

**CALIFORNIA AIR RESOURCES BOARD**  
**Low Carbon Transportation Investments**  
**Fiscal Years 2021-22 and 2022-23**

**Advanced Technology Demonstration and Pilot Project Solicitation**

**List of Applications Received and Project Summaries**



<b>Page</b>	<b>Project Applicant</b>	<b>Project Title</b>	<b>Location</b>	<b>Located in a Disadvantaged Community</b>	<b>Requesting Commercial Harbor Craft Regulatory Funding</b>	<b>Funding Amount Requested</b>
1-2	CALSTART, Inc.	CAT POWER Hub: The California Advanced Technology Portable Off-road Job Site Energy Resource Hub	Sacramento County	Yes	No	\$44,228,594
3	Center for Transportation and the Environment (CTE)	CHOP: Cryo-compressed Hydrogen Operations at Ports	Port of Long Beach	Yes	No	\$23,929,808
4	Center for Transportation and the Environment (CTE)	2x2 Fuel Cell Cutaway Demonstration	Humboldt County, Ventura County	Yes	No	\$8,916,724

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5	Center for Transportation and the Environment (CTE)	Glendale Municipal Green Zone Construction Work Crew	Glendale	Yes	No	\$1,073,084
6	Center for Transportation and the Environment (CTE)	Megawatt Charging System (MCS): Beachheads to Maritime Decarbonization	Port of Los Angeles, Port of San Diego	Yes	No	\$48,528,613
7	City and County of San Francisco's Department of Recreation and Parks (SFRPD)	SFRPD Technology Pilot and Demonstration of Battery-operated and Electric Landscaping Equipment	San Francisco	Yes	No	\$780,488
8	City of Bakersfield	Grid Resources on Wheels (GROW™) for Farmers in California and Everywhere	Bakersfield	Yes	No	\$14,780,954
9-10	City of Berkeley Marina, California	City of Berkeley Marina Electric Demonstration Project	Berkeley	Yes	Yes	\$218,451

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11-12	City of Lancaster, California	Lancaster Energy: Hydrogen Based Decarbonization and Emissions Reduction Program	Lancaster	Yes	No	\$9,072,000
13-14	City of Los Angeles, Harbor Department (Port of Los Angeles, POLA)	Los Angeles Marine Emission Reduction Project	San Pedro, Long Beach, Avalon	Yes	Yes	\$30,980,378
15-16	Clean Coalition	Conversion and Electrification of the Gold Rush Commercial Fishing Vessel	Richmond	Yes	No	\$2,421,386
17-18	County of Monterey	Monterey Bay Municipal Fleet Electrification and Workforce Accelerator	Monterey, Santa Cruz, Watsonville, San Benito	Yes	No	\$15,713,981
19	Eastern Contra Costa Transit Authority	Rider Pass Up Reduction Through the Use of Advanced Technology	Eastern Contra Costa County	Yes	No	\$481,200

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20-21	Foundation for California Community Colleges (FCCC)	California Zero-Emission Aviation Demonstration Project	San Joaquin Valley	Yes	No	\$8,829,351
22-23	Monterey Bay Air Resources Board (MBARD)	Building Monterey Bay's First Hybrid-Electric Whale Watching Vessel	Monterey Bay	Yes	Yes	\$1,000,000
24-25	New Day International	Electric Fast Ferry Demonstration Project	San Leandro, San Francisco	Yes	Yes	\$32,000,000
26-27	Port of Oakland	Bay Area Zero-Emissions Tug (BAZE ElectRA Tug): Accelerating the Port of Oakland's Pathway to Zero-Emissions	Port of Oakland	Yes	No	\$25,308,411
28-29	Sacramento Metropolitan Air Quality Management District (SMAQMD)	Sacramento Valley RR Zero-Emission Switcher Demonstration	McClellan	Yes	No	\$1,972,350

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30	San Diego Air Pollution Control District (SDAPCD)	ZEST - Zero Emission Sustainable Transportation	San Diego, Coronado	Yes	Yes	\$15,272,401
31	San Joaquin Valley Air Pollution Control District	Sierra Northern Railway ("SNR") Demonstration to Accelerate Domestic Hydrogen Switcher Locomotive Conversion and Establish a Fueling Solution	Oakdale, Riverbank, Chicken Ranch Rancheria (tribal land)	Yes	No	\$23,140,660
32	Scripps Institution of Oceanography, UC San Diego	Hydrogen Power for the Coastal Class Research Vessel (CCRV)	Point Loma	Yes	Yes	\$17,087,380
33-34	South Coast Air Quality Management District	California Transportation Electrification Advancement for Municipalities (TEAM)	Los Angeles, Riverside, Clovis, Porterville, Sacramento	Yes	No	\$36,432,602

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35-36	South Coast Air Quality Management District (SCAQMD)	Strategic Pathways for Extended Electric Drayage (SPEED)	Rialto, San Diego, Ontario, Fresno, Pomona, Fontana, Fullerton, Bakersfield, Long Beach, Sacramento, Long Beach, San Bernardino, Gustine	Yes	No	\$44,556,822
37-38	South Coast Air Quality Management District (South Coast AQMD)	Electrification of Balboa Island Ferries and Installation of Supporting Charging Infrastructure	Newport Beach	No	Yes	\$8,297,549
39-40	South Coast Air Quality Management District (South Coast AQMD)	Tours X Sea View Cruises Electrification Project and Supporting Shore Charging Infrastructure	Port of Long Beach	Yes	Yes	\$14,940,895

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41	South Coast Air Quality Management District (South Coast AQMD)	Improved Capture and Control of OGV Emissions at Berth at Anchor	San Pedro Bay Ports	Yes	No	\$9,941,060
42	The Regents of the University of California, Agriculture and Natural Resources	Electric Autonomous Tractor Swarms (EATS)	Exeter, Five Points, Irvine, Holtville, Tulelake, Parlier, Camarillo, Davis	Yes	No	\$7,180,426
43	Town of Tiburon	Angel Island Tiburon Ferry Electrification Project	Tiburon	Yes	Yes	\$22,639,552
44-45	University of Southern California (USC)	Plasma-based Electrostatic Precipitator (ESP) with Fully-integrated Diesel Particulate Filter (DPF) for PM and NOx Remediation in Marine Engines	Vallejo	Yes	Yes	\$1,000,000

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46-47	Western Riverside Council of Governments (WRCOG)	Western Riverside County Municipal Green Zones Pilot Project	Banning, Moreno Valley, Riverside	Yes	No	\$1,351,560
48-49	Wolf Technology Inc.	Electric Container Drayage Chassis (ECDC)	Port of Los Angeles, Port of Long Beach	Yes	No	\$4,471,847

Solicitation materials are available at: [www.arb.ca.gov/msprog/aqip/solicitations.htm](http://www.arb.ca.gov/msprog/aqip/solicitations.htm)

Application scoring criteria are described in the Advanced Technology Demonstration and Pilot Projects Grant

Solicitation at: [https://ww2.arb.ca.gov/sites/default/files/2023-07/fy21-23demoandpilot\\_solicitation.pdf](https://ww2.arb.ca.gov/sites/default/files/2023-07/fy21-23demoandpilot_solicitation.pdf)

[[ww2.arb.ca.gov](http://ww2.arb.ca.gov)]



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**Project Applicant:** CALSTART, Inc.

**Project Title:** CAT POWER Hub: The California Advanced Technology Portable Off-road Job Site Energy Resource Hub

**Project Name:** CAT POWER Hub: The California Advanced Technology Portable Off-road Jobsite Energy Resource Hub

**Applicant:** CALSTART, Inc.

**Project Partners:** Caterpillar, Danner, Moxion Power, SMUD, Burns & McDonnell, Sacramento County, Sacramento Air Quality Management District, Teichert, Holt of California, Aura Planning, Community Resource Project (CRP), Bruns Auri, Inc., Sacramento Clean Cities, California Mobility Center (CMC), Delta College, Capitol College & Career Academy, and Green Technical Education and Training

**Description:** CALSTART, in collaboration with a select group of industry leaders, is embarking on the CAT POWER Hub project. This initiative aims to demonstrate an off-road job site energy hub to address the challenges associated with charging zero-emission off-road equipment in remote and off-grid locations. The CAT POWER Hub will incorporate mobile energy storage and charging systems for off-road job sites, stationary charging solutions for electric machinery and vehicles, and a solar-powered microgrid with fixed battery energy storage systems to enhance grid stability and support renewable energy time shift. These technologies will power heavy-duty battery-electric machines deployed by Teichert and Sacramento County across various job sites in the region.

**Amount of Funding Requested:** \$44,228,594

**Total Cost of Project:** \$88,461,647 (\$44,233,053 Match)

**Expected Emission Reductions:** Over a useful life of ten years, the CAT POWER Hub project is projected to reduce at least 6,880 metric tons of CO<sub>2</sub>e and 9.3 tons of criteria pollutants. Long term, the project is expected to exceed these emissions reductions by a significant margin through renewable energy generation and storage, as well as the introduction of additional electric construction machines.

**Location and Benefits to Disadvantaged Communities:** The CAT POWER Hub project will be located within and provide benefits to disadvantaged communities. The project places a strong emphasis on workforce development and training, aiming to empower disadvantaged communities to participate in the transition to a green economy. Collaboration with schools, nonprofits, businesses, and community-based organizations will enable a program that targets marginalized groups, including women, students, veterans, and refugees to provide them with essential skills in the green technology economy.

**Major Participants and Roles:**

- CALSTART is the project lead and grant administrator.

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- Caterpillar is a key technology provider.
- Sacramento Municipal Utility District will provide grid connection and energy to the project.
- Burns & McDonnell will design and engineer the Hub's infrastructure.
- Sacramento County will be an end-user of electric machinery at job sites.
- The Sacramento Air Quality Management District will support community and stakeholder communications involvement.
- Moxion Power and Danner will provide mobile energy solutions.
- Teichert will support the Hub's construction and deployment of electric machines.
- Aura Planning will coordinate the community benefits and workforce development program.

The CAT POWER Hub project represents a significant step toward electrifying job site machinery and promoting sustainable practices in the construction and resource extraction industries. It showcases a holistic approach to addressing environmental and community needs while fostering workforce development and training opportunities.

