California Energy Commission
Clean Transportation Program

FINAL PROJECT REPORT

South San Joaquin Valley Zero Emissions Vehicle Talent Pipeline

Prepared for: California Energy Commission

Prepared by: The 21st Century Energy Center

Kern Community College District

Workforce & Talent Development
21st Century Energy Center
KERN COMMUNITY COLLEGE DISTRICT

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PREFACE

Assembly Bill 118 (Núñez, Chapter 750, Statutes of 2007) created the Clean Transportation Program, administered by the California Energy Commission (CEC), to advance California's climate goals and support projects that reduce greenhouse gas emissions from the transportation sector. Most recently, Assembly Bill 126 (Reyes, Chapter 319, Statutes of 2023) reauthorized the Clean Transportation Program to July 1, 2035.

The Clean Transportation Program has an annual budget of approximately $100 million and provides financial support for projects that advance California's clean transportation goals, including:

- Developing and deploying zero-emission technology and fuels.
- Producing alternative and renewable low-carbon fuels in California.
- Deploying zero-emission fueling infrastructure, fueling stations, and equipment.
- Establishing workforce-training programs and conducting public outreach on the benefits of alternative transportation fuels and vehicle technologies.

To be eligible for funding under the Clean Transportation Program, a project must be consistent with the CEC's annual Clean Transportation Program Investment Plan Update. The CEC issued *solicitation number, or agreement number if not via competitive solicitation* to *describe purpose of solicitation/agreement*. In response to *solicitation number*, the recipient submitted an application which was proposed for funding in the CEC's notice of proposed awards *date of NOPA* and the agreement was executed as *agreement number* on *date of execution.*

ABSTRACT

This is the final report for CEC agreement ARV-21-055. The purpose of this agreement is to address workforce needs for the purpose of helping to ensure the rapid expansion of zero emission vehicle (ZEV) adoption and support the infrastructure necessary to ensure that expansion.

The agreement with Kern Community College District was for $490,237 for the South San Joaquin Valley (SJV) Zero Emission Vehicle Talent Pipeline project. The project delivered three workforce training classes and four incumbent worker workshops, resulting in 264 trainees completing ZEV training and 625 incumbent workers participating. Additionally, a train-the-trainer class for electric vehicle supply and equipment (EVSE) technician training was developed and offered to 11 community college and high school faculty.

As a result of this training, over 800 workers increased their knowledge of zero emission vehicles. Eleven high school, adult school, or community college instructors received professional development training to offer entry-level EVSE technician training. An estimated 122 participants obtained employment and 56 continued with post-secondary education.

Keywords: Alternative Fuels, Clean Transportation, Community College, Technical Training, Workforce Training, Curriculum

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EXECUTIVE SUMMARY

The South San Joaquin Valley (SJV) Zero Emissions Vehicle Talent Pipeline project was developed to address workforce needs helping to ensure the rapid expansion of zero emission vehicle adoption and support the infrastructure necessary to ensure that expansion. The South SJV Zero Emissions Vehicle Talent Pipeline project was designed to develop a workforce talent pipeline to support the installation and operations and maintenance of electric vehicle charging infrastructure (EVCI) required to meet the State of California's goals for reduction of greenhouse gas (GHG) emissions. The South San Joaquin Valley Zero Emissions Vehicle Talent Pipeline project had two areas of focus: 1. new employee training and 2. existing employee (incumbent worker) training.

Outcomes

The new employee training delivered through the South San Joaquin Valley Zero Emissions Vehicle Talent Pipeline project developed a pipeline of 204 applicants to the Kern County Electrical Apprenticeship program through thirteen 85-hour Electrical Apprenticeship Readiness training classes. 78 participants received 81 hours Electric Vehicle Supplies and Equipment (EVSE) technician training classes (renamed Basic Electrical Concepts and Safety). A total of six Basic Electrical Concepts and Safety Classes were delivered. A total of 1,766 industry recognized credentials were earned. A total of 54% of trainees were either placed in employment or continued with post-secondary education.

A total of 12 incumbent worker workshops were delivered covering 5 different topics (ZEVs for Fleet Managers, ZEVs for Agriculture, ZEVs for Electrical Contractors, ZEVs for Non-Profits and a Train-the-Trainer for College and High School Faculty interested in teaching the Basic Electrical Concepts and Safety class). There were a total of 625 participants in the incumbent worker workshops.

