles to ZEVs and deploy EVSE. Jobs will be created in the region directly, through the deployment of EVSE which will result in new jobs in construction, electrical upgrades, permitting, and design. Federal and state government agencies need to support local efforts as they comply with ZEV initiatives, regulations, and planning requirements to make sure investments are being made in their DACs, ensuring jobs are created in the communities that need them most.

[49] Los Angeles County Economic Development Corporation (LACEDC) https://laedc.org/wpcms/wp-content/uploads/2020/03/EV_Report_Digital_FINAL_Single_Page.pdf



## Reduction of GHG and Other Air Toxins

### Purpose

Reduction of GHG emissions, criteria air pollutants, and toxic air contaminants (TACs) in Kern County are a critical goal of this Blueprint which supports the acceleration of the region's clean transportation goals. Kern County has poor air quality, causing dangerous health effects along with a reduced quality of living for its residents, especially those in disadvantaged communities as identified by CalEnviroscreen and Low-Income Community mapping tools. ZE transportation, including electrification and hydrogen technology, provides an opportunity to address these issues for both regional fleets and longer-range transportation fleets that traverse Kern County, particularly MD/HD trucks, accessing the goods movement corridors. Counties seeking to comply with federal and state legislative emission reduction goals benefit from developing regional Blueprints to fine tune the approach while incorporating the needs and capabilities of their region. This begins with an understanding of which criteria emissions and TACs most heavily impact the region, the source of the pollution, and finally an investigation of the best ways to generate emission reductions within the jurisdiction. California is an ideal state to pursue electrification, as it is estimated that there will be 1.5 to 2.4 million ZEVs on California's roads by 2025, all of which will require significant additions to fueling and charging infrastructure.[50] The following discussion chapter outlines the targets for electrification as related to goals for GHG and emission reductions.

### Current Issue

Kern County sits at the southern end of California's Central Valley, one of California's most frequented trade corridors. Kern's position in the trade corridor results in a large number of vehicle miles traveled (VMT) from goods movement vehicles and emissions from on-road mobile sources. Trucks used for agricultural goods and other commercial goods travel to and from the ports of Los Angeles, Long Beach, and Oakland serving Kern's many distribution centers and warehouses that process goods to be shipped back out to consumers. The on-road mobile source pollutants created by fossil fueled vehicles are the cause of approximately 80% of smog-forming NOx emissions in the San Joaquin Valley's airshed and across California. They also represent about 50% of GHG emissions when including emissions from fuel production, and more than 95% of toxic diesel particulate

[50] https://etcommunity.org/assets/files/Workforce-ProjectionstoSupportBatteryElectricVehicleChargingInfrastructureInstallation-Final202106082.pdf



matter emissions.[51] According to CARB's emissions modeling tool, EMFAC,[52] Kern County had 1,813,557,166.79 diesel VMT in 2021. The high numbers of diesel vehicles traveling through Kern County make the county extremely vulnerable to the criteria air pollutants, and toxic air contaminants that are released. Furthermore, the topography of the valley itself concentrates the emissions and exacerbates the formation of ground-level ozone by retaining nitrogen oxides (NOx) in the local airshed.[53] The geographic structure of valley naturally causes thermal inversions which trap air pollution in the lower atmosphere. The degraded air quality results in negative health impacts including respiratory illness, stress to the heart, loss of lung capacity, asthma, bronchitis, cancer, and shortened live spans. Some community members such as those with preexisting heart and lung conditions, children, the elderly, and pregnant women are more susceptible to these effects.[54] These emissions also lead to new or worsening environmental justice concerns, as emissions and heavily trafficked areas are typically lower income, and the poor air quality further decreases quality of life[55]. Lower income residents are also less able to take recourse when the air quality conditions worsen—wealthier residents may have easier access to air conditioning, air filters, and they may more easily take time away from work. Health effects and economic vulnerabilities worsen in communities with fewer resources. Many residents of these types of communities are employed through the agriculture industry in Kern County, thereby leading to greater impacts to agricultural production, and greater economic losses for Kern County.

## Greenhouse Gas Targets

The physical properties of GHGs such as $CO_2$ and methane cause them to have a global impact, rather than a local impact. Each gas has different sources, life spans, and physical properties that determine the gas' potency, and ability to trap heat and pollutants in the atmosphere, commonly known as the global warming potential[56]. Public sector action on multiple layers of governance has been enacted to reduce the impacts of climate change. Federal, state, and local governments have set reduction goals to address GHGs. On April 22, 2021, President Biden announced new target to achieve a 50-52% reduction from 2005 levels of GHG pollution nationwide by 2030. This target supports the President's

[51] https://ww2.arb.ca.gov/resources/fact-sheets/advanced-clean-trucks-fact-sheet
[52] EMFAC https://arb.ca.gov/emfac/
[53] https://www.epa.gov/ground-level-ozone-pollution/ground-level-ozone-basics
[54] https://www.epa.gov/air-research/research-health-effects-air-pollution
[55] https://www.lung.org/clean-air/outdoors/who-is-at-risk/disparities
[56] https://www.epa.gov/ghgemissions/understanding-global-warming-potentials

goal of achieving net-zero GHG emissions by 2050 and of limiting global warming to 1.5 degrees Celsius [57].

In 2006, California passed the Global Warming Solutions Act (AB 32), which set a statewide 40% GHG emission reduction goal by 2030 and carbon neutrality by 2045[58]. This laid the groundwork for a multi-year statewide program to reduce greenhouse gas emissions. Since AB 32's passing in the legislature CARB has made scoping plan updates in 2008, 2013, 2017, and 2022 to assess program progress and project plans to achieve the 2006 goals[59].

At the local level, SJVAPCD and the East Kern Air Pollution Control District goals have generally aligned with CARB goals. Through the Sustainable Communities and Climate Protect Act of 2008 (SB 375), CARB was tasked with setting regional GHG reduction targets for California's metropolitan planning organizations (MPO), including Kern COG. Each MPO must include a Sustainable Communities Strategy (SCS) chapter as part of their Regional Transportation Plan (RTP) to address the transportation and land use strategies the region could use to meet SB 375 targets set by CARB[60]. In 2014, CARB set regional targets for Kern of 5% reductions by 2020 and 10% reductions by 2035 of GHGs. In 2018, the targets were revised to 9% reductions by 2020 and 15% reductions by 2035.[61] While Bakersfield does not have its own GHG reduction goals set currently, they are working on a Climate Action Plan that is expected to align with the emission reduction goals of the rest of the state.[62]

### Criteria Air Pollutant Targets

Criteria air pollutants include ground-level ozone, carbon monoxide, nitrogen oxides, sulfur dioxide, lead, and particulate matter, all of which have serious health effects on the residents who breathe them in.[63] Ground level ozone is formed from NOx and reactive organic gases (ROG) both are released from tailpipe emissions. Once released the molecules interact in the presence of sunlight to create smog also known as ground level ozone. There are explicit federal reduction targets for Criteria air pollutant reductions,

[57] https://www.whitehouse.gov/briefing-room/statements-releases/2021/04/22/fact-sheet-president-biden-sets-2030-greenhouse-gas-pollution-reduction-target-aimed-at-creating-good-paying-union-jobs-and-securing-u-s-leadership-on-clean-energy-technologies
[58] https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=200520060AB32
[59] https://ww2.arb.ca.gov/our-work/programs/ab-32-climate-change-scoping-plan
[60] https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=200720080SB375
[61] https://www.kerncog.org/2022-rtp/
[62] https://www.bakersfieldcity.us/1088/Climate-Action-Plan-CAP#:~:text=A%20climate%20action%20plan%20(CAP,targets%20for%202030%20and%20beyond.
[63] https://www.epa.gov/sites/default/files/2015-10/documents/ace3_criteria_air_pollutants.pdf

and the state and local air-districts are charged with the responsibility to achieve levels that are in accordance with public health guidelines. In areas where the emissions sources are too high, and determined to be in "nonattainment," the goal is also to reduce overall criteria air pollutants as much as possible as soon as possible. These standards were established by the Clean Air Act (CAA), which recognized the detrimental health effects of criteria pollutants and created a federal regulatory framework to reduce them. National Ambient Air Quality Standards (NAAQS) are set for the 6 criteria air pollutants by CAA as required by the EPA.[64] CAA gives power to states to develop their own plans.