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**Project Applicant:** Center for Transportation and the Environment (CTE)

**Project Title:** CHOP: Cryo-compressed Hydrogen Operations at Ports

The CHOP: Cryo-compressed Hydrogen Operations at Ports project, led by CTE, proposes to deploy two heavy duty forklifts and up to ten Class 8 tractors equipped with innovative cryo-compressed hydrogen storage in Southern California to improve the operational efficiency of zero emission cargo handling equipment. The project partners are Wiggins Forklift, SSA Pacific, TTSI, Shipper's Transport, Verne Cryo, Port of Long Beach, Breathe SoCal, and Long Beach City College. Wiggins will lead integration activities of its next generation fuel cell forklifts with Verne's cryo-compressed hydrogen storage tanks, while Verne will lead the integration of its tanks on up to ten Nikola Tre-FCEV trucks. SSA Marine will operate the forklifts for up to 15 months under the project demonstration at its Port of Long Beach facility at Pier F in ro-ro operations. The tractors will be demonstrated for 6 months by TTSI and an additional 9 months by Shippers' Transport, to prove the viability and benefits of the technology under multiple operating scenarios with both fleets. Verne will supply a liquid based mobile refueler integrated with cryo-compression equipment to each project site to fuel the vehicles. The team expects this project will successfully demonstrate benefits to vehicle range/operating time and payload capacity, critical factors in the zero-emission cargo handling sector, the adoption of which has been stifled by limitations to these factors thus far. The location of the demonstrations of the technologies are all within communities designated as disadvantaged by the California Climate Investments Priority Populations Map. The proposed technology will provide benefits to these communities such as improving air quality and diminishing negative health impacts associated with the emission of pollutants. Specifically, the expected emission reductions are expected emission reductions in PM2.5, NOx, ROG, DPM, and GHG. Extensive workforce training will be available to all workers who are involved with this project. There will be operator training provided for all demonstrators and technicians. In this way, equipment operators and mechanics will gain valuable experience and workforce training for operating and maintaining hydrogen fuel cell vehicles. Additionally, Wiggins plans to lead three to four trainings on hydrogen fuel cell technologies for heavy-duty transportation at Long Beach Community College. This will allow students and staff at Long Beach Community College to gain hands-on experience with heavy-duty hydrogen fuel cell technologies. This project is requesting \$\_\_ in funding. The total cost of the project is \$\_\_ (total cost of project including requested funding amount and match amounts that are proposed).

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**Project Applicant:** Center for Transportation and the Environment (CTE)

**Project Title:** 2x2 Fuel Cell Cutaway Demonstration

The **2x2 Fuel Cell Cutaway Demonstration Project** will be led by the Center for Transportation and the Environment (CTE), who will be joined by project partners Humboldt Transit Authority (HTA), Gold Coast Transit District (GCTD), Unique Electric Solutions (UES), and the Center for Responsible Transportation Priorities (CRTP). The project will also receive financial support from SoCalGas. The project proposes to deploy four fuel cell cutaway vehicles of two differing models across two distinct California geographies, in order to evaluate and contrast performance. Two of the vehicles will be operated by HTA in a more rural area in Northern California, and two of the vehicles will be deployed in a more urban area in Southern California. These vehicles will be operated in fixed-route service by both transit agency partners, and data collection throughout the project will allow the project team to analyze and compare performance between vehicle types, geographies, and uses. This project has requested \$8,916,724 in funding from CARB, and \$8,983,000 will be provided in match from the project team, creating a total project budget of \$17,899,724. The project will also be associated with a reduction in emissions in the communities in which the fuel-cell vehicles operate, as these vehicles will produce zero tailpipe emissions. The project is estimated to generate 138.6 metric tons of CO<sub>2</sub> emissions reductions per year, with a total of 1.214 US tons of criteria pollutant reductions per year. Both proposed deployment locations are within or immediately adjacent to disadvantaged communities, according to CalEnviroScreen, and the routes in which the vehicles will operate serve members of low-income and marginalized groups. The availability of zero-emission transit options in these communities and the associated emission reductions offers benefits to populations disproportionately impacted by pollution. Finally, the project will feature workforce development and training initiatives in order to adapt existing operators and maintenance technicians to this cutting-edge technology. Operators and technicians will receive a three-day training program focused on safety, operation, and maintenance of these vehicles.

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**Project Applicant:** Center for Transportation and the Environment (CTE)

**Project Title:** Glendale Municipal Green Zone Construction Work Crew

The Glendale Municipal Green Zone Construction Work Crew project, lead by CTE, seeks to pilot four types of heavy-duty electric vehicles (EVs) to determine the usability of new and innovative electric vehicle technologies for a construction work crew. The project partners in this project are the Center for Transportation and the Environment and the City of Glendale, with community outreach support from the Glendale Environmental Coalition. In this project, the City of Glendale will acquire four electric vehicles to constitute a construction work crew, including a dump truck, excavator, pick-up truck, and wheel loader. Fleet operators and technicians for these vehicles will be provided all necessary workforce training, which includes a virtual fleet training program and in-person vehicle training workshop. This group of vehicles will be deployed as a team on various projects throughout the Glendale city limits. These construction sites around the city will all be located within disadvantaged communities, and the technology will provide benefits to these communities such as improving air quality and diminishing negative health impacts 0.41 US tons PM<sub>2.5</sub>/yr, 0.30 US tons NO<sub>x</sub>/year, 0.118 US tons ROG/year, 0.0318 DPM/year, and 694.25 metric CO<sub>2e</sub>/year. This project is requesting \$1,073,084 in funding. The total cost of the project is \$2,146,788.

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**Project Applicant:** Center for Transportation and the Environment (CTE)

**Project Title:** Megawatt Charging System (MCS): Beachheads to Maritime Decarbonization

**Megawatt Charging System (MCS): Beachheads to Maritime Decarbonization**

The Center for Transportation and the Environment (CTE), along with project partners ABB, Adept, American Bureau of Shipping, Black & Veatch, CharIN, Cal Maritime, Chicano Park Museum and Cultural Center, Crowley, Port of Long Beach, Port of Los Angeles, Port of San Diego, UC Riverside, and BlueSky Maritime, with match contribution from SoCal Gas, propose to establish an industry standard for a megawatt charging system (MCS) suitable for the marine environment for electric vessel charging. This project includes establishing a design standard for the MCS and introducing this system on two Crowley vessel platforms: a new plug-in battery electric hybrid tug, to be deployed at the Port of Los Angeles, and an existing e-Wolf all-electric tug, deployed at the Port of San Diego. The project includes MCS charging infrastructure supported by microgrids at two locations at the Port of Los Angeles, as well as upgrades to existing infrastructure at the Port of San Diego to support the e-Wolf. The project also proposes to incorporate deployment of two electric shuttles and supporting infrastructure at the Chicano Park Museum to service Barrio Logan, one of the state's most heavily burdened and severely disadvantaged communities. The proposed shuttle will run from the CPMCC to the Port of San Diego, allowing Barrio Logan residents increased opportunities to work and recreate. All project components will occur within or adjacent to disadvantaged communities, concentrating benefits within marginalized populations. Finally, the project features several workforce training initiatives, including offering scholarships to students from marginalized backgrounds to attend a Maritime University and pursue employment on a Jones Act Vessel. The project will also feature CharIN Academy training, which will allow the industry standards body to share lessons learned and appropriate use surrounding the MCS. The CPMCC will offer shuttle operators three EV Learning Center Workshops in order to ensure safe operation of the new electric vehicles. Additionally, Crowley will be using augmented reality technology to train maintenance staff and operators on the proposed vehicles and technologies. Cal Maritime plans to retrofit a training vessel to accommodate zero-emission powertrains for the training of students and the demonstration of emerging alternative fuel technologies for the maritime sector. The total project cost is estimated at \$97,726,187, with a request of \$48,528,613 from CARB and \$49,197,576 in match. The project is expected to reduce emissions across sectors, including in the difficult-to-decarbonize maritime sector. The project is expected to yield 0.0108 tons PM2.5/year; 0.0829 tons NOx /year; 0.013 tons ROG/year, .0004 tons DPM/year, and 995.62 metric tons GHG/year in reduced emissions.

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**Project Applicant:** City and County of San Francisco's Department of Recreation and Parks (SFRPD)

**Project Title:** SFRPD Technology Pilot and Demonstration of Battery-operated and Electric Landscaping Equipment

**"San Francisco Green Zones: reducing air pollution emissions through electrification of grounds, maintenance, and landscaping equipment in Central and Southeast San Francisco"**

Led by the City and County of San Francisco's Department of Recreation and Parks (SFRPD), this project will advance Green Zones in San Francisco's central and southeast neighborhoods, SFRPD's Park Service Areas (PSA) 2 and 3, and the edge of PSA 5. SFRPD will proliferate the use of electrified, zero emission grounds, landscaping, and maintenance equipment in these neighborhoods, all of which have received the highest pollution rankings on CalEnviroScreen 4.0; are low-income and disadvantaged, according to the California Climate Investments Priority Populations map (AB 617); and are designated by the Bay Area Air Quality Management District as communities most impacted by air pollution. Expected emissions reductions from the entire project are estimated at 965 metric tons of carbon dioxide equivalent (MTCO<sub>2e</sub>). Criteria pollutant co-benefits reductions are estimated at 4,313 lbs. nitrous oxides (NO<sub>x</sub>); 42,587 lbs. reactive organic gases (ROG); 11 lbs. diesel particulate matter (DPM); 351 lbs. particulate matter (PM<sub>2.5</sub>). Workers to be trained in utilizing the new technology will include SFRPD's gardeners, and workers in its gardener apprenticeship program, which offers low or no skill entry-level positions that bring participants up to full, journey-level proficiency. The total project cost for San Francisco's Green Zones project is \$1,560,976.18. SFRPD is requesting \$780,488.09 from CARB and is providing matching funds of \$865,315.27 which includes \$84,827.18 contingency to cover unexpected labor costs.