The South SJV Zero Emission Vehicle Workforce Pilot helped increase the pipeline of workers to support the installation and maintenance of electric vehicle infrastructure while providing information for contractors, nonprofits, and fleet managers on how they can benefit from the states incentives to increase the number of ZEVs on the road to reduce greenhouse gas emissions. Benefits included:

- Electrical contractors learned how electric vehicle charging infrastructure installation can increase their revenues
- Electric vehicle charging station maintenance and operation technician jobs will be filled by program completers.
- GHG emissions will be reduced as the adoption of ZEVs accelerates.
- The training program targeted outreach to residents of low income and disadvantaged communities (priority populations) to ensure that they benefit the most

CHAPTER 1:
Review of Agreement Requirements

Background
California leads the nation in addressing the climate crisis through aggressive greenhouse gas emission reduction goals, regulations, and innovative funding programs. The California Energy Commission's Clean Transportation Program is one of the first transportation-focused funding programs created by the California Legislature to help achieve the state's climate policies. In 2021 the CEC partnered with CARB to implement the Inclusive, Diverse, Equitable, Accessible, and Local (IDEAL) ZEV Workforce Pilot (GFO-21-602) to support workforce development for ZEVs, ZEV infrastructure, and ZEV-related commercial technologies in California with a focus on priority populations.

The South San Joaquin Valley Zero Emission Vehicle Talent Pipeline project was awarded one of the IDEAL ZEV Workforce Pilot Grants.

The 21st Century Energy Center
The 21st Century Energy Center, part of the Kern Community College District (KCCD), offers comprehensive workforce training programs tailored to the growing clean and renewable energy sector. These programs are designed to equip individuals with essential skills and certifications, enhancing their employability in clean energy industries. The website for the 21st Century Energy Center can be found at https://www.kccd.edu/workforce-and-economic-development/workforce-and-talent-development/21st-century-energy-center/index.html

Goal of the Contract
There is a skills gap in workforce preparation related to the installation and maintenance of the electric vehicle charging infrastructure (EVCI) required to meet California's zero-emission vehicle goals. The market has not addressed these skills shortages because there is uncertainty regarding the timing of the installation of EVCI and employers do not want to train and/or hire individuals before there is sufficient work to support EVCI.

The CEC has a goal of 250,000 electric vehicle (EV) chargers installed by 2025 and 1.2 million by 2035. Studies indicate that this will result in the need for a 3.7% increase in the number of electricians by 2025, and a 6.8% increase in electricians by 2035. Similarly, at the industry target of one (1) electric vehicle supply equipment (EVSE) operation and maintenance technician for every 200 EV chargers, there will be 1,250 EVSE technicians needed by 2025 and 6,000 by 2035. Additionally, electrical contractors, fleet managers, managers of agriculture operations, and nonprofit managers are lacking current and complete information regarding how to help their organizations and client's best benefit from the transition to clean transportation.

Goals of the Agreement
The goals of this agreement are to establish the South Valley ZEV Talent Pipeline Project. This project includes working with industry, nonprofits, and government agencies to develop and conduct training to fill the talent pipeline for installing and maintaining electric vehicle charging infrastructure. To accomplish this goal the project sought to provide incumbent workers with information they need to navigate the transition to zero emission vehicles transition.

Additionally, the project planned to support employers and workers from diverse, equitable, and inclusive communities so that they can all benefit from the opportunities presented by California's shift to zero emission vehicles.

Objective of the Agreement

The objectives of this agreement are to develop training, conduct training, and facilitate job placement. Training to be developed and conducted included: Introduction to ZEVs and ZEV Careers, Electric Vehicle Supply and Equipment (EVSE) Technician Training, Electric Vehicle Charging Infrastructure Training, ZEVs for Electrical Contractor Training, ZEVs Fleet Manager Training, ZEVs for Agriculture Operations Training, ZEVs for Non-Profits and Community-Based Organizations seminar.

CHAPTER 2:
Determining Priorities and Initial Steps

Create a Funding Plan with Stakeholders

The initial steps of this effort included developing a funding plan and applying for the grant funding opportunity (GFO-21-602). Kern CCD 21st Century Energy Center met with employers, and industry groups including the San Joaquin Valley Electric Vehicle Partnership, National Electrical Contractors Association, San Joaquin Valley Clean Cities Coalitions, Kern County Electrical Apprenticeship, and local government entities to identify priorities for development of a funding proposal and grant application.

The resultant priorities identified two tracks of workforce training necessary to support the state's clean transportation goals. First, there was a need to develop training for workers to support the installation of electric vehicle charging stations. Next, there was a need for upskilling of incumbent workers so that they can help their employers navigate the transition to ZEVs.

The funding plan proposed funding development and delivery of new job skills training classes and the development and delivery of targeted incumbent worker workshops.

Implement Approved Plan Pursuant to Agreement

The goal of this task was to implement the approved agreement. Kern Community College District 21st Century Energy Center implemented and administered the approved agreement, including all of the following:

- Development and delivery of job skills training for those new to the industry.
- Development and delivery of workshops for incumbent workers.
- Development and delivery of train-the-trainer materials and workshop for high school, adult school and community college faculty.