### Toxic Air Contaminant Targets

Toxic air contaminants include particulate matter (PM), mercury, polychlorinated biphenyls (PCBs), benzene, and volatile organic compounds (VOCs) and are often known as human carcinogens.[65] As there are criteria air pollutant reduction goals, there are specific TAC reduction goals. There are federal standards in place to move towards removing them entirely from the air due to their harmful effects. At the state level, California has set reduction goals only for certain TACS, such as PM. CARB adopted the Diesel Risk Reduction Plan in September 2000, outlining a goal of 75% PM reduction by 2010 and 85% by 2020.[66] The local governments of the San Joaquin Valley and Kern have not specified independent goals for TAC reductions and will therefore follow those of the state and federal government.

Similar to the handling of criteria air pollutants, the CAA requires the EPA to regulate toxic air contaminant emissions. National Emissions Standards for Hazardous Air Pollutants (NESHAPs) provides a list of all TACs by source category for non-mobile sources. The EPA also uses the National Compliance Initiative: Creating Cleaner Air for Communities by Reducing Excess Emissions of Harmful Pollutants to enforce the laws and regulations established to decrease toxic air contaminants.[67]

### Emitters at a Local Level

Due to the location and economic drivers of Kern County in relation to Southern California, it is subject to a heavy burden of criteria air pollutants and toxic air contaminants. Image 8.1 shows Kern's county lines in red laid over the map of freeways

[64] https://www.epa.gov/laws-regulations/summary-clean-air-act
[65] https://www.epa.gov/haps/initial-list-hazardous-air-pollutants-modifications
[66] https://ww2.arb.ca.gov/our-work/programs/diesel-risk-reduction-plan#:~:text=In%20September%202000%2C%20the%20California,and%2085%20percent%20by%202020.
[67] National Compliance Initiatives | US EPA. https://www.epa.gov/enforcement/national-compliance-initiatives

and population centers in California, showing the intersection of the 58, 99, and I-5 freeways in the center of the county.[68] Kern County is at the geographic center of population for the state, making it the location with the lowest transportation costs for products shipped to consumers statewide. This also results in the lowest carbon footprint for goods distribution statewide, however, resulting in an increase in air emissions locally. The Federal Highway Administration's 2011 Interstate Brief claims I-5 as the nation's busiest interstate, with 21.4 billion miles traveled annually.[69] Many of the vehicles traveling on these freeways are MD/HD diesel trucks transporting goods through trade corridors, as well as local and regional trucks moving agricultural products.

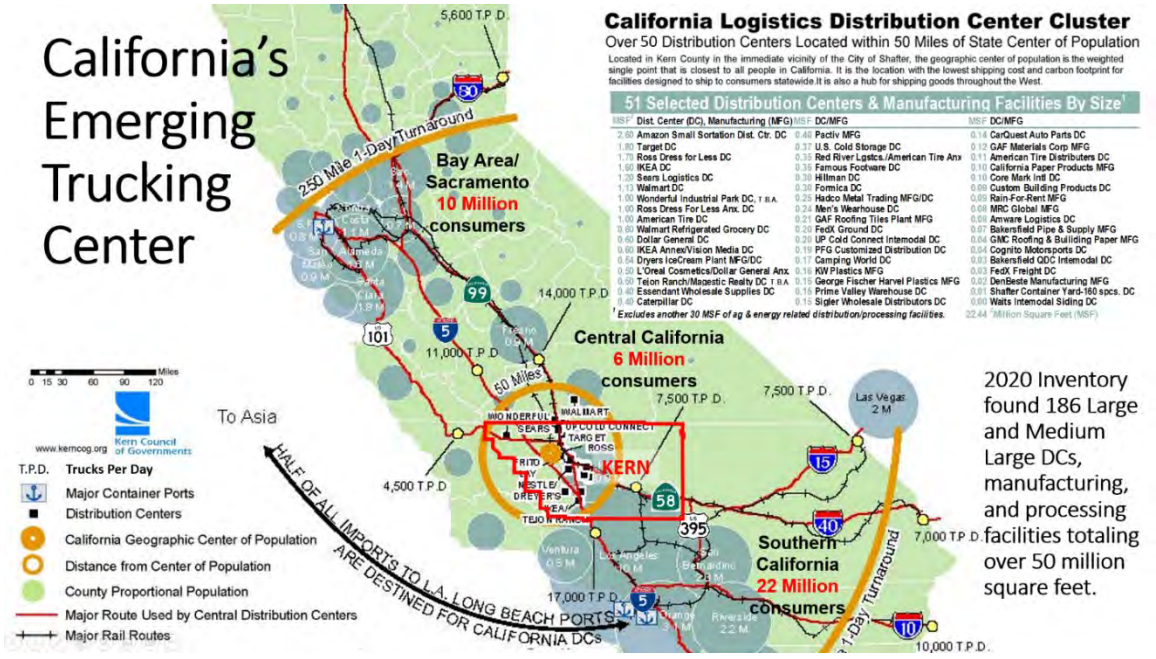



**Image 8.1**: **Kern Public Works map of freeways through Kern County**

MD/HD trucks, still largely powered with diesel engines, are mobile source polluters that release criteria emissions, GHGs, and TACs as they traverse Kern County. Research from the Kern Area Regional Goods-Movement Operations Sustainability (KARGO) study found some sites in Kern County exceed an average of 750 truck visits a day.[70] The high density

[68] https://maps.kerncounty.com/H5/index.html?viewer=KCPublic
[69] https://www.fhwa.dot.gov/interstatebrief2011/
[70] https://www.kerncog.org/wp-content/uploads/2021/01/KARGO_P1_2021.pdf

of travel results in dangerous and persistent levels of emissions in the surrounding communities.

Replacing MD/HD diesel vehicles with ZEVs can contribute dramatically to reducing criteria, TAC, and GHG emissions. ZEVs release no tailpipe emissions compared to their diesel counterparts, are more energy efficient, decrease petroleum dependence, and reduce GHG emissions significantly. For a successful conversion to ZEVs, the region must adopt supporting fueling and charging infrastructure. Kern County is an ideal location for ZEV infrastructure development given the prevalence of highways in the region, coupled with the high volume of traffic that travels through this corridor. The dependence the trade industry has on Kern County means there already are, and always will be, high truck volume carrying loads, relying on Kern for their supporting fueling infrastructure. According to the KARGO study, the number of MD/HD truck trips are expected to double in some parts of the county by 2042 compared to 2018. If these fleets and infrastructure can be converted to ZE, significant results in emission reductions for the region will be achieved.

### Moving Towards Federal and State Goals

California has drastic goals for a full transition to ZEVs, which is a vital step toward carbon neutrality by 2045. The State is taking many steps to help California transition to carbon neutral transportation, which will also improve public health and air quality.

In June 2020, CARB passed a new regulation as part of their approach to accelerate the transition to MD/HD ZEVs on a large scale. The ACT regulation is two-fold: There is a manufacturer sales requirement along with a reporting requirement for Class 2-8 combustion vehicles.[71] Manufacturers of combustion vehicles are required to sell an increasing percentage of ZE trucks between 2024 and 2035. By 2035, manufacturers must meet the following goals for ZE sales: 55% of sales for Class 2-3, 75% for Class 4-8, and 40% for tractor sales. The other aspect of the regulation requires large employers (manufacturers, retailers, brokers, etc.) to report details about their shipments and shuttle services. Fleets of 50 trucks or more are required to report information about their current fleet operations. This reporting helps identify and develop future strategies to guarantee fleets purchase ZE trucks and deploy them where suitable to meet their needs.

[71] https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2019/act2019/fro2.pdf

CARB has also produced other draft ACF regulations in an effort to reach the goal of achieving a ZE truck and bus California fleet by 2045.[72] The initial focus of this regulation would be on fleets deemed high-priority due to their vehicles being fit for early electrification. The goal of this effort is to achieve a full transition to ZEVs in California as soon as possible by increasing the number of MD/HD ZEV purchases.