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**Project Applicant:** City of Bakersfield

**Project Title:** Grid Resources on Wheels (GROW™) for Farmers in California and Everywhere

***Grid Resources on Wheels (GROW™) for Farmers in California and Everywhere*** is supported by the City of Bakersfield as lead applicant along with SineWatts, Kern County Community College District, University of California, Santa Cruz, University of California, Merced and Boathouse Properties.

The innovative water pumping demonstration project leverages advanced silicon semiconductor physics and magnetics platform to convert EVs into high power, high efficiency, mobile, power resources for the Future Grid™ irrespective of the equipment being supplied. Unlike today's EVs, these utilitarian trucks will be *packaged* and *enabled* with high power, high density, superior efficiency, *fundamentally new* power conversion technology. They will seamlessly and *bidirectionally* power in alternating current (AC) or direct current (DC) modes for both single and polyphase electrical equipment and loads.

The total cost for the Project is \$17,391,654 and the grant amount requested from CARB through this application is \$14,780,954 and matching funds total \$2,610,701. The project reduces GHG emissions by 6,035 MTCO<sub>2e</sub> by reducing 446,760 gallons of diesel fuel consumption.

The Project is located near and will provide benefits to disadvantaged communities throughout the Bakersfield area. The Project will expand workforce training, job assistance and career development in the clean technology field and will further build upon labor and development partnerships with local businesses and workforce organizations. Hands-on training and expanded apprenticeship and pre apprenticeship programs for EV manufacturing, maintenance and charging infrastructure installation and maintenance will be included in the workforce element of the proposed Project.



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**Project Applicant:** City of Berkeley Marina, California

**Project Title:** City of Berkeley Marina Electric Demonstration Project

The City of Berkeley Marina ("City"), Aqua superPower ("Aqua") and Vita Power ("Vita") are collaborating on a project to provide an all-electric, zero emission excursion vessel and fast marine charger at the Berkeley Marina. The goals of this demonstration project are: (1) to reduce emissions, (2) to transition a gas-powered excursion boat to all electric and install a fast marine charger to improve familiarity and acceptance with electric boats ("e-boats"), and (3) improve diversity, equity, and inclusion ("DEI") in Berkeley boating programs and job training. The neighborhoods surrounding the Marina are impacted by poor air quality conditions, and many rank at or above the 90th percentile for diesel particulate matter exposure. People of color and disadvantaged community members also comprise an extremely small population of slip holders and visitors at the Marina. The City wants to reduce emissions generated from marina operations and is requesting funding from CARB to replace its gas-powered boat used for its DEI and job training excursion programs with a new, all-electric excursion vessel. The new vessel will reduce emissions exposure in the community, offer a better experience for DEI boaters, and support the City of Berkeley's goal to become a net zero-emission city by 2045. The electric excursion boat will also be used for other outreach and education events at the Waterfront and for workforce training and development programs, including the City's monthly boat driving training and education program and as a training vessel for local and State-wide marine technician programs.

Expected emissions reductions as a result of transitioning to an all-electric vessel include: Particulate Matter 2.5 of 128 lbs; Nitrogen Oxide of 6,022 lbs; Reactive Organic Gases of 219 lbs; Diesel Particulate Matter of 135 lbs; and Greenhouse Gas reductions of 347 MTCO<sub>2</sub>E. Other project benefits include improved access and experience for families of color and of lower socioeconomic status, access to marine industry job training opportunities, serves as a technology showcase for electrifying marine vessels and supports City of Berkeley's Climate Action Plan. The City is the lead and overall administrator and will own and operate the electric excursion vessel. Aqua will lease the site, install, and own and operate the fast marine charger. Vita Power will manufacture the electric excursion vessel. Aqua and Vita have more than 5 years of experience in the U.S. and globally. The technologies that will be used in the project are an 8-passenger electric excursion vessel (the Vita Seal) manufactured by Vita Power and a fast marine charger installed and operated by Aqua. The City is requesting funding to purchase the Vita Seal excursion vessel and fast marine charger and to support administrative expenses to expand its DEI boating and job training programs. The total project cost is \$451,507. The City and its partners are requesting grant funding from CARB in the amount of \$218,451 to cover 48% of the project

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costs. The City and its partners are committed to matching the grant funding at 52% of the overall budget, at an amount of \$233,056.

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**Project Applicant:** City of Lancaster, California

**Project Title:** Lancaster Energy: Hydrogen Based Decarbonization and Emissions Reduction Program

The City of Lancaster, in partnership with Green Grid Inc., is pleased to work together on this project, titled "Lancaster Energy: Hydrogen Based Decarbonization and Emissions Reduction Program". The project will be located at the Antelope Valley Fair & Event Center, at 2551 W. Avenue H in Lancaster, CA.

With the proposed project, the City of Lancaster seeks to achieve full decarbonization of its existing Fair and Event Center and proposed Multi-Agency Regional Resilience Center (MARRC), while arranging for an adequate supply of hydrogen for its current and future fuel cell vehicles. This project will help the City to eliminate air pollution and greenhouse gas emissions from its combustion sources at this site and set forth an example of building decarbonization for other facilities around the city and in California. Stationary hydrogen fuel cells and storage will be installed to provide a reliable source of energy to meet all the needs of the Fair & Event Center and new MARRC. A hydrogen fueling station will also be constructed, which will service the City's hydrogen vehicle fleet.

This project will demonstrate a patented AI-enabled solution to safely and efficiently integrate multiple green hydrogen suppliers and end uses, while proving the benefits of replacing natural gas based facilities heating with electric heat pumps, switch the City vehicle fleets to hydrogen vehicles, and run City buildings on delivered green hydrogen. In this technology demonstration, the City of Lancaster will also implement a decarbonization community outreach program, streamlined hydrogen project permitting program, and demonstrate an extended reality AI enabled hydrogen worker training program which all integrate with the technology demonstration and pilot to pave the way for massive growth in zero emissions solutions.

The total cost of this project is \$18,144,000. The City of Lancaster will provide 50% match funding of \$9,072,000 all in cash. The calculated emissions reductions of this project is estimated to be 1,580 MTCO<sub>2</sub>e/year. These reductions are achieved through building decarbonization and emissions avoided through the use of the hydrogen fueling station to fuel the City's hydrogen fleet.

This project is located in a low-income census tract and provides services for the surrounding disadvantaged community of Lancaster. This pilot project will hire and train at least two local qualified people to become hydrogen equipment operators to perform routine operations and maintenance of the pilot project and validate the worker training model which can be scaled State wide under other programs. This pilot project is expected to continue for many years after this performance period and these jobs developed should be long term well compensated jobs. The worker

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training is planned to incorporate a workforce development program within the community using the hydrogen station, fuel cells and trucking trailers to incorporate training opportunities in the entire green hydrogen supply chain. This can provide a pathway for residents to enter into the growing green jobs sector, which can help to build a more sustainable and resilient community and support the growing green economy in the City of Lancaster.

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**Project Applicant:** City of Los Angeles, Harbor Department (Port of Los Angeles, POLA)

**Project Title:** Los Angeles Marine Emission Reduction Project

Port of Los Angeles (POLA), with the Port of Long Beach (POLB) and Catalina Channel Express (CCE) and Harbor Breeze Cruises - is undertaking the Los Angeles Marine Emission Reduction project (LA MER) to immediately reduce emissions for disadvantaged communities while advancing the understanding of cutting-edge harbor-craft technologies for the future. The total project cost is \$62,590,932. Of this amount, POLA is requesting \$30,980,378 in grant funds with \$31,610,554 to be provided as match.

This multi-faceted project will demonstrate two different emission-reduction technologies in different vessel types across many duty cycles. Additionally, POLA will work with Port of Long Beach, harbor-craft operators, regulators, engine manufacturers, technology developers, and the US Coast Guard (USCG) to evaluate next-generation technologies that could be feasible for the tugboats, ferries, and pilot vessels operating in San Pedro Bay. Project components include:

**Passenger Ferry with Tier 4 Engines and Diesel Particulate Filter (DPF).**

Design, construct, launch, and demonstrate a high-capacity passenger ferry with Tier 4 propulsion engines and a diesel particulate filter (DPF), assuming a DPF has been verified by the California Air Resources Board and approved by USCG at time of engine installation. The new ferry, operated by CCE, will operate on renewable diesel and replace three smaller ferries with Tier 2 and Tier 3 engines, which enhances the efficiency of regional ferry service and thus increases the emissions benefits.

**Zero-Emission Capable Excursion Boats.** Design, construct, launch, and demonstrate two zero-emission capable hybrid excursion boats in partnership with Harbor Breeze. The vessels are expected to exceed the definition of Zero-Emission Advanced Technology (ZEAT) vessel under the Harbor Craft Regulation. Each boat will have renewable-diesel-powered Tier 4 propulsion engines for safety, resiliency, and added range, but will be able to operate a minimum of 30% of the time in zero-emission mode with some trips operating as much as 100% of the time in zero-emission mode depending on duty cycle and route length. Although not part of this project, Harbor Breeze also will install shore power at a public wharf to serve the zero-emission capable excursion boats.

**Next Generation Harbor Craft Technology Evaluation.** Develop a report to evaluate the commercial status of emission-reduction technologies, to assess the feasibility of marinizing DPFs, to request information from engine

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manufacturers on future low-carbon fuels and technologies, to identify infrastructure gaps for zero-emission harbor craft, and to understand workforce development needs specific to tugs, ferries, and pilot boats operating in San Pedro Bay.

Project benefits will accrue to the disadvantaged, high-priority populations in which the vessels will be domiciled and spend nearly all of their time. Emission benefits include 1,503 MT CO<sub>2</sub>e and 113 weighted tons of criteria and toxic emissions per year.

LA MER also includes a robust workforce plan, training harbor-craft workers in new engine technologies and advanced battery-electric solutions while supporting recruitment programs that draw from the local, underserved community. The LA MER project balances the need to immediately reduce air-quality and health-risk impacts on nearby disadvantaged communities with the long-term goal of carbon-neutral, zero-emission harbor vessels.