Curriculum Development

The South San Joaquin Valley Zero Emission Vehicle Talent Pipeline Project focused on developing a pipeline of candidates to support zero emission vehicle infrastructure. The strategy included the development of training for new entrants into the industry and workshops to improve the knowledge of incumbent workers.

Table 1: Curriculum Development – Workforce Training Classes

Class	Class Summary
Introduction to ZEV and Careers	This class introduces students to zero emission vehicles, the policies incentivizing growth in ZEVs and the various careers that exist to support the ZEV ecosystem.
EVSE Technician	This class was renamed “Basic Electrical Concepts and Safety for Non-electricians". This class teaches the basic concepts needed to be an entry-level worker maintaining, troubleshooting, and repair electric vehicle chargers.
Electric Vehicle Charging Installation (EVCI)	The class provides the basic safety and electrical fundamentals required to support installation of electric vehicle chargers. This class includes a pre-apprenticeship for the union electrical trades.

Table 2: Curriculum Development – Incumbent Worker Workshops

Workshop	Workshop Summary
ZEV for Electrical Contractors	This workshop introduces electrical contractors to the opportunities presented by the growth in electric vehicle charger installations. The workshop introduces participants to resources for finding incentives, and strategies for discussing charger installation benefits with clients.
ZEV Fleet Managers	This workshop introduces fleet managers to the options and benefits of electrifying their fleets. The workshop discusses incentives available and emerging technologies as well.
ZEVs for Agriculture Operations	This workshop introduces agriculture businesses to the options and benefits of electrifying their operations and vehicles. The workshop discusses incentives available and emerging technologies as well.
ZEVs for Non-Profits and Community-Based Organizations	This workshop introduces non-profits and community-based organizations to the benefits provided by vehicle electrification and strategies for electrifying their fleets and making ZEVs available for their clients.
Train-the-Trainer	A Train-the-Trainer class was developed for the Basic Electrical Concepts and Safety for Non-Electricians class (EVSE Technician)

CHAPTER 3:
Workforce Training

Workforce training for this project involved the development and refinement of three classes: Introduction to ZEV and Careers, Electric Vehicle Charging Installation (EVCI), Basic Electrical Concepts and Safety for Non-electricians (formerly EVSE Technician). The Introduction to Zero Emission Vehicles (ZEV) and Careers class was designed to educate trainees on the policy and economic drivers leading the expansion of the adoption of zero emission vehicles and to familiarize them with the many different career pathways available support zero emission vehicles.

Course Title: Introduction to Zero Emission Vehicles and Careers

Course Description: This course establishes a core knowledge base in the rapidly emerging clean transportation and zero emissions vehicle (ZEV) industry. Key focus is to help participants develop an understanding of existing and future jobs in the ZEV space. Discusses public policy, industry economics, trends, technology, and in-demand skills, providing a foundation for participants to pursue entry-level careers or specialized training in the ZEV industry**.**

Course Materials: Instructors provide in-class handouts.

Course Modules:
The goals of the Introduction to Zero Emission Vehicle and Careers are to develop a basic understanding of the zero emission vehicles including the climate and policy drivers and the variety of technologies in the industry. The modules for the Introduction to ZEV and Careers class include: the driving forces behind the need for clean energy, especially the need for widespread adoption of ZEV technology in the transportation sector from both an environmental and economic perspective. Clean energy initiatives and technologies pertinent to the emerging economy. An overview of today's ZEV markets, initiatives, and technologies. Various measures in place to advance ZEV adoption and infrastructure, particularly in the State of California and Kern County. Key jobs in the ZEV space. The duties, knowledge, skills, and additional resources needed to succeed in each role, and formulate a career action plan. Students leave with a better understanding of the clean transportation industry and information to help them better understand what roles they could play in the industry. Overall, the project conducted 16 cohorts of the Introduction to Zero Emission Vehicles and Careers class with 251 students attending and completing. Of those 251 students 209 elected to continue with the Electric Vehicle Charger Installation training.

Figure 1: Instructor leading the Introduction to Zero Emission Vehicles and Careers Class



Source: Kern Community College District 21st Century Energy Center

Course Title: Electric Vehicle Charging Installation (EVCI)

Course Description: In this entry-level course participants learn safety and technical skills to become good candidates for laborer positions supporting the installation of electric vehicle chargers. Additionally, participants spend 4 days with the Kern County Electrical Apprenticeship in a pre-apprenticeship which provides them preferred consideration for entry into the electrical union apprenticeship.

Course Materials: Instructors provide in-class handouts.