In September 2020, California Governor Gavin Newsom signed Executive Order N-79-20, setting impactful goals for ZEVs in California.[73] By 2035, 100% of sales for new passenger vehicles, operations for drayage trucks, and operations for off-road vehicles and equipment must be ZE where feasible. By 2045, 100% of operations for MD/ HD vehicles, must be ZE where feasible. This Executive Order is a step-off point for the rapid electrification of MD/HD vehicles in the state over the next few decades.

Diesel particulate matter (DPM) and NOx are just two of the toxic pollutants released by diesel vehicles that harm communities near trade corridors, ports, and railyards[74]. DPM is also a known carcinogen.[75] Regions of California affected by the emissions from diesel suffer some of the worst air quality in the United States[76]. Planning the installation of electric vehicle charging infrastructure to support the rapid electrification of MD/HD vehicles in California is critical in reducing the emissions and improving the air quality in both Kern County and throughout California. Similarly, efforts to convert to hydrogen fueling are also underway to provide alternative ZE transportation fuel options.

## Moving Towards Local Goals

In July 2022, Kern COG adopted the 2022 Regional Transportation Plan (RTP) as a long-term plan for Kern's transportation network including all forms of travel in the region[77]. Chapter 4 of the RTP includes the Sustainable Community Strategy (SCS), which strives to reduce tailpipe emissions from passenger vehicles and light duty trucks through better coordination of transportation expenditures. The SCS also notes how the Kern region can meet state clean vehicle regulations. The SCS strives to improve public health,

[72] https://ww2.arb.ca.gov/resources/fact-sheets/advanced-clean-fleets-regulation-summary
[73] https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-Climate.pdf
[74] https://oehha.ca.gov/calenviroscreen/indicator/diesel-particulate-matter#:~:text=Diesel%20PM%20contains%20hundreds%20of,breathing%20air%20containing%20diesel%20exhaust.
[75] https://ww2.arb.ca.gov/resources/summary-diesel-particulate-matter-health-impacts
[76] https://www.catf.us/deathsbydiesel/
[77] https://www.kerncog.org/wp-content/uploads/2022/12/2022_RTP.pdf



transportation, safety, and air quality, to protect natural resources and undeveloped land, and to support community services, energy independence, and economic vitality. The plan provides strategies for improving air quality through the reduction of various emissions including Carbon Dioxide (CO2) emissions and criteria pollutant emissions. The plan demonstrates a path to reach the reduction goals set by CARB, 15% emission reduction by 2035 compared to 16.7 lbs. per capita in 2005. The San Joaquin Valley Air Pollution Control District's inability to demonstrate compliance with the one-hour ozone standards and attainment plan goals causes them to receive an annual penalty for excess emissions.[78,79] Improvements in air quality might allow for the eventual removal of the penalty. Continued progress towards emission reductions has also been seen in the Eastern Kern Air Pollution Control District (EKAPCD), which should meet the 2008 ozone standard by 2023 and the 2015 ozone standard by 2027.[80] The Kern region SCS framework was initiated by two key laws from California Assembly Bill (AB) 32 and Senate Bill (SB) 375. Numerous Blueprint plans throughout the state and specifically in Kern County were leading factors in the adoption of AB 32 and SB 375.[81] Some of these plans include the Kern Regional Blueprint (2008) and the San Joaquin Valley Regional Blueprint (2009).[82,83] The Regional Transportation Plan is updated each four years following guidance provided by the California Department of Transportation. The SCS embraces a strong commitment to emission reductions from mobile sources to fulfill state regulations, meet federal air quality standards, and improve public health in the Kern County Region.

[78] http://www.valleyair.org/air_quality_plans/OzoneOneHourPlan2013/AdoptedPlan.pdf

[80] https://www.kerncog.org/wp-content/uploads/2022/04/CHAPTER-4-SUSTAINABLE-COMMUNITIES-STRATEGY-2022-RTP-PJC-041222.pdf

[81] https://ww2.arb.ca.gov/our-work/programs/sustainable-communities-climate-protection-program/about

[82] https://www.kerncog.org/wp-content/uploads/2009/10/KernCOG_annual_2008.pdf

[83] https://sjvcogs.org/valleywide_activities/blueprintgreenprint/

## Benefits to Disadvantaged, Low-Income, and Other At-Risk Communities

### Disadvantaged Area Community Introduction and Background

According to the California Environmental Protection Agency, a DAC is a community that is disproportionately impacted by environmental pollution. Environmental pollution contributes to negative public health effects and environmental degradation in areas with a concentration of low income, low levels of education, low levels of home ownership, high unemployment, or high rent burden (CalEPA, 2021). These areas are identified in the CalEPA screening tool, CalEnviroscreen 4.0, which uses a combination of pollution burden indicators and population characteristics indicators to score each California census tract. Image 9.1 illustrates higher CalEnviroscreen 4.0 scores throughout the Central Valley of California. Kern County is located in the southern region of the Central Valley as shown in Image 9.1.

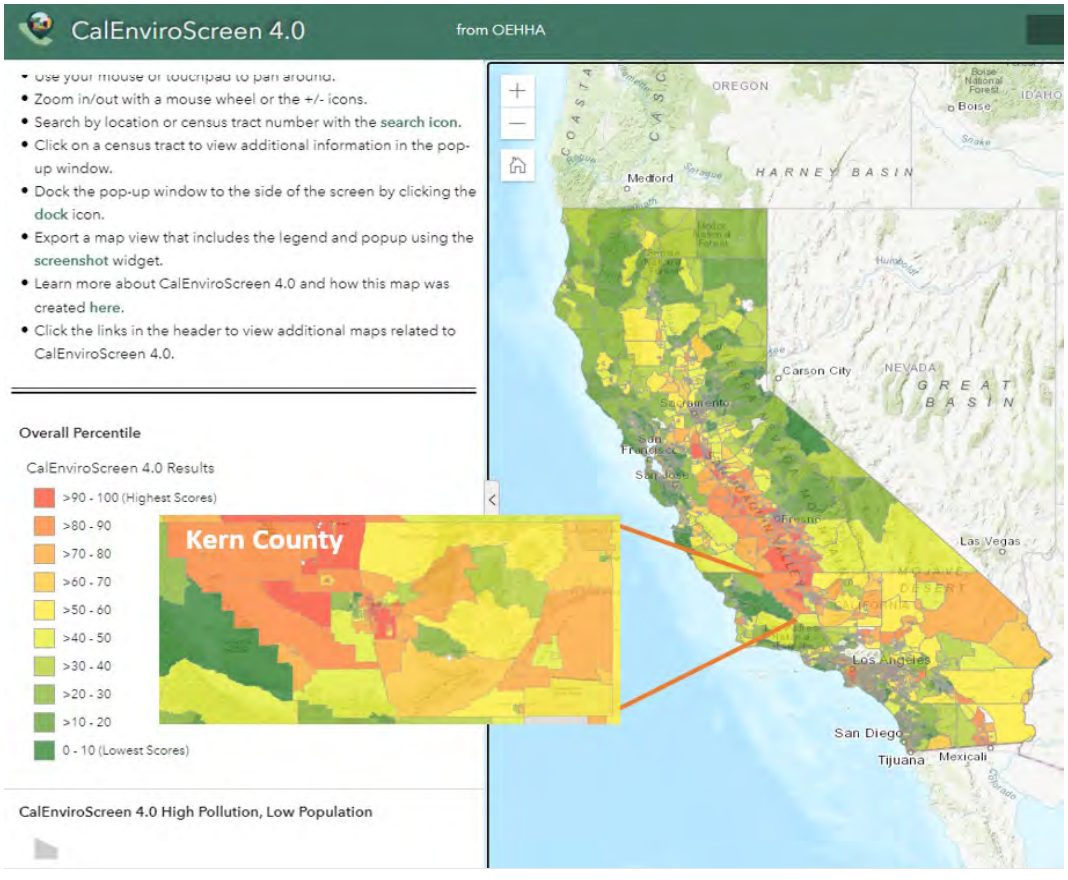


**Image 9.1: CalEnvrioScreen4.0 Map of California with Closeup of Kern County**

Higher CalEnviroscreen scores are due in part to elevated levels of pollution brought on by major transportation corridors traversing Kern County. Kern County sits at the southern end of California's Central Valley, one of California's four priority trade corridors (Los Angeles/Inland Empire, Central Valley, Bay Area, and San Diego/Border).[84] The Federal Highway Administration has various definitions for transportation corridors but in general these corridors are transportation routes used by multiple modes of transportation to move both people and goods. Kern County is crisscrossed by the I-5, CA-58, CA-178, CA-46, CA-14, US –395, and CA-99 highways, key MD/HD truck routes for goods movement transportation. State Route 99 is the busiest north-south truck route on the West Coast. State Route 58 is considered the busiest east-west truck route in the San Joaquin Valley and is the only all-season route over the Sierra Nevada Mountain range. Goods movement transportation is a vital industry in this area, and the intensity of transportation directly impacts the quality of air and quality of life.