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**Project Applicant:** Clean Coalition

**Project Title:** Conversion and Electrification of the Gold Rush Commercial Fishing Vessel

- a. **Project Name:** Conversion and Electrification of the Gold Rush Commercial Fishing Vessel
- b. **Name of applicant and project partners:** Clean Coalition (Applicant), SF Fishing Charters, Green Yachts, EPTechnologies, and workforce development organizations (Canal Alliance, Santa Rosa Junior College, and College of Marin) as well as the fishing community in California.
- c. **Brief description of proposed project including location (excluding personally identifiable information for any private individuals):**
- d. **Requested Funding Amount:** \$2,421,386.40
- e. **Total Project Cost:** \$2,643,984.00
- f. **Expected emission reductions in PM2.5, NOx, ROG, DPM, and GHG:**  
The project will create a 3.1 tons of annual weighted emission reduction per year, which amounts to a voluntary 21.7 tons of reduced pollutants reduced before the compliance deadline. Additionally, it will eliminate 412 metric tons of CO2 equivalent below the GHG emissions that EPA Tier III engines would create after repower to a compliant Tier III engine
- g. **Whether the project is to be located within or provide benefits to a disadvantaged community:** The Gold Rush has its operations based out of Richmond. As the map to the right from the CalEnviroScreen 4.0 shows, their home port, marked by a black circle, is located within a DAC and within two miles of multiple DAC census tracts and therefore meets the CHC definition of operation within a Disadvantaged Community.
- h. **Workforce Training:** There are three primary workforce development efforts that will result from grant awards. Job classification categories below use Standard Occupational Classifications (SOCs) used by the California Employment Development Department and the Bureau of Labor Statistics:  
Vessel Operator will need a trained and skilled mechanic on staff who is familiar with the electric propulsion installed on their vessel(s) in the following job classification codes:
  - i. Vessel Operator will need a trained and skilled mechanic on staff who is familiar with the electric propulsion installed on their vessel(s) in the following job classification codes:

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- 49-2093 Electrical and Electronics Installers and Repairers, Transportation Equipment<sup>12</sup>
- ii. Vessel Operator will need to hire staff to market, operate, maintain electric vessels in order to maintain existing service levels, expanded service on existing vessels converted to electric and/or staff expanded service with new electric vessels in the following job classification codes:
  - 53-5021 - Captains, Mates, and Pilots of Water Vessels<sup>34</sup>
  - 49-2093 Electrical and Electronics Installers and Repairers, Transportation Equipment<sup>12</sup>
  - 41-1012 - Non-Retail Sales Supervisors<sup>56</sup>
  - 53-6061 - Transportation Attendants, Except Flight Attendants<sup>78</sup>
- iii. Green Yachts, a project partner serving in the capacity of contractor, must develop skilled marine electrification mechanics for its installation team in the following job classification codes:
  - 49-2093 Electrical and Electronics Installers and Repairers, Transportation Equipment

The transition to electric vessels will include our whole community. The participation of disadvantaged community members in the marine sector, both as vessel operators and as marine mechanics is lower than in other sectors. We want to hold ourselves and our project partners accountable for being inclusive in our recruitment and hiring practices so that the marine sector represents the diversity of our greater community.



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**Project Applicant:** County of Monterey

**Project Title:** Monterey Bay Municipal Fleet Electrification and Workforce Accelerator

**Project name:** Monterey Bay Municipal Fleet Electrification and Workforce Accelerator

**Partners:** Monterey County (applicant), Cities of Santa Cruz and Watsonville, Counties of San Benito and Santa Cruz, Ecology Action, Monterey Bay Economic Partnership (MBEP)

**Location:** Monterey Bay Region

**Description:** The five public jurisdiction partners have formed a chartered organization, the Regional Climate Working Group, and together with Ecology Action and MBEP, are proposing under the Green Zones category to develop a replicable model for municipal electric vehicle (EV) fleet transition.

The Monterey Bay Municipal Fleet Electrification and Workforce Accelerator has three objectives:

- (1) Understand and address organizational and planning barriers through change management techniques and use of a fleet electrification planning tool;
- (2) Increase staff acceptance of EVs by training EV users and fleet mechanics/maintenance staff and co-developing standard operating procedures around training, maintenance, and charging; and
- (3) Reduce emissions and inform future decision-making by strategically procuring EV's and EVSE and collecting data across more than 40 municipal departments; and
- (4) Engage with disadvantaged communities and regional workforce efforts to broaden benefits of the project.

The potential benefits of the project include a replicable model of zero-emission adoption in multiple municipal departments across multiple use cases, with a year of data collection provided to CARB and disseminated through forums. Additionally, the curriculum and training results of the workforce training plan will be compiled, analyzed, and published for other municipalities' use. Workforce training will build from a program for municipal staff through the efforts of two community-based organization partners, Ecology Action and Monterey Bay Economic Partnership (MBEP). Ecology Action will connect disadvantaged communities with project workforce efforts and with EVITP training. The project is located in multiple disadvantaged and/or low income communities and will provide benefits to those communities. MBEP will connect regional workforce networks to the curriculum and other opportunities from the project.

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**Total Project Cost:** \$31,432,827

**Requested Funding Amount:** \$15,713,981; **Match Amount Proposed:** \$15,718,846

**Expected Emissions Reductions:**

Particulate Matter 2.5 (PM2.5):

.217 metric tons/year

Nitrogen Oxide (NOx): 21.3 metric tons/year

Reactive Organic Gases (ROG):

6.82 metric tons/year

Diesel Particulate Matter (DPM):

0.019 metric tons/year

Greenhouse Gases (GHG):

14,656 metric tons CO2/year

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**Project Applicant:** Eastern Contra Costa Transit Authority

**Project Title:** Rider Pass Up Reduction Through the Use of Advanced Technology

The Project Summary for Public Posting:

Rider pass up reduction through the use of advanced technology

Applicant: Eastern Contra Costa Transit agency

Partner technology developer: Way Sine LLC

The aim is to reduce rider pass ups throughout the eastern contra costa region with the use of technological enhancements. This will be achieved through the integration of cloud hosted software solutions, and interconnected hardware solutions on and off the bus. Technological partners will play a key role in designing and implementing the advancements. The pilot demonstration will require development, manufacturing, installation and monitoring of measurable outcomes. All components are readily available within the market, and will be reconfigured to expand and enhance its functionality for this purpose.

Hardware and service upgrades will directly impact and improve services in disadvantaged communities in the city of Antioch, for example, and the surrounding area. This area has been identified as low income and CES4 disadvantaged according to the Priority Populations 2023 Map.

GHG emissions reductions will be a direct result of reduced boarding times, reduced idle times, reductions in call backs/dial-a-ride service and all associated hardware being off grid. On-street signage will be powered by solar/battery, and on-bus hardware will be powered by the bus itself. Through these efforts it is the desired outcome that additional choice riders will be encouraged to use public transit as a primary mode of transportation.

Amount of funding requested = \$481,200.00

Total cost of project including requested funding amount and match amounts that are proposed = \$508,200.00

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**Project Applicant:** Foundation for California Community Colleges (FCCC)

**Project Title:** California Zero-Emission Aviation Demonstration Project

Aviation is a growing contributor to global climate change - and is one of the last transportation sectors to make meaningful progress to electrify and eliminate mobile emissions. The *California Zero-Emission Aviation Demonstration Project* (Project) is the bold step needed to accelerate the electrification of the aviation industry. Located on Victoria Island Farms within a disadvantaged community (DAC) in the San Joaquin Valley, the Project will demonstrate 5 FAA-approved, zero-emission, autonomous aircraft, the Pelican Spray, to apply agricultural chemicals to some of California's most valuable crops. The aircraft will be powered by 3 off-grid solar mobile charging systems and supported by 2 zero-emission pick-up trucks for repositioning the aircrafts around the farm. The Project will be the first California-based deployment to demonstrate the innovation and economic viability of autonomous, zero-emission aviation, advancing widespread, commercial adoption by the agriculture industry and leading the way to electrify the aviation industry in California and Worldwide.

FCCC is the applicant, administrator, and lead on workforce development and training, bringing nearly 20 years of experience successfully administering and implementing large-scale regional and statewide air quality and workforce development programs. Pyka, a California company with advanced manufacturing, R&D, and headquarters in Oakland, will manufacture, operate, and collect data on the 5 aircraft and deploy supporting mobile chargers and zero-emission pick-up trucks to Victoria Island Farms, a leader in sustainability in the Central Valley. Ogive Technology, Inc., an expert in aerial spraying, sensing and control systems, will calibrate the equipment for commercial operations.

The Project will provide direct benefits to the farm's surrounding priority populations by eliminating emissions, minimizing the amount of chemicals applied, and reducing chemical spray drift and noise pollution. The estimated emission reductions for the proposed Project include: 1,006 tons of CO<sub>2</sub>e, .897 tons of NO<sub>x</sub>, .172 tons of ROG, .031 tons of PM<sub>10</sub>, .031 tons of DPM.

FCCC and Pyka will design a robust, equity-based Workforce Development and Training Plan that will create clear training and hiring pathways, enabling community college students to gain meaningful paid work experience and placement in living-wage green jobs. Two community-based organizations, NPower California and Bay Area Community College Consortium will support the workforce and training plan to serve the DACs surrounding Victoria Island Farms, Pyka's Oakland facilities, and statewide.

To support market expansion, Pyka and FCCC will share the Project's data and lessons learned with farmers and other end-users and at state-sponsored

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symposiums. The Project's results also will be shared nationally and internationally as Pyka continues to develop innovative all-electric, autonomous aircraft for the air cargo and passenger markets.

The Project will bring 25% match funding -- \$1,181,650 of cash match and \$1,780,079 of in-kind match to leverage the proposed \$8,829,351 California Air Resources Board (CARB) investment, for a total project budget of \$11,791,080.

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**Project Applicant:** Monterey Bay Air Resources Board (MBARD)

**Project Title:** Building Monterey Bay's First Hybrid-Electric Whale Watching Vessel

**Applicant:** Monterey Bay Air Resources Board (MBARD)

**End User and Technology Demonstrator:** Monterey Bay Eco Tours (MBET)

**Project Title:** Building Monterey Bay's First Hybrid-Electric Whale Watching Vessel

**Project Objectives:** In partnership with MBARD, MBET and Left Coast Composites (LCC) will build the first zero-emission capable hybrid whale watching vessel in California. The vessel will operate on the cleanest available technology, bringing it into compliance with Commercial Harbor Craft regulations.