Course Modules: The course is designed to provide students with safety, basic technical and soft skills which will make them good candidates to enter an apprenticeship or gain other entry-level employment. Modules for the EVCI class include safety awareness, including an understanding safety procedures and protocols for working with high-voltage systems, including lockout/tagout procedures, personal protective equipment (PPE), and electrical safety protocols. Participants learn about NFPA 70E (NEC), code and standards, and earn an OSHA 10 card and CPR/ First Aid card. Students are taught basic electrical knowledge including NCCER Level 1 Electrical Knowledge which provides a fundamental understanding of electrical systems, including AC and DC circuits, Ohm's law, and safety precautions for working with high-voltage system, and knowledge of voltage and current demand. Students also learn to operate tools and meters such as Multimeter, Voltmeter, Ohmmeter and Insolation meters. Students are provided with knowledge of insulation testing and how to read electrical schematics. Students also learn and apply safe digging practices. The course also provides fundamental employability skills including resume building, and interviewing skills and students get to practice these skills through mock interviews. Additionally, the class has a Personal Finance module so that participants are prepared to manage their money when they gain employment. Finally, students participate in a pre-apprenticeship Kern Electrical Apprenticeship Readiness week of training at the union Kern Electrical Apprenticeship Training Center.

The project had 204 trainees complete the EVCI training out 209 who started. All 204 completers earned industry-recognized certificates with a total of 1,251 certificates earned by those 204 completers.

Figure 2: Graduates of the Electric Vehicle Charging Infrastructure (EVCI) Class



Source: Kern Community College District 21st Century Energy Center

Figure 3: Student receives certificate at the Kern Electrical Apprenticeship Training Center



Source: Kern Community College District 21st Century Energy Center

Figure 4: Student shows off an electrical circuit he just built



Source: Kern Community College District 21st Century Energy Center

Course Title: Basic Electrical Concepts and Safety for Non-electricians (originally EVSE Technician)

Course Description: This entry-level course provides a foundational knowledge of maintenance and repair of Electric Vehicle Supply Equipment (EVSE), commonly used in the rapidly growing ZEV industry. The course is designed to help participants develop an understanding of the operation, components, and troubleshooting techniques used in EV charging. The course includes a focus on electrical, repair and maintenance, communication protocols, and computer navigation skills to provide participants with a strong foundation to pursue entry-level careers or specialized training in the EVSE maintenance and repair industry.

Course Modules: This course provides safety knowledge and technical skills to help students be good entry-level candidates to work servicing and repairing EV Chargers. Modules for this course include safety awareness, including an understanding safety procedures and protocols for working with high-voltage systems, including lockout/tagout procedures, personal protective equipment (PPE), and electrical safety protocols, 70E (NEC), Code and standards. Students earn an OSHA 10 card and CPR/ First Aid card. Students are taught basic electrical knowledge including NCCER Level 1 Electrical knowledge which provides a fundamental understanding of electrical systems, including AC and DC circuits, Ohm's law, and safety precautions for working with high-voltage systems and knowledge of voltage and current demand. Students also learn to operate tools and meters such as Multimeter, Voltmeter, Ohmmeter and Insolation meters. Students are provided with knowledge of insulation testing and how to read electrical schematics. Students are introduced to electrical vehicle charging infrastructure & equipment basics and technical knowledge. Students learn basic repair &

maintenance skills and trouble shooting. Students gain a basic understanding of EV charger communications protocols. Students learn and practice customer service skills. The course also provides fundamental employability skills including resume building, and interviewing skills and students get to practice these skills through mock interviews. Additionally, the class has a personal finance module so that participants are prepared to manage their money when they gain employment. Upon completion of this class, students are prepared to be successful entry-level employees with contractors which service and repair EV chargers.
Overall, 82 trainees enrolled in Basic electrical Concepts and Safety for Non-electricians with 78 completing and earning and industry-recognized certification. A total of 302 certifications were earned by the 78 completers.

Figure 5: Basic Electrical Concepts and Safety Students show their certificates in front of training board.



Source: Kern Community College District 21st Century Energy Center

Figure 6: Instructor helps students troubleshoot electrical circuit



Source: Kern Community College District 21st Century Energy Center

Program Challenges

Initially, the most daunting challenge was recruiting trainees to take 4-6 weeks of training when the overall job market was so good. For the first few cohorts, several trainees did not complete training stating that they had financial concerns and had received offers of temporary work which they could not afford to turn down. Eventually, the project received additional funding that could be leveraged with the California Energy Commission funding for the South SJV Zero Emissions Vehicle Talent Pipeline project to provide completion stipends for trainees. This greatly improved the project's retention and completion rate.