Kern County has over 1.8 billion diesel VMT annually, which directly translates into the prevalence of air quality disparities that adversely impact Kern County's public health. The California Air Resources Board EMFAC tool was used to understand vehicle activity and resulting emissions in Kern County. EMFAC is an Emission Factor model that provides estimates of on-road mobile source emissions in California. According to EMFAC, in 2021, Kern County had just over 15,900 MD/HD diesel trucks registered within its county's census tracts, and these vehicles account for over 5,500 tons of NOx emissions, 66 tons of PM 2.5, and 2.6 million tons of CO2 emitted annually.[85] While these statistics pertain to diesel MD/HD trucks exclusively, the air quality of Kern is subjected to further degradations when including gasoline-fueled MD/HD trucks and other non-NZE/ZE vehicles and MD/HD trucks travelling through Kern County on the major transportation corridors.

In preparation for the second phase of the Kern Area Regional Goods-movement Operations (KARGO) Sustainability Study, the project steering committee (PSC) is conducting analysis of future land uses and the impact on truck routes. During the stakeholder meetings, the PSC provided truck volume maps that show where the paths

[84] CARB Proposition 1B - https://ww2.arb.ca.gov/resources/documents/proposition-1b-guidelines
[85] EMFAC – Aggregate of all vehicle's classes and fuel types - https://arb.ca.gov/emfac/emissions-inventory/5a9d1bbd83f07a6d32ef4075a2ce430ff2a1c770

of the heavier traffic routes, Image 9.3, and a map of the routes overlayed with locations of sensitive populations, Image 9.4.

The effects on air quality from transportation are further compounded due to the topography of the region. The map of Kern County in Image 9.5 below shows the communities in Kern County surrounded by the Sierra Nevada Mountains to the east and Los Padres National Forest to the west. The topographic landscape of the San Joaquin Valley Air Basin portion of Kern County exacerbates the effects of emissions by creating a bowl. During the warmer months when high-pressure and inversion layers are in place, they act as a lid to the bowl, and trap air pollution over the area, contributing to an ozone problem. During the foggy cooler months, air movement stagnates, and emissions remain in the valley contributing to a problem with particulate matter.

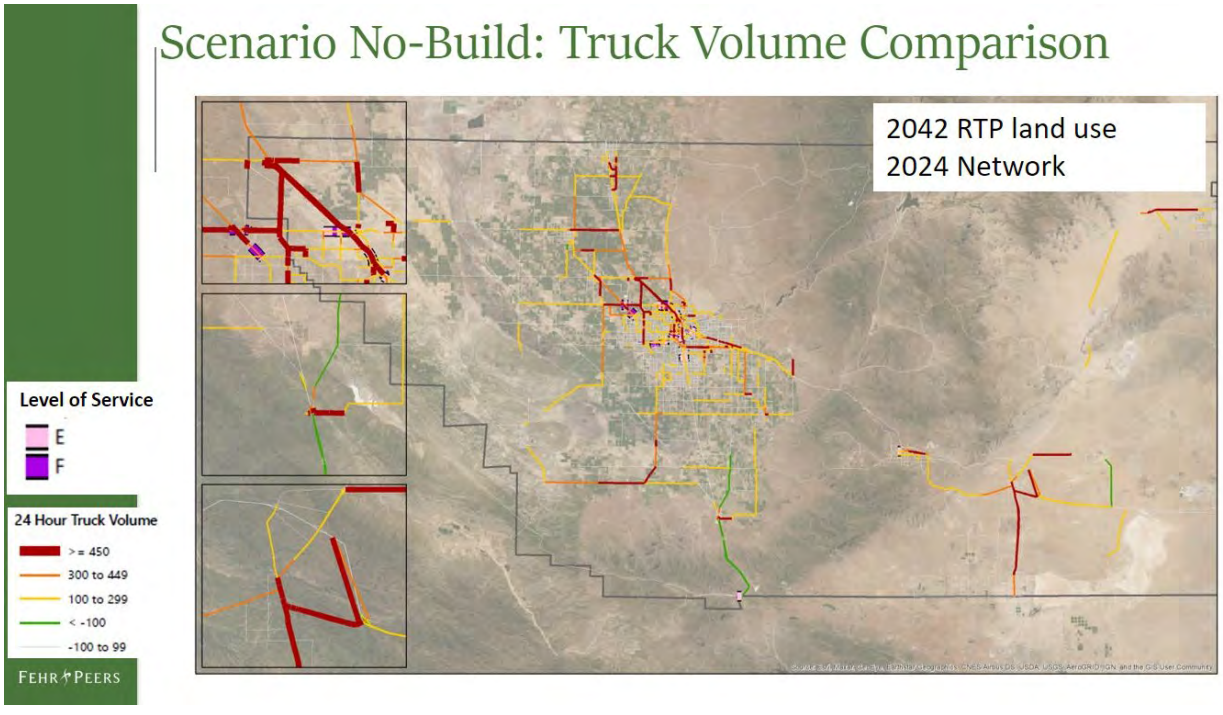



Image 9.3: Map of Kern County Truck Volumes showing the heavier traffic routes within the county.

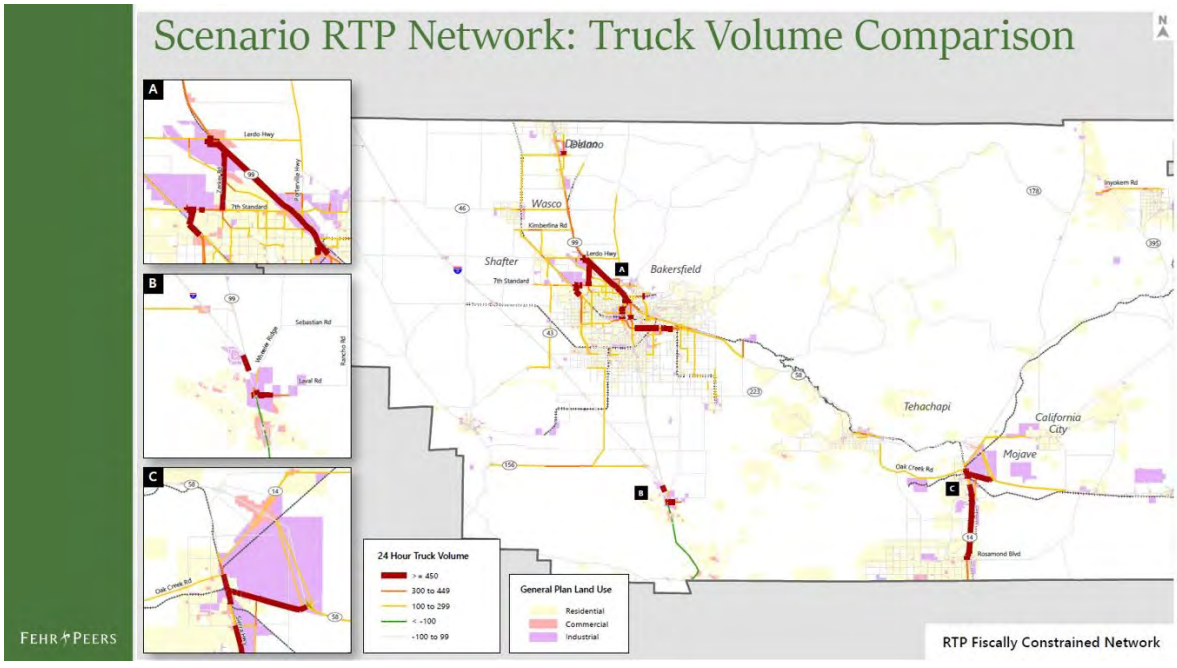



**Image 9.4: Map of Kern County Truck Volumes showing where the sensitive populations are in comparison to the traffic routes.**