**Project Description:** The proposed vessel will be custom-built by LCC and Coast Guard Certified to carry 49 passengers for year-round whale watching excursions out of Moss Landing Harbor. This 57-foot-long catamaran will have electric inboard motors with emergency backup diesel-powered generators to meet Coast Guard safety requirements. The project will include renewable energy sources by including rooftop solar panels to trickle charge the batteries.

**Methodologies to be Employed:** The vessel will be built using closed-mold vacuum infusion, a building technique that reduces waste and minimizes volatile organic compounds (VOC).

**Technologies to be Utilized:** EP-70 Electric Propulsion System, Twin 22kW Polar Power DC Gensets, Lithium Iron Phosphate Batteries, Sunpower Maxeon 3 DC 420 watt solar panels.

**Potential Benefits and Outcomes:** MBET operates out of Moss Landing, a low-income community that shares borders with three CES 4 designated disadvantaged communities. Building and operating a hybrid-electric vessel will help improve air and water quality, protecting public health in a port-adjacent community that is already burdened by high levels of air pollution. This new vessel will help increase community interest in electric vessels and supporting infrastructure and increase options for electric ecotourism.

**Workforce Training:** MBET will provide ongoing training for staff about hybrid-electric vessel build, design and general operation, electric propulsion technology, and effective battery maintenance. Adding another vessel into MBET's fleet will create 15 new jobs in ecotourism and the green economy. LCC will provide vocational training to an apprentice to participate in this build so it can be reproduced and marketed for production.

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**Major Project Participants:** MBARD (experienced in facilitating CARB-funded projects to improve air quality within the air district); MBET (3 years of experience operating fully electric ecotours); LCC (30 years of experience building vessels of various sizes); Elco Motors (100 years of experience developing electric maritime power systems).

**Total Cost:** \$2,600,000 **Requested Amount:** \$1,000,000 **Match Amount:** \$350,000  
**Expected Emission Reductions:** PM2.5: 255lbs, NOx: 100,071lbs, ROG: 4,287lbs, DPM: 267lbs, GHG: 31,830 MTCO<sub>2</sub>e

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**Project Applicant:** New Day International

**Project Title:** Electric Fast Ferry Demonstration Project

**Project Name:** Electric Fast Ferry Demonstration Project

**Applicant & Project Partners:** New Day International (non-profit Grantee), PROP (operations), Green City Ferries (design/integration), BAE Systems (powertrain), Cavotec (charging), Tucker Yacht Design (3rd party administrator), Marinship Development Interest (infrastructure).

**Project Description:** The Electric Fast Ferry Demonstration Project will build, certify with the U.S. Coast Guard, and put into service the first electric fast commuter ferry in the U.S. The project will demonstrate a solution to the inherent electrification challenge (battery charge time v. efficient fast ferry scheduling) with advanced portable supercharging technology. Shoreside infrastructure, including portable container-based supercharging equipment, will allow electric fast ferries to complete shifts with efficient commute scheduling - while also empowering CARB and the Demonstration Project with the flexibility to consider multiple Project Demonstration routes that empower. Utilizing the latest industry standards for charge connection, including new megawatt supercharging, will enable other electric vessels and vehicles to use the state-of-the-art charging equipment. The Electric Fast Ferry Demonstration Project will provide many environmental, economic and community benefits including an electric fast ferry that eliminates pollution *and* dramatically reduces operating costs faster, cheaper, and more reliable commuter option for disadvantaged communities stimulating economic vitality in disadvantaged communities securing high-quality green jobs reducing single-occupancy vehicle congestion on Bay Area bridges setting a powerful, scalable, transit model example for California marine communities.

The Electric Fast Ferry Demonstration Project will carefully collect, analyze, and publish ferry service metrics demonstrating the viability and reduced operating costs of the new advanced electrification technology. This groundbreaking information will empower an important and resilient transportation option for maritime communities and help accelerate the transition to zero-emission (ZE) public transportation in California and beyond.

**Amount of Funding Requested:** \$19 M from CARB and \$13 M from CEC

**Total Project Cost:** 37.8 M including matching fees



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**Expected Emission Reductions:**

Particulate Matter 2.5 (PM2.5): 19,095

Diesel Particulate Matter (DPM): 20,756

Nitrogen Oxide (NOx): 421,680

Greenhouse Gases (GHG): 54,9250

Reactive Organic Gases (ROG): 39,225

**Disadvantaged Communities:** Electric Fast Ferry Demonstration Project terminals will be located in - and stimulate the local economies - of disadvantaged communities. Residents of these communities will benefit from a faster, cheaper, and more reliable commuter option (v. congested Bay Area bridges).

**Workforce Training:** This project will result in high-quality, future-proof green jobs with ferry crews trained in the operation and service of advanced carbon fiber/foil-assisted vessels, electric motors, water jets, batteries, and shoreside supercharging equipment service center technicians trained in maintenance of carbon fiber, maritime battery banks, water jets, and electric drive systems.

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**Project Applicant:** Port of Oakland

**Project Title:** Bay Area Zero-Emissions Tug (BAZE ElectRA Tug): Accelerating the Port of Oakland's Pathway to Zero-Emissions

The Port of Oakland (Port) and its tenant and project technology demonstrator AMNAV, along with leading maritime industry stakeholders and zero-emissions technology vendors, seek funding to design and build a zero-emissions electric tugboat (e-tug) that will operate in the San Francisco Bay. The Bay Area Zero-Emissions Tug (BAZE ElectRA Tug) (Project) will facilitate the first zero-emissions vessel deployment at the Port and will be powered by a state-of-the-art microgrid system. The Project aims to achieve a replicable prototype that can foster the commercialization of zero-emissions vessels. The primary objectives of the Project are to develop a zero-emissions vessel design that: 1) Reduces maritime-related emissions, particularly those impacting disadvantaged communities (DACs); 2) Identifies and addresses safety, technical, regulatory, electrical, and mechanical challenges for zero-emissions tugs; 3) Applies value engineering to the design and development of the e-tug to set industry standards; 4) Accelerates market commercialization of zero-emission tugs; 5) Advances the zero-emissions goals of the State and the Port's Seaport Air Quality 2020 and Beyond Plan; and 6) Promotes workforce opportunities for disadvantaged populations.

E-tugs represent an opportunity to significantly reduce marine-related emissions while generating minimal emissions in the production and delivery of fuel for the vessel. With a green fuel supply, well to wake emissions can be zero; the improvements to air quality would be especially impactful to the priority population/DACs within and adjacent to the Port. The Project will include a turnkey microgrid power system (Cat<sup>®</sup> ESS and associated switchgear) for charging the proposed e-tug, supporting purely battery-electric tug daily operations. Power is to be supplied by the Port through a connection to the ESS, supporting accumulation of power in the shoreside batteries while the tug operates for quick charging, and supporting lower power vessel charging when docked.

With a total project cost of \$50,829,193, the Port is requesting \$25,308,411 from CARB, with a proposed match of \$25,520,782 from the Port, AMNAV, Cal Maritime, and Alameda County Workforce Development Board, with workforce activities also being performed by the Working Waterfront Coalition.

The e-tug demonstration will provide substantial environmental and workforce benefits while advancing the commercialization of zero-emissions harbor craft technology. The e-tug will directly benefit the West Oakland community and surrounding census tracts by mitigating greenhouse gas (GHG) emissions and other criteria pollutants, which has a disproportionate impact on historically disadvantaged and priority populations near the Port. Using AMNAV's existing Tier 2 harbor tug as a

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baseline and powered by electricity sourced from 82 percent renewable energy, the e-tug is estimated to realize 302.2 metric tons of carbon dioxide equivalent (MTCO<sub>2</sub>e) savings per year and an annual reduction of 11.55 tons of NO<sub>X</sub>, 0.49 tons of ROG, 0.22 tons of DPM, and 0.21 tons PM<sub>2.5</sub>. The Project partners will facilitate workforce training to support e-tug deployment, including training by the manufacturer on charging, operating, and maintaining the equipment, and certification opportunities via California State University's Cal Maritime Academy.

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**Project Applicant:** Sacramento Metropolitan Air Quality Management District (SMAQMD)

**Project Title:** Sacramento Valley RR Zero-Emission Switcher Demonstration

The Sacramento Metropolitan Air Quality Management District (SMAQMD), Zero-Emission Locomotive Technologies LLC (ZEL TECH), and the Sacramento Valley Railroad (SAV - a Patriot Rail company) are partnering to propose the demonstration of a zero-emission battery-electric switcher locomotive to operate zero-emission throughout the McClellan Business Park business and industrial center in Sacramento, California. SMAQMD requests \$1,972,350 in California Advanced Technology Demonstration and Pilot Projects funding to co-fund the "*Sacramento Valley RR Zero-Emission Switcher Demonstration*" project. For this project, SMAQMD and SAV propose to demonstrate ZELTECH's zero-emission battery powered switcher locomotive technology, designed to support the 1,500 horsepower requirements for full operational capability throughout the SAV network of track lines within McClellan Business Park. With maximum speeds of 10-15 miles per hour (mph) within the park, the SAV duty cycle for locomotives is a demanding 24 hour per day operation, five days per week. The advanced technology battery system consists of fire- safe Lithium Iron Phosphate (LFP) chemistry lithium-ion battery packs and is rated at 2,100 kW-hours total, and designed to supply enough energy for two 8-hour working shifts without re-charging. With opportunistic charging it is projected that the locomotive can work 24 hours per day for five days before a weekend total recharge of the battery system is required. Electric charging infrastructure will be installed to support the demonstration unit at the SAV tracks in the McClellan Business Park in Sacramento, CA. The total project cost is \$3,945,831, with project partners providing 50%, or \$1,973,841 in match funding (1,384,450 cash and \$589,031 in-kind). SAV's locomotive facility is located at 4144 Dudley Blvd. Bldg. 412, McClellan, CA 95652, and the demonstration unit will operate in revenue service throughout McClellan Business Park

- Successful implementation of this project will serve as a catalyst for change in the McClellan Business Park complex, demonstrating the technical feasibility of zero-emission switcher locomotive service in rigorous goods movement operation not only in the park, but throughout California.
- The entire SAV operating trackage is within a disadvantaged community area as defined by SB 532. Direct localized emission reductions in designated disadvantaged communities surrounding the project site will benefit local residents, including those in zip codes 95652, 95660, 95821 and 95838.