Future Program Opportunities

California has an opportunity to address the high number of electric vehicle chargers in the state which are inoperable. As the State develops strategies for investing in repairing these stranded assets, it will create more work for contractors to repair in operable chargers. This will lead to more hiring by contractors supporting EV charging infrastructure. This increase in demand will make the project's Basic Electrical Concepts and Safety for Non-Electricians class a stronger option for filling an entry-level workforce pipeline for electrical contractors doing this work.

CHAPTER 4:
Incumbent Worker Workshops

The South SJV Zero Emissions Vehicle Talent Pipeline project developed and conducted four different incumbent worker workshops. The workshops were designed to keep industry professionals abreast of developments in the zero-emission vehicle ecosystem including information about policy, policy changes and incentives available. The 4 workshops are ZEVs for Electrical Contractor, ZEVs Fleet Managers, ZEVs for Agriculture Operations, ZEVs for Non-Profits and Community-Based Organizations.

ZEVS for Electrical Contractors

The goals for the Zero-emission Vehicles (ZEVs) for Electrical Contractors Workshop are that participants will gain knowledge and resources to:

1. Participate in activity supporting the successful transition to electric transportation.

2. Work with clients to identify and implement electric vehicle and infrastructure solutions to ensure future success.

This workshop is designed for electricians with varying skills and experiences to work on installations of electric vehicle supply equipment (EVSE) at business, commercial, or public locations, with some discussion of residential electric vehicle charging. Participants are provided with information such as why ZEVs are important, the types of electrical vehicles and related jobs, the basics of fueling ZEVs. The workshop informs participants about required certifications, client needs, potential project partners, and key permitting and utility considerations. Participants also learn about available grants and incentives, including funding requirements such as operational reporting and up-time documentation. Participants who attend the workshop leave with an understanding of project parameters, permitting, utility considerations, grants, and incentives that can benefit clients. This knowledge may help electricians grow their businesses and help electricians and their companies transition their operations into zero-emission transportation and equipment.

The workshop was attended by 12 electrical contractors or employees of electrical contractors, and 2 individuals who work in education. The timing for this workshop in January 2025 was unfortunate as it coincided with contractors expressing concern that government support for electric vehicles would decrease.

ZEVS for Fleet Managers

The goals for the ZEVs for Fleet Manager Workshop were to provide industry professionals with the information they need to assess the benefits of adding battery-electric of hydrogen fuel-cell vehicles to the fleets.

The workshop provided the following information to inform fleet managers: information regarding total cost of ownership for EVs, solutions to infrastructure needs, and other options to ownership such as truck-as-a-service and fleet-as-a-service. Attendees were also presented with information about the opportunities for public and commercial charging for fleets now and emerging opportunities in the future. Information regarding hydrogen fueling infrastructure trends was also provided. Participants learned about various commercial EV models available

and vehicles that are coming soon, including light duty and heavy duty for private and public transportation needs. Participants were also provided with information regarding infrastructure incentives, Advanced Clean Fleet rules, including a guide to the regulations for every class of commercial vehicle. There was a discussion about training and retaining technicians for ZEV repairs, EV charging and hydrogen refueling and a presentation of case studies of organizations that have implemented ZEVs. Finally, participants were provided with opportunity to ride in or drive commercial EVs. Attendees leave the workshop with enough information about commercial EVs to help them evaluate the suitability of electric vehicles for use in their fleets.

Attendance at the ZEVs for Fleet Managers workshops was robust with a total of 419 individuals attending these workshops. Individuals for a variety of backgrounds attended with 362 being from private industry, 29 from government or education, and 15 from non-profits or community-based organizations. Attendance did decline with 239 attendees at the February 29, 2024 workshop and only 26 at the December 4, 2025 workshop.

Figure 7: Stockton ZEVs for Fleet Managers Ride and Drive



Source: Project Clean Air Inc.

ZEVS for Agricultural Operations

The goal for the ZEVs for Agricultural Operations workshop was to present the information business managers and owners of agriculture business need to assess and determine the benefits of electrifying their operations with an emphasis on vehicles and equipment. Participants received information covering agriculture and zero emission vehicle (ZEV) infrastructure, the state of agricultural automation, and practical automation use cases. Attendees also learned about ZEV vehicles and equipment, emerging autonomous technologies, available incentives, and participated in a ride-and-drive activity. A total of 136 people attended the 3 ZEVs for Agricultural Operations workshops. The best attended workshop was the March 13, 2025, workshop held in Tulare in conjunction with the World Ag Expo. Attendees were primarily from private industry with 120 attendees being from industry, 12 from government or education, and 5 form non-profits or community-based organizations.

Figure 8: ZEVs for Agricultural Operations agenda



Source Project Clean Air Inc.