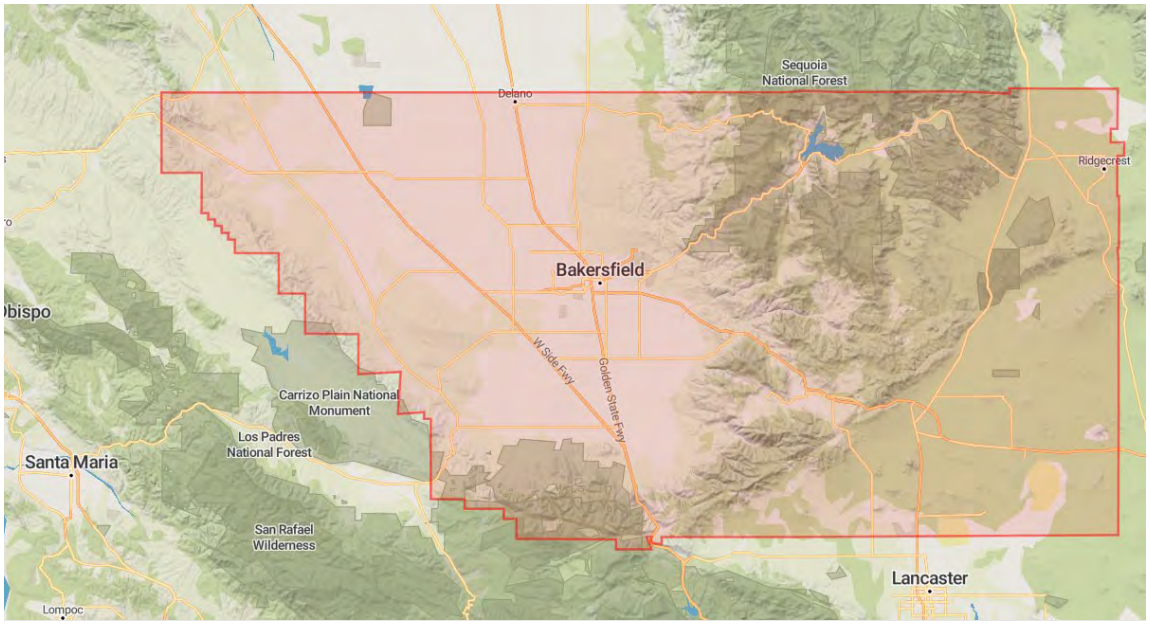



Image 9.5 Map showing Kern County topography including part of the Sierra Nevada Mountains covering eastern Kern and Los Padres National Forest to the west. Map courtesy of **https://www.anyplaceamerica.com/directory/ca/kern-county-06029/**



## Benefits to DACs

### Air Quality

The county of Kern is in the California Central Valley and in the U.S. EPA Region 9. The county is in the 93rd percentile for PM 2.5, the 98th percentile for Ozone, and the 95-100th percentile for environmental quality.[86] Particulate matter (PM 2.5) is a type of pollution from internal combustion engines (cars, trucks), factories, wood burning, stationary engines, and other activities that is extremely small and consists of organic chemicals and metals. The size and composition of PM 2.5 lead to various health problems in those exposed.[87] Ozone is a pollutant that is created when sunlight reacts with NOx and Reactive Organic Gases (ROG) from the transportation sector, farming, manufacturing, construction, and dry cleaners. According to the CDC's National Environmental Public Health Tracking Network, ozone exposure, even at low levels, can irritate lungs, inflammation, and exacerbate chronic illnesses.[88]

The air quality in the Valley and eastern portions of Kern County will see reductions in the high concentration of pollutants emitted by transportation activities if fossil-fueled vehicles are replaced with zero- and near-zero-emission vehicles. Replacing fossil-fueled MD/HD vehicles with ZE counterparts would eliminate 100% of their NOx and PM 2.5 emissions. With these replacements, transportation emissions would become dependent on cleanliness of grid electricity. Supporting the deployment of MD/HD ZEVs charging infrastructure is a crucial first step in reducing emissions. This Blueprint will support the installation of infrastructure that is designed with medium- and heavy-duty vehicles in mind so more ZEVs can successfully replace higher polluting vehicles and improve the air quality in Kern County.

### Community Health and Safety

According to the Kern County[89] report by the Center for Disease Control and Prevention (CDC), 7.3% of children and 7.9% of adults in the county have asthma, which has been linked to outdoor and indoor air pollution. The CDC report informed that in 2016 Kern residents were exposed to unhealthy levels of Ozone 89 days out of the year. As a general

[86] CalEnviroScreen - https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-40
[87] CDC - https://ephtracking.cdc.gov/InfoByLocation/
[88] CDC - https://ephtracking.cdc.gov/InfoByLocation/
[89] Kern County report was created by the Center for Disease Control and Prevention and accessed via the Environmental Protection Agency's (EPA's) Environmental Justice Screening and Mapping Tool (Version 2020) https://ephtracking.cdc.gov/showInfoByLocationExt/?&FIPS=06029



indicator, the range of pollution burden in Kern County is anywhere from 43 – 96% higher than the rest of the state, much of which is attributed to diesel pollution from MD/HD trucking. Different pollutants contribute to the County's poor air quality, but most notable is diesel particulate matter, which contributes several tons of PM to the atmosphere every year.

Exposure to pollutants like PM 2.5, ozone, and particulate matter leads to health disparities. For instance, Kern County maintains an asthma rate 99% higher than the rest of the state.[90] Lung health is critical to heart health. Cardiovascular disease is also commonplace with the county being 70 – 90% more at risk for cardiovascular disease than the rest of California, adding to increased emergency room visits for heart attacks by Kern County residents.[91] Supporting the deployment of MD/HD ZEV charging is crucial for improving the health of all residents of Kern County, especially in Kern County DACs. The buildout of infrastructure to support the deployment of zero-emission medium- and heavy-duty vehicles will directly reduce the level of vehicle emissions in the area and help to reduce exposure to harmful pollutants. In addition to alleviating the health burdens endured by Kern DACs, supporting ZEV infrastructure will also reduce premature deaths, hospitalization costs, and missed school days and workdays.

### Community Conditions: Community Poverty Statistics & Disadvantaged Area Communities

The pollution burden has made many communities in Kern eligible to be elected as AB 617 communities. AB 617 is a California Assembly Bill that requires CARB and air districts to develop and implement additional emissions reporting, monitoring, reduction plans, and measures in an effort to reduce air pollution exposure in disadvantaged communities. The San Joaquin Valley Air Pollution Control District currently conducts work in two AB 617 communities in Kern County: the City of Arvin and the County community of Lamont and the City of Shafter.[92] These communities are mostly rural, surrounded by agriculture and energy operations, with residents living near highways and railways. Citizens and workers suffer from disproportionate exposure to pollutants that increase their likelihood of developing cardiovascular disease and asthma. These communities are also stricken by poverty, unemployment, and face barriers to education, all ramifications of the health disparities they suffer. Beyond designated AB 617 communities, Kern County contains disadvantaged communities, identified by CalEnviroScreen 4.0. These communities are

[90] CalEnviroScreen - https://oehha.ca.gov/calenviroscreen/indicator/asthma
[91] CalEnviroScreen - https://oehha.ca.gov/calenviroscreen/indicator/cardiovascular-disease
[92] San Joaquin Valley Air Pollution Control District - https://community.valleyair.org/selected-communities/

supported by Senate Bill (SB) 535, an investment of state funding to benefit emissions reductions and greenhouse gas reductions in communities most in need. Kern County is riddled with disadvantaged communities, speaking to the prevalence of air and water[93] pollution that causes these areas to be dealing with the highest percentage of burden in California.