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- Based on ARB's methodology, annual emission reductions for the proposed project are estimated in tons per year (tpy) to be: 0.305 tpy PM2.5, 9.500 tpy NOx, 0.802 tpy ROG, 0.332 tpy DPM, and 607.838 metric tonnes per year of CO2e.

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**Project Applicant:** San Diego Air Pollution Control District (SDAPCD)

**Project Title:** ZEST - Zero Emission Sustainable Transportation

San Diego Air Pollution Control District (SDAPCD), in collaboration with Star & Crescent Boat Company, D.B.A. Flagship Cruises & Events (Flagship), Aurora Marine Design (Aurora), and the Port of San Diego, will be designing and constructing two new, battery-electric ferries that will replace Flagship's diesel ferries, providing service from downtown San Diego (Broadway Pier) and the San Diego Convention Center to Coronado. The **ZEST (Zero Emission Sustainable Transportation)** Project will also be upgrading facilities at Broadway Pier and the Convention Center to accommodate the installation of new off-the-shelf automotive 350kW DC fast chargers for shoreside charging of the new, battery-electric ferries. The Project will be informed by robust and meaningful community engagement with considerations for equity at all design stages. Furthermore, the Project will enable workforce development activities to support local communities and serve as a spotlight project for broader vessel decarbonization in the state and more broadly throughout the country.

Flagship's ferries operate in waters adjacent to and upwind of designated Priority Populations in San Diego. This creates an opportunity to directly improve air quality in these low-income and disadvantaged communities by decarbonizing the ferry service. Additionally, the pollution from automobile traffic to and from Coronado on the freeway and Coronado Bridge can be meaningfully reduced by the new ferries providing an alternative connection, with an increased capacity of 17% over the existing ferries, for commuters to access economic opportunities on either side of the bridge. The Project outcomes will reduce negative impacts and provide the following benefits to the surrounding disadvantaged communities:

- (1)** Improved local air quality
- (2)** GHG emissions reductions
- (3)** Increased access to affordable transit and transit for those without personal vehicles
- (4)** Improved domestic knowledge and workforce training with battery-electric vessels and related technologies.

Workforce development and training for the Project will consist of:

- (1)** newly created battery electric vessel training with the Maritime Institute and
- (2)** workforce development training through the Port of San Diego for Priority Populations interested in clean technology and maritime careers.

**Total Project Cost:** \$20,942,535

**Requested Funding Amount:** \$15,272,401

**Match Funding Amount:** \$5,655,134

**Expected Emission Reductions:** Particulate Matter 2.5 (PM2.5): 0.32 tons, Nitrogen Oxide (NOx): 20.80 tons, Reactive Organic Gases (ROG): 0.89 tons, Diesel Particulate Matter (DPM): 0.32 tons, Greenhouse Gases (GHG): 530.11 tons (Over 2 years)

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**Project Applicant:** San Joaquin Valley Air Pollution Control District

**Project Title:** Sierra Northern Railway (“SNR”) Demonstration to Accelerate Domestic Hydrogen Switcher Locomotive Conversion and Establish a Fueling Solution

San Joaquin Valley Air Pollution Control District (“Valley Air District”), the Applicant, is partnering with Sierra Northern Railway, a Class III freight railroad, for a project titled Sierra Northern Railway (“SNR”) Demonstration to Accelerate Domestic Hydrogen Switcher Locomotive Conversion and Establish a Fueling Solution (the “Project”). Major participants in the Project include GTI Energy (“GTI”) and SNR.

The Project, which will take place at SNR’s existing facilities, includes building/converting three diesel switcher locomotives into ZE locomotives; establishing a fueling station; and testing the ZE locomotives on SNR’s rail lines which will further SNR’s objective to convert 50% of its own locomotives to ZE technology in the next decade, while simultaneously commercializing the technology and encouraging other short lines to do the same. Valley Air District, on behalf of SNR, is seeking to fund an approximately \$30,995,660 million project via the California Air Resources Board (“CARB”) FY 2021-22 and FY 2022-23 Advanced Technology Demonstration and Pilot Project (“ADTPP”) grant program and are requesting \$23,140,660 in ADTPP grant funds and are proposing a 25% match of \$7,211,040.

Expected emission reductions are PM<sub>2.5</sub>, NO<sub>x</sub>, ROG, DPM, and GHG and are to be achieved while realizing the Technology’s Target Level of Performance: ZE locomotives offer up to 1,500 kW output, a minimum 300 kg of 350 bar onboard hydrogen storage and offer a 10-year useful life. Data collected during the demonstration will provide insights into refining performance, improving operations, and reducing the costs of operating this technology for commercial operators that SNR assists with similar endeavors. This important environmental technology is also expected to displace an estimated 10,000 or more gallons of diesel fuel used per year, along with associated greenhouse gas (“GHG”) and criteria area pollutants, such as NO<sub>x</sub> and particulate matter (“PM”).

The Project, which is anticipated to provide substantial health and economic benefits to the Northern California region, will also provide benefits to Oakdale, CA, a disadvantage community through reduced emissions; promoting transportation equity, and workforce training programs.

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**Project Applicant:** Scripps Institution of Oceanography, UC San Diego

**Project Title:** Hydrogen Power for the Coastal Class Research Vessel (CCRV)

**Project name:** Hydrogen Power for the Coastal Class Research Vessel (CCRV)

**Applicant:** Scripps Institution of Oceanography, UC San Diego

**Project Description:** We will design, build, commission and operate a novel liquid hydrogen fueled zero-emission oceanographic research vessel capable of long duration scientific missions on the high seas. Our Coastal Class Research Vessel (CCRV) will use liquid hydrogen with the capacity to operate continuously on hydrogen alone for not less than two consecutive days, with hydrogen fuel cells providing the electrical power necessary for propulsion, scientific systems, instrumentation, and hotel load. Home-ported on San Diego Bay, this ship will be uncompromising in its ability to conduct its research and education mission, and will demonstrate full-ocean zero-emission operations to the maritime industry, scientists, students, and policymakers.

As a bold first mover in marine zero emissions technology, our project will demonstrate technical, operational, economic, and regulatory solutions that are needed to for the maritime industry to transition away from polluting fossil fuels to clean decarbonized operations. Among the important outcomes for this project will be the maturation of regulatory framework within which zero-emission power systems must operate.

Our project will inform and advance the transformation of the maritime industry to zero emissions.

**Amount requested:** \$17,087,380

**Total cost (including requested funding and cost match):** \$62,306,673.

**Expected emission reductions:** Relative to our existing vessel, we will eliminate 50,077 metric tons of greenhouse gases, 4,833,524 pounds NO<sub>x</sub>, 235,496 pounds DPM, 225,134 DPM<sub>2.5</sub>, and 483,285 pounds of organic gases over the span of CCRV's planned service life (30 years).

**Location:** Our projects is based, and CCRV will be operated from, Point Loma in San Diego Bay, which is a Priority Low-Income Community as defined California Climate Investments Priority Populations 2023 database.

**Workforce training:** Because there is currently not a pool of seagoing mariners trained to operate ships using zero-emission technology, workforce training is an essential element to our program, involving training requirements and standards of competency to operate a hydrogen-fueled vessel, with broad growth potential as the industry transitions to zero emission fuels.



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**Project Applicant:** South Coast Air Quality Management District

**Project Title:** California Transportation Electrification Advancement for Municipalities (TEAM)

The South Coast Air Quality Management District (SCAQMD) requests \$36,432,602 for the California Transportation Electrification Advancement for Municipalities (TEAM) project to deploy medium- and heavy-duty (MHD) zero emission vehicles (ZEV) in municipal green zones (MGZs). TEAM will advance ZEV technologies, reduce greenhouse gas (GHG) emissions, and improve air quality - particularly in California Climate Investment Priority Populations. SCAQMD is partnering with municipalities including the Cities of Los Angeles, Riverside, Clovis, Porterville, and Sacramento to demonstrate advanced ZEV technologies in municipal operations including but not limited to fire rescue, public works, sanitation, transit, and parks. The overall project objectives are:

- Establish MGZs in key regions to support the ZEV transition for municipal fleets.
- Demonstrate a portfolio of advanced ZEV technologies and charging infrastructure in real-world municipal operations that meet the needs of a variety of fleets and duty cycles.
- Reduce diesel emissions and criteria pollutants across the state.
- Provide a ZEV fleet transition and MGZ model for municipalities or public agencies.
- Develop a highly skilled workforce qualified to support market transformation to advanced ZEV technologies.

This project will deploy 104 advanced MHD battery-electric vehicles (BEVs) including refuse haulers, construction equipment, shuttle buses, firetrucks, and box trucks that can be upfitted for different applications along with supportive high-power charging infrastructure and innovative mobile charging solutions. SCAQMD and TEAM municipalities are partnering with leading global original equipment manufacturer (OEM), Volvo Group (Volvo), which has been developing and manufacturing MHD BEV since 2018 to source advanced vehicle technologies that meet the needs of various municipal fleet operators. The municipal partners are each at different stages of the ZE fleet transition process, which will contribute to establishing comprehensive learnings and best practices for other municipalities regardless of where they are in the fleet transition journey. The project team is also partnering with Cerritos College and Clean Fuel Education to implement enhanced ZEV technology curriculums to support local workforce development and ensure highly skilled workers are ready to support the transition to ZE fleets.