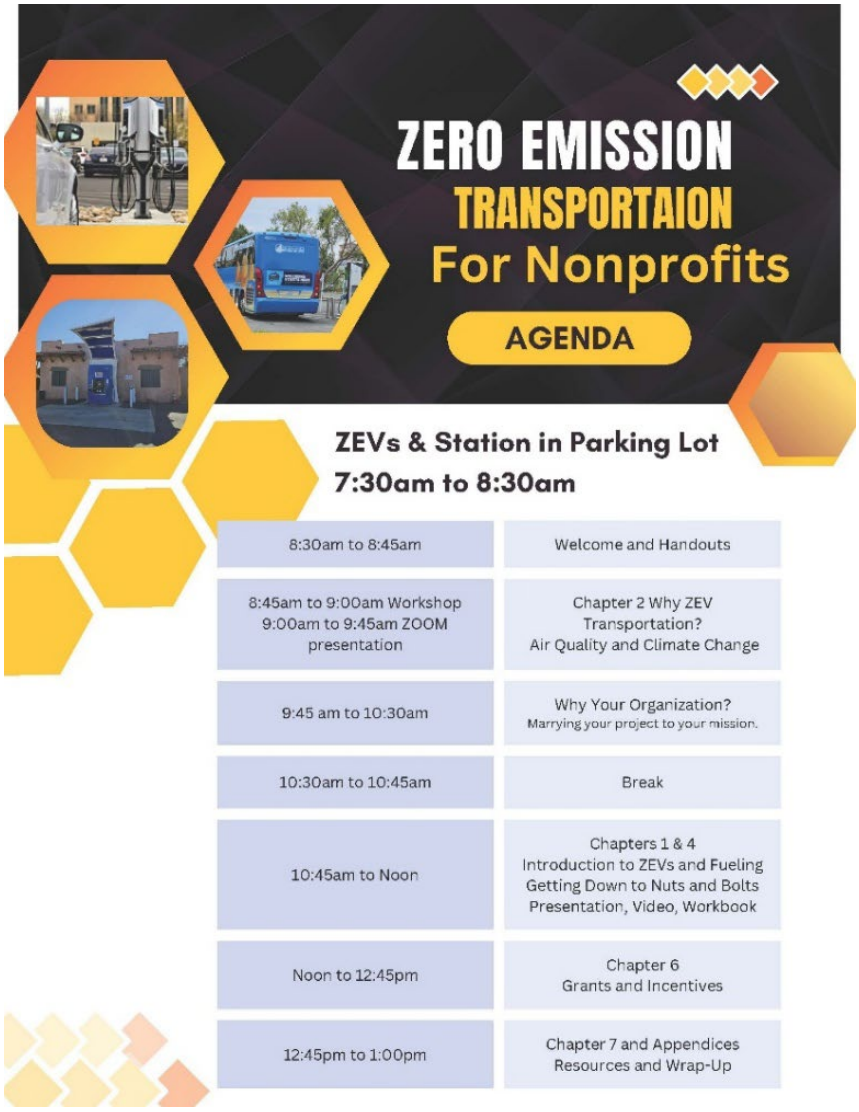
ZEVs for Non-Profits and Community-Based Organizations

The goals for the Zero Emission Vehicles (ZEVs) for Nonprofits Workshop are that participants will leave understanding how ZEVs may help their organization to attain its goals and to deliver their services to their constituents. Attendees learn how the organization can transfer ZEV benefits to clients and the community. This workshop is designed for nonprofits and government agencies of various missions and sizes.

Participants learn why ZEVs are important and the basics of ZEVs and fueling ZEVs. Information is provided about issues organizations need to consider before transitioning to ZEVs, and how ZEVs can support their agency's mission. The workshop includes information about how to integrate ZEVs into their fleet and operations. There is also a discussion of strategies for addressing employees' and volunteers' personally owned vehicles and information regarding available grants and incentives and tips and tools for accessing those

funds. All participants also receive a resource kit. Attendees leave better informed regarding the benefits of ZEVs for their organization and how to begin transitioning their operations to incorporate electric vehicles. The project conducted two ZEVs for Non-profits Workshops with 45 total attendees. A total of 25 attendees were from non-profits and 15 from government or education, and 5 from private industry. Attendance was solid for the July 25, 2024 workshop with 33 total attendees when there was greater confidence in the continued support for electric vehicles represented by the federal Bipartisan Infrastructure Law. The project needed to move the second workshop on October 2, 2025 to being a webinar, and we were still only to attract 12 attendees to that workshop.

Figure 9: Zero Emission Vehicles for Nonprofits agenda



Source: Kern Community College District 21St Century Energy Center

CHAPTER 5:
Faculty Professional Development

A Train-the-Trainer class was developed for the Basic Electrical Concepts and Safety for Non-Electricians class (EVSE Technician). The class is designed to help instructors teach the basic electrical and troubleshooting skills required of entry-level workers for employment by contractors who repair and maintain electric vehicle charging equipment. The one-day class introduced faculty to the topics covered, and examples of hand-on activities were demonstrated. The Train-the-Trainer workshop was held at Madera Community College in order to increase accessibility to the largest number of faculty without them needing an overnight stay. Attendees were provided with a supply list and each left with a USB drive full of instructional materials. In all, eleven community college, adult school and high school faculty participated in this one-day training.