### Access and Education

The barriers to ZEV adoption include a lack of familiarity with the operation and maintenance of EV infrastructure (i.e., fear of the unknown). Resources to educate citizens such as informational public meetings, training, and ride-and-drive events, are needed to develop familiarity and be persuasive in EVSE adoption and encourage replicability throughout the county. Local efforts of the San Joaquin Valley Clean Cities Coalition have demonstrated that vehicle dealerships are at a great distance from rural communities, making test drive events more expensive to conduct in AB 617 and smaller communities. Electric carshare programs such as Green Raiteros and Miocar have limited reach and still provide access to EVs in DACs and provide opportunities to try-out ZEVs. Kern County's location along major transportation corridors and the economic dependence on transportation make it critical to reduce barriers to ZEV adoption and provide sufficient education on ZEV technologies.

Conducting collaborative outreach with key stakeholders and community members will provide the communities with access to information on zero-emission infrastructure projects, opportunities for workforce development, and clean technology jobs. The communities can benefit from the transportation industry in terms of employment and will continue to need access to the aforementioned opportunities as vehicle emission regulations become stricter and ZEV technology use increases. Providing access to workshops, meetings or presentations can create an opportunity for community members to collaborate and encourage public-access infrastructure development.

Developing a Blueprint for ZE charging locations that are dispersed throughout the county will accelerate infrastructure development and eliminate access barriers. Increasing access to public charging reduces range anxiety and eliminates the deterrent of ZE range limitations. Developing a MD/HD-focused Blueprint allows agencies to make requirements for future infrastructure requirements that allow for widespread access. Such requirements include standardization of infrastructure and open architecture of

[93] The State Water Resources Control Board's 2021-118 Report finds that drinking water for nearly 1 million Californians contains more than the maximum levels for substances that are harmful to human health. https://www.auditor.ca.gov/reports/2021-118/index.html



payments to allow for the greatest number of trucks to connect to the chargers and to pay with non-proprietary cards. Additionally, developing a Blueprint that focuses on MD/HD vehicles during the early stages of market penetration allows for the planning of and consideration of MD/HD chargers that need to be fully integrated into EV stations. The development of a MD/HD Blueprint ensures that utility upgrades to sites are adequate for the vehicle's usage and will ensure that sites are equipped with adequate curb cut designs, fueling lanes, and canopy heights that accommodate the wheelbase and height of MD/HD trucks.

When accommodating hydrogen technologies, previous investment in gaseous fuels can also be a great asset within Kern County. Starting in the late 1990s, deployment of compressed natural gas vehicles and infrastructure has taken place in the Central Valley, and there are several large commercial fleets and even more transit agencies that serve as an example for knowledge and experience with gaseous fuels. The progenitor gaseous fuel industry will serve as a building block that makes the anticipation of hydrogen fuel deployment much more realistic.

[Please also see the workforce development memorandum section, for a detailed discussion of educational benefits to DACs.]

### Financial Benefits

To encourage the adoption of zero-emission technologies, tax breaks and incentives are offered to lessen the upfront costs of establishing zero-emission infrastructure. These are available from a variety of sources, including but not limited to local, utility, state, and federal entities. Most programs can be combined or stacked with others, making the investment lower risk and also including additional incentives for DACs. Financial assistance reduces the total cost of ownership, making the investment in ZE infrastructure less costly than or comparable to a conventional fuel station.

Proposed legislation and current rules established by state and federal governments require and will require EV adoption on the consumer and business level. Resale value for ZEVs and infrastructure will remain high as demand will be high, making the return on investment into zero-emission infrastructure a positive rather than a loss. Although this same benefit drives up the cost for purchases of used vehicles, typical of DAC-based businesses and individuals.

### Economic Development



ZEV infrastructure and vehicle deployment can generate economic development in DACs. Most notably, jobs will be created for infrastructure construction. Electricians, site planners, laborers, and engineers are all needed to complete the design, construction, and operations. With job creation, laborers that are already experienced in trades related to infrastructure deployment will be attracted to new opportunities, spurring economic gains that would otherwise be absent. These spurred gains will have influence on ZE markets, reducing dependence on foreign fuel sources as infrastructure gains popularity and encouraging investments in domestic manufacturing to generate an even larger workforce outside those installing ZE infrastructure. The Central Valley has seen that larger companies engaged in solar installation have increased business by adding charging stations to their portfolio of offerings. They have developed expertise in navigating grants and incentives applications and reporting to further assist their customers.

A report titled *Workforce Projections to Support Battery Electric Vehicle Charging Infrastructure Installation*[94] evaluates the impact of EV charging infrastructure on workforce needs. The report was prepared for the Electric Transportation Community Development Corporation and identifies equitable pathways for jobs within the electric vehicle charging infrastructure industry for DACs. The report finds that an estimated 9,100 jobs supporting medium- and heavy-duty electric vehicle infrastructure will be created by 2030 in California and this number is in addition to an estimated 38,200 jobs that will be created by the light-duty EV infrastructure.

### Consumer Protection

Consumer protection strategies that provide for an equitable transition to EV technology should include protecting access to transportation specifically in low-income areas, dispersing costs and benefits to high- and low-income consumers and reducing air pollution in low-income areas. Some examples of consumer protection strategies developed are the regulations established by CARB to set clear and consistent payment standards at public charging stations. The regulations require that credit card readers at all stations align with existing payment methods and allow for equitable access to charging stations across all users.

Dispersing costs and benefits to consumers can be achieved by reducing the cost and risk in transitioning to EVs. BEVs are expected to reach cost parity with diesel counterparts by

[94] Electric Transportation Community Development Corporation - https://etcommunity.org/assets/files/Workforce-ProjectionstoSupportBatteryElectricVehicleChargingInfrastructureInstallation-Final202106082.pdf

2030.[95] Business models such as transportation-as-a-service (TaaS) and charging-as-a-service (CaaS) pioneered by companies like Zeem Solutions, WattEV, AMPLY Power, and Electrada offer, or will offer in the next few years, ZEVs and charging infrastructure for fleets to use without any responsibility to own, maintain or manage the infrastructure and vehicles. Business models such as these provide fleets the flexibility to try ZEVs with minimal risk or responsibility for the upfront cost.

Additionally, consumer protections applied to ratepayers are also important. Utilities can provide rate structures that preserve affordability and availability of electricity and provide incentives for vehicles and infrastructure. Separately, to ensure consumer safety and correct installation of infrastructure, Utility Make Ready Programs, or programs in which utilities pay for some of the cost of EV infrastructure, must follow the California Public Utilities Commission's (CPUC) Transportation Electrification Safety Requirements Checklist that restricts chargers to only those certified by a Nationally Recognized Testing Lab (NRTL) and includes several operational safety requirements.[96]

### Explanation to Image 9.1: CalEnviroscreen 4.0 Indicator Map Results for Kern County

The following maps show the pollution burden indicator maps created by the CalEnviroscreen 4.0 mapping tool. These indicator maps show the air quality conditions in Kern County and the sources contributing to the pollution.

Ozone: Ozone is a pollutant that is created when NOx reacts with ROGs from sources like vehicle emissions, farms, construction, factories, and dry cleaners after being exposed to sunlight. Ozone exposure, even at low levels, can cause irritation to lungs, inflammation, and exacerbate chronic illnesses.[97] Ozone concentrations are high throughout most of Kern County, as seen in the image below.