The Cities of Los Angeles, Riverside, Clovis, Porterville, and Sacramento all represent official 2023 California Climate Investments (CCI) Priority Populations and disadvantaged communities (DACs) which will benefit from emissions reductions, air

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quality improvements, and workforce development opportunities resulting from the TEAM project. The project is expected to have the following benefits:

- ZEV technology advancement and market acceleration
- Widespread emissions reductions in CCI Priority Populations
- Establishment of best practices and lessons learned for municipal ZE fleet transition planning
- Local workforce development

The total cost of the proposed project is \$72,922,394 with \$36,489,792 provided by TEAM partners in the form of cash and in-kind match. TEAM partners are committed to investing in ZEV technologies and will provide cost share including covering engineering costs, utility infrastructure upgrades, equipment, materials, charger installation and outreach and training activities to ensure the objectives of this project are achieved at full scale and critical benefits reach California communities.

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**Project Applicant:** South Coast Air Quality Management District (SCAQMD)

**Project Title:** Strategic Pathways for Extended Electric Drayage (SPEED)

The South Coast Air Quality Management District (South Coast AQMD) alongside Volvo Group North America (Volvo), Sacramento Metropolitan Air Quality Management District, San Joaquin Valley Air Pollution Control District, and San Diego County Air Pollution Control District is demonstrating a statewide electric corridor with the Strategic Pathways for Extended Electric Drayage (SPEED) project. Supported by a high speed, publicly accessible truck charging network, the electric corridor will enable the transportation of goods from ports by connecting Sacramento and San Diego via the 1-5, 1-710, 1-210, 1-10, and the 1-805.

The SPEED project will deploy 100 battery-electric Class 8 drayage tractors, five (5) megawatt chargers, 67 direct current fast chargers, 1.3MW of battery storage, and one ( 1) learning platform truck capable of rapid charging up to 750kW operated by Dependable Highway Express. A battery recycling system will identify batteries for appropriate second life applications. The battery electric trucks (BETs) will be deployed throughout the four (4) air districts and be owned and operated by WattEV, 4 Gen Logistics, Bali Express, RPM Transportation, and KKW Trucking. An electric goods movement corridor will be demonstrated utilizing WattEV's publicly accessible chargers with charging hubs connecting northern and southern California in Bakersfield, Gustine, Port of Long Beach, Sacramento, San Bernardino, Taft, and San Diego.

South Coast AQMD is requesting \$44,556,822.20 in grant funding from the California Air Resource Board to deliver 100 BETs into drayage operations and support a public charging demonstration of regional and long-haul capabilities. In support of SPEED, the project team will provide \$44,663,113.80 in cash match against a total budget of \$89,219,936.

This project implements 100 Volvo VNRes in place of diesel equivalents and are powered by grid energy, traveling approximately 62,751 miles annually. The table below summarizes the total project emissions avoided from the vehicles deployed over a two (2) year project lifetime and a ten (10) year expected lifetime.

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<b>Time Period</b>	<b>PM2.5 (Short Tons)</b>	<b>Nitrogen Oxide (Short Tons)</b>	<b>Reactive Organic Gases (Short Tons)</b>	<b>Diesel PM (Short Tons)</b>	<b>Greenhouse Gases (MTCO<sub>2e</sub>)</b>
<b>2 Years</b>	0.388 /year x 2 years= 0.776	16.39 /year x 2 years= 32.78	0.336 /year x 2 years= 0.672	0.149/year x 2 years= 0.298	8,307.9/year x 2 years= 16,615.8
<b>10 Years</b>	0.388/year x 10 years= 3.88	16.39/year x 10 years= 163.9	0.336/year x 10 years= 3.36	0.149/year x 10 years= 1.49	8,307.9/year x 10 years= 83,079.3

SPEED will see BETs operating throughout the state in communities that have historically suffered from poor air quality and high pollution burdens due to their proximity to the main transportation corridors in the state and at the ports. As such, all sites are within or serve routes located in priority populations. To ensure benefits are directed to these vulnerable populations, South Coast AQMD will partner with MightyComm, GNA, CharIN, Cerritos College, Breathe SoCal, University of California at Riverside, and Clean Fuel Education to develop safety trainings, educational opportunities, and workforce hiring practices to accelerate BET deployments and facilitate long-term success.

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**Project Applicant:** South Coast Air Quality Management District (South Coast AQMD)

**Project Title:** Electrification of Balboa Island Ferries and Installation of Supporting Charging Infrastructure

The Balboa Island Ferry (BIF) is an important transportation and tourism link between Balboa Island and the Balboa Peninsula in Newport Beach, California. BIF owns and operates three identical vintage wooden ferries originally built in the 1950s. In 2022, BIF carried approximately 1.5 million passengers (or 4,110 per day) and approximately 350,000 cars (or 959 per day) on average. The vessels are 64 feet long and 20 feet wide and licensed to carry three automobiles plus 75 walk-on passengers, or 100 walk-on passengers and no cars. The vessels have a double-bow configuration that provides direct loading and unloading without the need to maneuver for up to 18 hours daily to transport cars and pedestrians between Balboa Peninsula and Balboa Island. In 2010, all three vessels were repowered with a 135 HP John Deere Tier 2 diesel engine. The engines have approximately 50,000 hours of operation as of today which is more than 4,000 hours of operation per year.

The vessels are subchapter T United States Coast Guard (USCG) inspected vessels operated by USCG licensed captains. The vessels are subject to the amended CARB Commercial Harbor Craft (CHC) regulation that went into effect on January 1, 2023. The CHC regulation requires short-run ferries "classified as a vessel dedicated to providing regularly scheduled round-trip ferry service between two points whose straight-line distance apart is less than three nautical miles" to be zero-emission by December 31, 2025, or December 31, 2026, for any vessel receiving a one-year extension.

The goal of this project is to convert each of the three BIF vessels from each using diesel John Deere 4045 engine with two transmissions to an electric propulsion system with two electric motors and a sufficient battery bank. Each BIF vessel has significant space constraints and repowering these vessels will need to meet the operating, safety, and service parameters of BIF and USCG. Workforce development and training courses partnering with colleges will be developed as part of this project to train mechanics in maintaining, repairing and operating the battery electric vessels. All three vessels operated by BIF are classified as short-run ferries under CHC section (e)(10) and, as such, all three single-engine vessels currently have the same compliance date of December 31, 2025. BIF applied for a compliance extension with CARB on August 23, 2023, for two of the three vessels. BIF is currently eligible under E5 compliance extension to delay the compliance deadline on vessel #2 by one year, and vessel #3 by two years. BIF is also eligible to renew this extension for up to 8 years maximum, in the event of equipment, regulatory, or supplier delays.

BIF is the only provider of ferry service and transit across Newport Beach Harbor from the mainland to Balboa Island. BIF serves workers commuting from diverse

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communities of Southern CA to work in the shops and restaurants on Balboa Island and the Balboa Peninsula. BIF also serves tourists from the region and all over the world who visit Newport Beach and Balboa Island, which have exceptionally busy tourist traffic year-round, with peak periods in spring, summer, and holidays. Additionally, BIF serves the nearly 3,000 island residents and the City of Newport Beach Parks and Recreation Junior Lifeguard program located on the Balboa Peninsula. The Junior Lifeguard program recently relocated to the Balboa Peninsula location and has added an additional 700 youth ferry passengers per day during the summer season which greatly increased the demand for the BIF transporting walk-on passengers. Most significantly, BIF provides an important alternative access to underserved communities who arrive at the port from diverse areas and use ferries to avoid the congested summer beach traffic. Additionally, the ferry provides an exceptional low-cost opportunity for visitors and residents to experience and enjoy the unique coastal waters of Newport Bay. The fare to cross as a pedestrian is a reasonable \$1.50 and only \$2.5 for a car to be transported across.

The California Air Resources Board (CARB) zero emission regulation requires all short run (less than 3 miles) ferries in the state to convert to zero emission propulsion by December of 2025. BIF is unique in the state of California, and conversion to zero emission propulsion would demonstrate feasibility in even the most technologically and logistically complex situations. This will remove barriers to adoption of zero emission propulsion in other marine sectors, and other unique and complex scenarios. In addition, converting the BIF vessels to electric will provide significant outreach opportunities to what California is doing in helping climate and air quality goals through new technologies.

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**Project Applicant:** South Coast Air Quality Management District (South Coast AQMD)

**Project Title:** Tours X Sea View Cruises Electrification Project and Supporting Shore Charging Infrastructure

Tours X, DBA Sea View Cruises (Tours X), operates a 48.5 foot, 49-passenger glass-bottom excursion vessel, Sea View, out of Long Beach that currently offers four one-hour trips per day, up to four days per week during the fall and winter seasons, and eight one-hour trips per day, up to five days per week during the spring and summer seasons. The vessel is a subchapter T US Coast Guard (USCG) inspected vessel operated by USCG licensed captains. The vessel has two diesel 1995 EPA Tier II John Deere 4045 diesel engines and a 1995 EPA Tier II John Deere 4045 generator. The vessel is subject to the amended Commercial Harbor Craft (CHC) regulations that took effect on January 1, 2023, which require excursion vessels with 2010 or older engines certified to EPA Tier IV or lower to be upgraded to EPA Tier IV plus DPF engines by December 31, 2026. The proposed project will deploy two of CARB's Zero Emission Advanced - Technologies (ZEAT) vessels that are zero emission capable. Tours X proposes converting its existing vessel, Sea View, to a hybrid vessel with an electric propulsion system that achieves surplus emission reductions. Also, Tours X proposes to add a new vessel, Ocean View, that will comply with the ZEAT Hybrid requirements for a new excursion vessel. These Sea View Cruises projects will be one of the marine electrification projects that plays a noteworthy global role in advancing marine electrification. This project consists of two iterative showcase technology demonstrations directly benefiting priority populations and regional air quality. Below is the summary of the two-phase approach proposed under this project:

Phase One: Convert the existing excursion vessel, Sea View, to hybrid electric which is expected to become the first official ZEAT Hybrid vessel in California. The Sea View Vessel will demonstrate the ability of an inland, slow-speed excursion vessel to operate primarily with electric propulsion, the onboard diesel engine will be used only for critical situations. It will also demonstrate the operational and economic viability of a longer commercial route of 4.5 nautical miles (NM) with a zero-emission propulsion system in the United States. Several first-in-the world technologies will be demonstrated, tested, and verified on board the Sea View Vessel once converted. Verification of these technologies assists in the inclusion of Phase Two of this project.