CHAPTER 6:
Tables

Data and Demographics

Table 3: Trainee Demographics

Number of trainees enrolled	276
Average age of trainees	32.2
Percentage of trainees from LIC/DAC (%)	83%
Trainee ethnicity (%)	
American Indian or Native Alaskan	0.0%
Asian or Pacific Islander	2.3%
Black/African American	15.3%
Hispanic or Latino	57.1%
Other	11.7%
White	13.6%

Table 4: Performance Metrics – Workforce Training

Total time trained (Classroom Hours)	2030
Number of Trainees Earning a Certificate	264
Number of Certificates Earned	1766
Completion rate (% of trainees who finish the course)	97%
Job placement (Number of trainees placed in the workplace during or after completion of program out of 123 who responded to survey)	57
Percent of Respondents who are employed	60.87%
Percent of Respondents who continued with higher education	61.74%
Trainee wage rate ($/hr)	$25.12

Table 5: Student Perceptions of Teaching survey results (SPOT)

Recommendation to others: Agree XX%; Neutral XX%; Disagree XX%	97.15% Agree 0.85% Neutral 1.99% Disagree
Concepts explained clearly and effectively: Agree: XX%; Neutral XX%;Disagree XX%	98.01% Agree 1.14% Neutral 0.85% Disagree
The instructor demonstrates knowledge of the subject: Agree: XX%; Neutral XX%;Disagree XX%	99.43% Agree 0.00% Neutral 0.57% Disagree
What specific course activities helped you learn the most?	"Electrical Safety was very important" and "Hands On", "Renewable Energy for EVs" and "Personal Finance", "LOTO" (lockout tagout process), "PPE", "On hands activities such as wiring breakers, creating power with switches, and taking tests", "Switch board project", "Parallel switches", "Putting together the relay circuit, and figuring out how it works", "Meter reading and blueprint reading", "Work inside of a battery". Guest Speakers, "EV simulations", "Taking charger apart", "Hands on training", "Safety", "Communication", "Circuit installation", "Electrical concepts". "Enjoyed class debates". "Renewable energy", "EV". "Class discussions", "Videos". "World examples"

Table 6: Total All Incumbent Worker Workshops

Performance Metrics	
Workshop Description	Workshops informing incumbent worker about trends, incentives and new products.
Total Workshop Hours	60.5
Number of Attendees	625
Trainee Types	
Number of Attendees	625
Attendee Type	
Private Industry	487
Government or education	68
Non-Profit or Community-based Organization	58

Data evaluation

The South San Joaquin Valley Zero Emission Vehicle Talent Pipeline project has excellent success in recruiting participants form low-income and disadvantaged communities, with 83% of participants coming from those communities. Outreach to minorities was successful as well with 88% of participants listing their ethnicity as other than White.

The South San Joaquin Valley Zero Emission Vehicle Talent Pipeline retained 97% of enrollees through completion of their training. Industry-recognized certificates were earned by 97% of enrollees. In total, 1,776 certificates were earned, with most completers earning more than 6 certificates.

Trainees enjoyed training and were complementary about the classes and instructors. Results of post-training surveys were strong with 97% agreeing that they would recommend the classes, 98% saying that the concepts were explained clearly, and 99% saying that the instructors demonstrate knowledge of the subject. Trainees listed hands-on training and safety training as the course activities which helped them learn the most.

The South San Joaquin Valley Zero Emission Vehicle Talent Pipeline project had less success in job placements. Of the 123 completers who responded to a survey 50 had found employment, which is only 46.34%. Twenty-six trainees responded that they were continuing education, which is 21.11%. Of those continuing with their education, 17 had also found employment. In total, 59 respondents reported successful post-training outcomes, which is 51.15%. Two factors may have contributed to a lower job placement rate than initially predicted. First, by the middle of 2023, confidence in the government's commitment to expanding zero emission vehicle infrastructure had begun to decline due to State of California budget deficits and later in 2024 anticipation of the elimination of federal supports for electric vehicle infrastructure. Electrical contractors and the local electrical union voiced caution about expanding their workforce. The second factor contributing to lower-than-expected success in job placement was likely the sizable proportion of justice involved individuals participating in our training. The Public Policy Institute states that post-release unemployment is 55%.