[95] Environmental Defense Fund - https://blogs.edf.org/climate411/files/2022/02/EDF-MDHD-Electrification-v1.6_20220209.pdf
[96] California Public Utilities Commission (CPUC) - https://www.cpuc.ca.gov/-/media/cpuc-website/files/legacyfiles/s/6442458882-safety-requirements-checklist-final-draft-.pdf
[97] CalEnviroScreen - https://oehha.ca.gov/calenviroscreen/indicator/air-quality-ozone

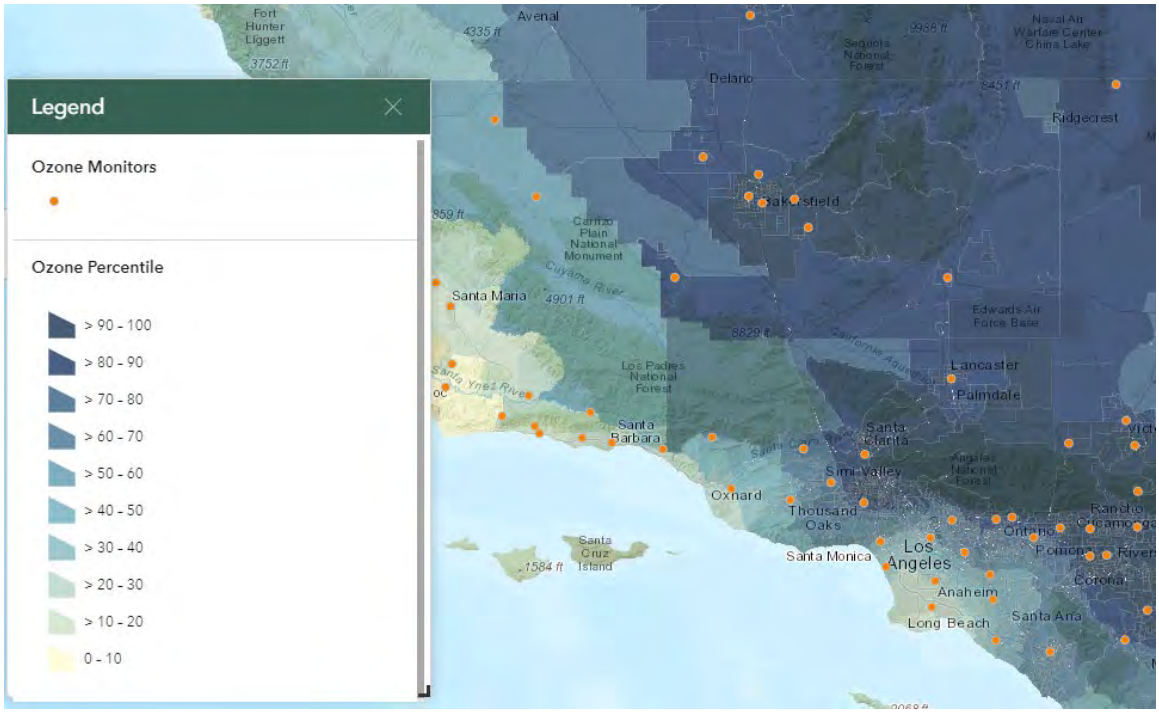



Image 9.2: Map of Ozone Levels Across Kern County

PM 2.5: Particulate matter (PM 2.5) is a type of pollution from cars, trucks, factories, wood burning and other activities that is extremely small and consist of organic chemicals and metals. The size and composition of PM 2.5 leads to various health problems in those exposed, including Chronic Obstructive Pulmonary Disease (COPD) and heart disease.[98] The map below shows higher concentrations of PM 2.5 in north-west Kern County.

[98] CalEnviroScreen - https://oehha.ca.gov/calenviroscreen/indicator/air-quality-pm25

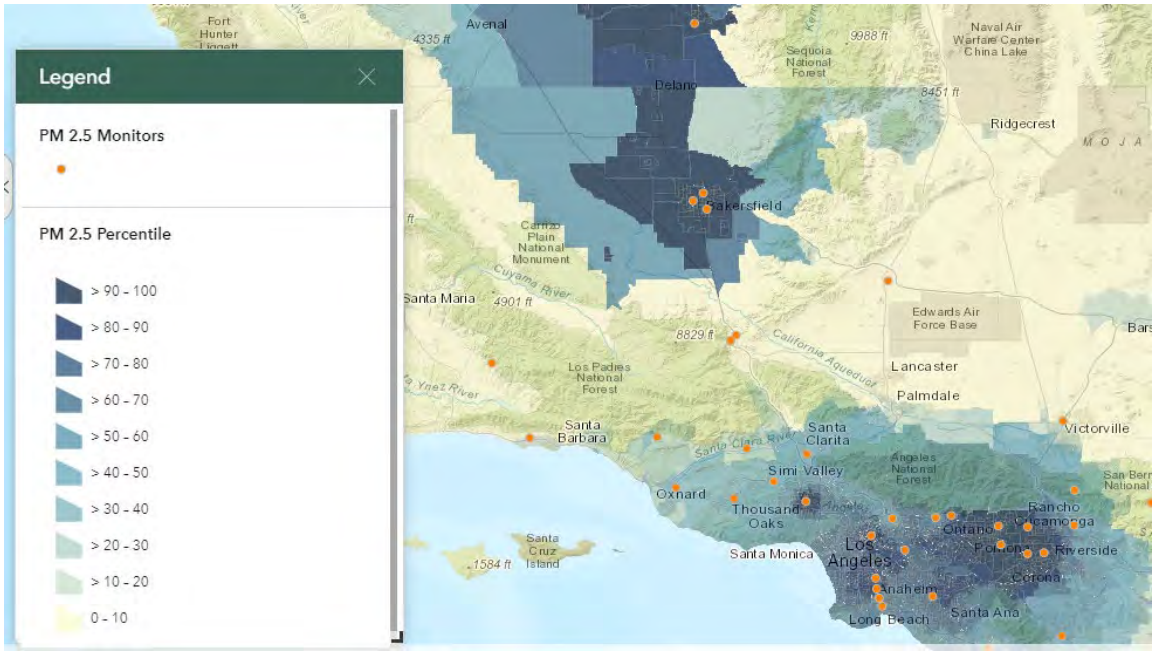



Image 9.3: Map of Ozone Levels Showing Higher Ozone levels in North-west Kern County

Diesel Particulate Matter: The Diesel Particulate Matter (Diesel PM) map is a measure of the exhaust from all diesel equipment including on-road and off-road vehicles such as trucks and trains and from stationary engines, such as agriculture water pumps. Diesel PM is a harmful pollutant that contains hundreds of different chemicals that contribute to health problems and is listed as a known carcinogen[99]. The map below shows that high Diesel PM is concentrated in Bakersfield. Several cities within the county also have concentrations of diesel PM, such as Delano, MacFarland, Wasco and Shafter to the North; Taft to the west; and Arvin and Tehachapi to the East.

[99] CalEnviroScreen - https://oehha.ca.gov/calenviroscreen/indicator/diesel-particulate-matter

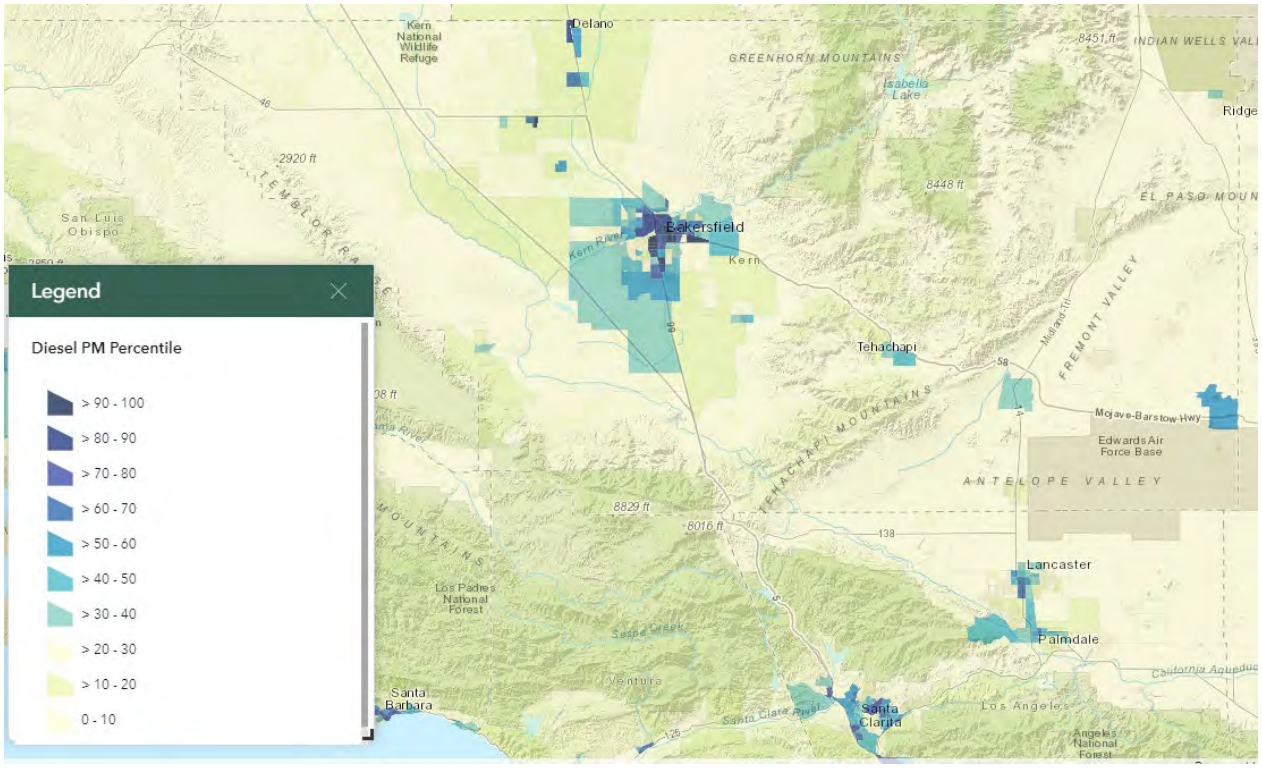



Image 9.4: Map Showing Diesel PM Concentration Over Bakersfield

Traffic Impacts: The CalEnviroScreen 4.0 Map provides a Traffic Impact map which provides a view of traffic density. Traffic density is calculated for each census tract by dividing the average traffic volumes by total road length. The map below shows the traffic density in Kern County is highest surrounding the city of Bakersfield and in southern Kern County where I-5 crosses the border between Los Angeles and Kern Counties.

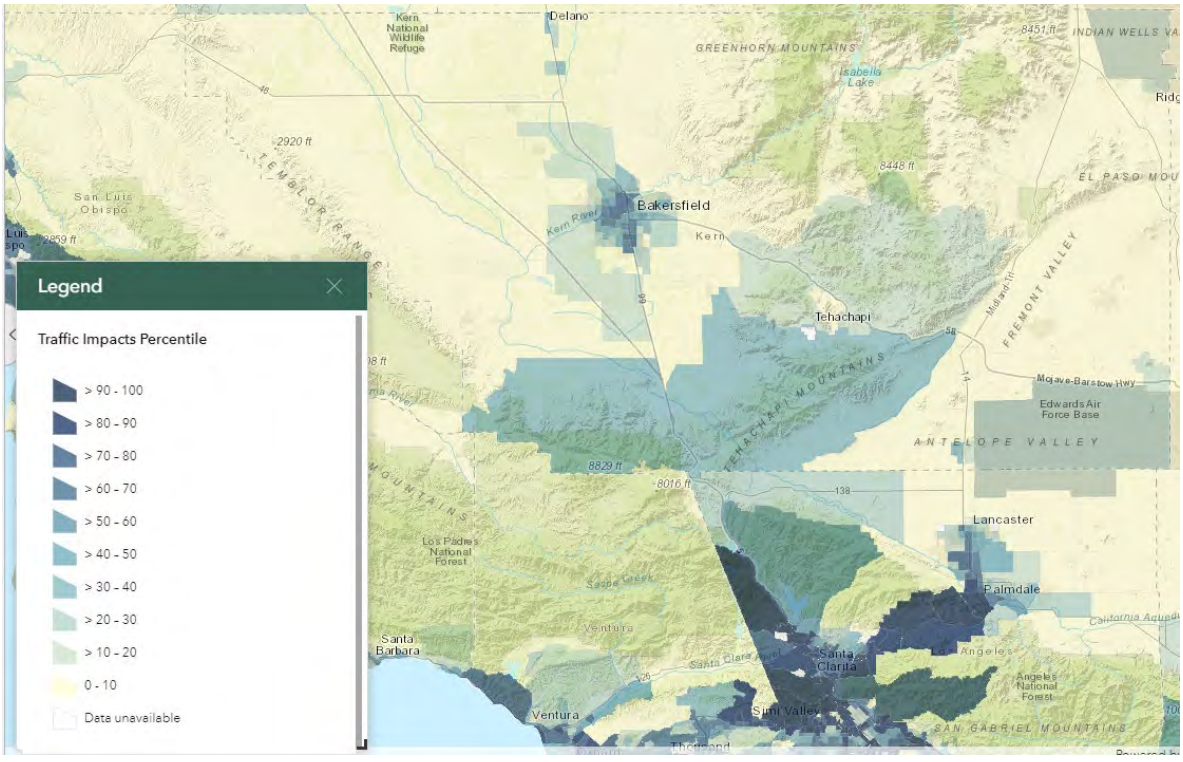



Image 9.5: Map Showing Traffic Density in Kern County



## Conclusion

Efforts to support the deployment of MD/HD ZEVs throughout Kern County benefit dramatically from the implementation of a coordinated Blueprint. Additionally, other regions throughout the state can find takeaways from the development of this plan (in terms of both content and processes) that can be utilized for the production of their own plans. There are several key takeaways from this Blueprint that should be considered during the preparation of future plans.

**Regulations**, notably CARB's Advanced Clean Trucks (ACT) and Advanced Clean Fleet (ACF) Rule provide significant pressures for fleets to transition to ZEVs as soon as possible.

**Stakeholder engagement** is essential to developing a practical and feasible Blueprint. Outreach and close coordination to project partners and stakeholder groups as early as possible is key. Specifically with utilities, coordination is very important, but the timing is nuanced. The utilities have done a tremendous amount of macroplanning leading up to this market and have deployed field services specifically designed to evaluate EV readiness for defined projects. As such, utilities are structured to engage with EVSE projects after they have progressed sufficiently to have a detailed discussions that include: a specific site address, load, number and type of vehicles, preferred equipment, and charger locations. Recruiting support from utilities for overarching Blueprint efforts may be a challenge during the initial development process, as much of the utility staff is designed to support specific projects rather than as a planning resource.

**Community engagement** is important during a Blueprint's development but must also be maintained and cultivated throughout project deployment. Positive impacts of clean technology projects, such as air quality benefits and jobs created should be emphasized to the local community. Early communications with key community stakeholders, such as environmental groups, and CBOs will help streamline implementation of projects. Additionally, community familiarity with the technology will help with the permitting process. Proper workforce development pipelines should be put in place or further developed early on to make sure that the technologies deployed are expertly supported by local tradesmen.

An understanding **of charging and refueling options** is essential to determining the needs of specific sites that will be analyzed in a Blueprint. Suitable technologies for a site's fleet planning needs are constantly in flux. Infrastructure plans should take careful consideration about long-term vehicle deployments, but ultimately infrastructure must



be deployed as soon as possible, and planners must use the best information they have available. Technologies need to be appropriate to the site's requirements while also allowing charge management and the amount of power to the site which may end up being available in a staggered schedule due to capacity constraints from the utility. Specific to hydrogen, technologies must be interoperable, both between different manufacturers as well as different technologies in the progressive stages of hydrogen transportation, storage and refueling. Refueling and charging infrastructure must also be sited appropriately for the operational characteristics of the vehicles projected to use the infrastructure.

Whether projects are funded by internal, private, or public sector funding, it is crucial to have a fully developed proforma of the projected expenses and revenue to justify the investment. The industry is reaching a rhythm on the highly capitalized private companies and public sector EVSE investments, though it is important to note that grant funding is necessary to bridge the gap to financial viability. There is also a trend of private infrastructure companies investing in public infrastructure or providing financing for private infrastructure where baseload is committed via a take-or-pay. There remains a challenge with the public MHD zero-emission infrastructure securing financing from banks and similar financial institutions because while the developers have business plans that work on paper, there is a lack of proven case studies verifying economic viability. In general, the financial institutions do not have the market experience to evaluate the potential risks and rewards of the developers proposed infrastructure projects. While this challenge will resolve with market development, project developers currently need to be creative and allow additional time to secure private investment.

This Blueprint also has tools and strategies, such as the site selection methodology and survey process, which are not endemic to Kern County and are able to be replicated from region to region. Tools developed from this Blueprint for Kern County can be tied firstly to adjacent regions, such as Southern California and the San Joaquin portion of the Central Valley which have similarities in funding programs and regional policies, vehicle usage patterns and other attributes. These regionally connected Blueprints can then be expanded across the nation's goods movement network as zero-emission vehicles and infrastructure become both more mandated and technologically feasible.