The San Joaquin Valley Zero Emission Vehicle Talent Pipeline Project offered 12 incumbent worker workshop which attracted 625 attendees. Incumbent workers learned about trends and policies impacting the zero-emission vehicle marketplace. Attendees learned about new and emerging technologies, incentives and applications for zero emission vehicles. Attendees also learned how to discuss zero emission vehicles with their clients and stakeholders. The project also conducted one train-the-trainer in which high school, adult school and community college faculty learned how to create an entry-level Electric Vehicle Supply and Equipment (EVSE) Technician class and left with class materials. Attendees came from private industry, education and government, and non-profits and community-based organizations. While most workshop attendees came from private industry (487 attendees 78% of the total) there were 68 (11%) attendees from government or education, and 58 (9%) attendees from non-profits or community-based organizations. Attendance at the ZEVs for Electrical Contractors Workshop and the ZEVS for Non-Profits workshops, which were offered in 2024 and 2025, was disappointingly low. It seems like the reduced confidence in government support for zero emission vehicles may have played a role in reducing attendance.

CHAPTER 7:
Lessons Learned

There are some important lessons that were learned through the implementation of the South San Joaquin Valley Talent Pipeline Project.

- Provide as much hands-on and real-world training as possible.
- Provide support to help trainees persist through training.
- Align workforce training with actual, confirmed employer hiring plans.
- When possible, secure employer hiring commitments.
- Design training programs to reflect all job requirements (e.g. education levels, possession of a driver's license, ability to pass a background check, and ability to pass a drug test, etc.)
- Design training to assist participants overcome barriers to employment when possible.
- Have a plan for adjusting to shifts in the employment ecosystem.

The South San Joaquin Valley Zero Emission Vehicle Talent Pipeline project was developed in late 2021 and was premised on the idea that state and federal policies promoting the acceleration of adoption of electric vehicles and other zero emission vehicles would also accelerate the installation of zero emission vehicle infrastructure. This assumption was supported by state and federal funding available to support the installation of electric vehicle charging and other ZEV infrastructure. Electrical Contractors and the International Brotherhood of Electrical Workers (IBEW), an international labor union representing electrical workers, were enthusiastic about the prospects for an acceleration in work installing electric vehicle charging and were supportive of the project but uncertain as to what the actual hiring demand would be. By the second half of 2023, California's structural budget deficit tempered the confidence that supports for a rapid acceleration of electric vehicle charging infrastructure would remain at the historic levels seen in 2021-2023.

Kern Community College District noticed and increased caution amongst electrical contractors to add to their workforce. The International Brotherhood of Electrical Workers Local 428 also lowered their estimate of annual new apprentices from 100 per year to 75 per year. This all resulted in a decreased demand for trainees who completed project training. After the presidential election in 2024, electrical contractors' reluctance to commit to electric vehicle charging infrastructure installation as an important growth strategy for their business intensified.

An added lesson learned was that the project needed to ensure trainees would be eligible for employment upon completion of training. The project did an excellent job of attracting and retaining students from low-income and disadvantaged communities. However, many of the students had multiple barriers to employment including criminal records and lacking a driver's license. This created an added challenge finding placements for these individuals. In retrospect, the project should have had some minimum qualifications that better aligned with the hiring requirements for the Electrical Contractors and the Electrical Workers' Union. One

approach may have been to have developed a pre-apprenticeship readiness class which better prepared students to be employable upon completion of the Electric Vehicle Charging Installation Pre-apprenticeship. The Pre-apprenticeship Readiness class could have focused on some basic math and employment readiness skills and provided support to individuals to overcome some of the barriers to employment including helping them obtain a driver's license or complete their High School diploma or earn a GED.

GLOSSARY

CALIFORNIA ENERGY COMMISSION (CEC)—The state's primary energy policy and planning agency. The agency was established by the California Legislature through the Warren-Alquist Act in 1974. It has seven core responsibilities:

1. Developing renewable energy
2. Transforming transportation
3. Increasing energy efficiency
4. Investing in energy innovation
5. Advancing state energy policy
6. Certifying thermal power plants
7. Preparing for energy emergencies

BECS— Basic Electrical Concepts and Safety

EV— Electric Vehicle

EVITP— Electric Vehicle Infrastructure Training Program

EVCI— Electric Vehicle Charging Infrastructure

EVSE— Electric Vehicle Supply Equipment

GED— General Educational Development

GHG— Greenhouse Gas

IBEW— Electrical Contractors and the International Brotherhood of Electrical Workers

IDEAL— Inclusive, Diverse, Equitable, Accessible, and Local ZEV Workforce Pilot

KCCD— Kern Community College District

LOTO — Lockout Tagout Process

NEC— National Electrical Code

NCCER— National Center for Construction Education and Research

PPE— Personal Protective Equipment

SJV— San Joaquin Valley

ZEV— Zero Emission Vehicle