Phase Two: Build a new, state-of-the-art electric hybrid excursion vessel, Ocean View, with an ultraefficient hull form embedded with a renewable energy generation and a sustainable/living interior. The Ocean View is expected to travel one of the longest distances by a commercial electric vessel in the United States. Additionally, Ocean View will play a pivotal role in creating a pathway to greater emission reductions among high-speed vessels in widespread commercial applications including pilot boats, medium-distance ferries, and near shore excursion vessels. In addition,

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charging infrastructure solutions are planned as a part of the proposed project. In Phase One, the Sea View will use an existing corded Level 2 240V/50A shore charging system and an inductive charging system that will be installed during Phase 1. After demonstrating inductive charging successfully during phase one of this project, in this phase, the Ocean View vessel will be primarily charged from the inductive charging system during the day and a slower corded charger overnight. Therefore, both vessels serve an important role in iteratively demonstrating the viability of inductive charging for marine vessels.



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**Project Applicant:** South Coast Air Quality Management District (South Coast AQMD)

**Project Title:** Improved Capture and Control of OGV Emissions at Berth at Anchor

The proposed project (Project) is expected to demonstrate a barge-based capture and control systems (C&C) that includes CO<sub>2</sub> scrubbing of auxiliary engine and boiler exhaust, as well as demonstrate an innovative capture system for controlling auxiliary engine and boiler emissions at anchorage. The Project includes a spud-barge platform, an exhaust capture system, purification units, carbon-capture, and a capture system designed to allow for control of vessel emissions at anchorage. The project will reduce NO<sub>x</sub> - 77.5 tons/yr, PM<sub>2.5</sub> - 10.3 tons/year, ROG - 2.5 tons/yr, and DPM - 8.6 tons/yr emissions or over 286 tons/yr of net emission reductions (weighted), and over 10,000 metric tons/yr of CO<sub>2e</sub> emissions from vessel's auxiliary engines and boilers when at berth. The project will demonstrate a new capture system for control of vessels at anchor. The total project cost is \$13,365,560, of which the project team will provide \$3,424,500 or 25% in cost-share. This project's funding request is \$9,941,060, including the administrative cost of \$795,285 necessary to implement the project.

The Project includes a team to design, develop and demonstrate the C&C and capture system for vessels at anchor with South Coast AQMD as the lead applicant and STAX Engineering as the lead technology partner responsible for developing, demonstrating, and obtaining CARB approval for the C&C. The demonstration will take place in the San Pedro Bay Ports. STAX will also continue the development and implementation of workforce training and development.

The Project is proposed for the San Pedro Bay Ports, a priority population. Reducing emissions from OGVs will reduce their exposure to air toxics cancer risk. The fifth Multiple Air Toxics Exposure study conducted in 2021 shows the San Pedro Bay Ports, and their surrounding areas have the highest cancer risk in the SCAB due to various air pollutants emitted from ships, other mobile sources associated with goods movements, and nearby facilities.

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**Project Applicant:** The Regents of the University of California, Agriculture and Natural Resources

**Project Title:** Electric Autonomous Tractor Swarms (EATS)

Title: Electric Autonomous Tractor Swarms (EATS)

Name of applicant and project partners: University of California, Agriculture and Natural Resources, Monarch Tractors, UC Davis, Valley Clean Energy

Brief description of proposed project: Electric Autonomous Tractor Swarms (EATS) offer a groundbreaking, environmentally sustainable, and economically feasible solution to reduce greenhouse gas (GHG) emissions. This project shall conduct research trials and demonstrate the diverse farming application capabilities of EATS managed by a single fleet coordinator to collectively cover the same workload as one larger diesel-powered unit. The goal is to evaluate EATS's real-world feasibility in terms of GHG emission reduction, economic benefits of adoption, suitability for a variety of crops and farm tasks, needed electrical infrastructure, safety and other aspects. The demonstration sites will be held at 9 locations spread out across the entire State of California. Outreach, workforce training, economic analysis and environmental assessment on the new technology shall be conducted.

Amount requested: \$7,180,426

Total cost of project: \$14,360,853

Expected emission reductions in PM2.5, NO<sub>x</sub>, ROG, DPM, and GHG:

- 1.75 short tons of PM2.5
- 55.33 short tons of NO<sub>x</sub>
- 1.99 short tons of ROG
- 1.71 short tons of DPM
- 6,158.51 MTCO<sub>2e</sub> GHG

This project is located within and provides benefits to a disadvantaged community.

Workforce training: We will engage with growers, tractor operators, educators, and the general populace through interactive field days and targeted workforce development initiatives.

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**Project Applicant:** Town of Tiburon

**Project Title:** Angel Island Tiburon Ferry Electrification Project

Angel Island Tiburon Ferry (AITF) operates three commercial vessels. The *Angel Island Ferry* and the *Bonita* vessels are classified as short-run ferries that travel less than three nautical miles on their CPUC regulated route between the Town of Tiburon and Angel Island State Park. The *Tamalpais* is an excursion vessel that provides cruises for private events, dinner cruises, sunset cruises, etc.

There are four components of the AITF Electrification Project

1. *Angel Island Ferry* will have its EPA Tier III 290 HP engines replaced with a ZEAT system with two 170 kW electric motors, 686 kWh of semi-solid state batteries and an EPA Tier IV + DPF emergency generator
2. *Bonita Ferry* will have its EPA Tier 0 270 HP engines replaced with a ZEAT system that is 100% zero-emission consisting of two 170 kW motors, 660 kWh of NMC lithium-ion batteries and a test-sized wing sail
3. *Tamalpais Excursion Vessel*, with EPA Tier II 475 HP engines will be sold for \$1\* and replaced with a new vessel, *Watts Up*, which will be an EV Maritime 200 ultra efficient semi-foiling composite hull with an interior modified for the needs of a US excursion vessel with twin Hamilton LTX jets, four 370 kW motors, 1029 kW of semi solid-state batteries and two 305 kW EPA Tier IV + DPF generators
4. *Shoreside charging, solar and floating dock upgrades*, includes upgrades to the electrical grid, the electrical system on-site, a 95 kW solar array, significant modifications to the floating dock in order to support the weight of high speed charging equipment, a corded charging system and an inductive charging system

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**Project Applicant:** University of Southern California (USC)

**Project Title:** Plasma-based Electrostatic Precipitator (ESP) with Fully-integrated Diesel Particulate Filter (DPF) for PM and NO<sub>x</sub> Remediation in Marine Engines

- a) The name of the applicant: University of Southern California (USC)
- b) The project technology demonstrators: Rypos Inc. and USC
- c) The project title: **Plasma-based Electrostatic Precipitator (ESP) with Fully-integrated Diesel Particulate Filter (DPF) for PM and NO<sub>x</sub> Remediation in Marine Engines**
- d) The objectives of the project: We will design, built, and test an electrostatic precipitator (ESP) that is integrated with a diesel particulate filter (DPF) system that is fully self-regenerating (i.e., maintenance-free) for treating marine engines. Computational modeling will help guide in the design of the integrated system. The fully-realized ESP/DPF system will be tested on a 150kW marine diesel engine. In addition to particulate matter (i.e., PM), we will test for reduction in emissions of NO<sub>x</sub> and reactive organic gases (ROGs).
- e) Description of the project: In this integrated solution, the ESP enables higher flow rates to be treated (i.e., larger engines) and the DPF provides self-cleaning (i.e., maintenance-free) operation. The electrostatic precipitator uses USC's patented high voltage nanosecond pulse electronics, which produce plasma-based enhancement of the ESP process and NO<sub>x</sub> remediation. Using a cylindrical geometry, the plasma enhanced-ESP will drive diesel soot particles to the DPF more efficiently, enabling smaller filters (i.e., aftertreatment systems) to be developed that are capable of treating higher flow rates from larger engines. The diesel particulate filter takes advantage of Rypos' self-cleaning cylindrical geometry that can be scaled up or down in a modular fashion. The proposed integrated approach will enable more compact systems to be developed that can be installed on ships where space (and mass) is a key limiting constraint.
- f) Methodologies to be employed: high voltage nanosecond pulse electronics, electrostatic precipitation, diesel particulate filtration, Rypos' active regeneration filtration technology and control electronics.
- g) Technologies to be utilized and supporting infrastructure: ESPs, DPFs, USC's engine test platform and suite of gas characterization tools, Rypos' manufacturing capabilities.
- h) Potential benefits and outcomes: Pollution emissions generated by the marine sector disproportionately affects underserved minority communities, also referred to as *environmental justice communities* near ports and harbors, increasing the inequity gap for minority groups. Our integrated ESP/DPF system aims to reduce particulate matter (i.e., PM, soot) emissions from all ships to bring environmental justice to underserved communities near these areas. This will bring environmental justice to underserved port communities

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as regulators can tighten regulations with the enabling technology providing cleaner air to communities located near ports and harbors.

- i) Workforce training: USC graduate students will be trained in the techniques of electrostatic precipitation, diesel particulate filter technology, exhaust gas analysis measurement techniques, air quality measurement techniques, high voltage electronics. Rypos' technicians will be trained in high voltage electronics and marine installation.
- j) Major participants: USC, Rypos, Best Environmental, San Francisco Bay Ferry/water emergency Transportation Authority (WETA)
- k) Total project cost: \$2M, l) Requested funding amount: \$1M, m) Match amounts proposed: \$1M
- n) Expected emission reductions: Particulate Matter 2.5 (PM2.5) = 95% reduction, Nitrogen Oxide (NOx) = 90% reduction, Reactive Organic Gases (ROG) = 90% reduction, Diesel Particulate Matter (DPM) = 95% reduction, and greenhouse gases (GHG) = 0% reduction.
- o) Years of experience in the manufacture, usage, and/or operation of advanced technology: Rypos Inc. brings 25 years of experience in the design and manufacture of DPF technology (i.e., diesel pollution control devices). Peter Bransfield and Peter Ellison have been leading Rypos' market development efforts for over 17 years. Prof. Cronin (PI) brings over twenty years of experience in electrical engineering, high voltage systems, physics, chemistry, and plasma-based pollution remediation.

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**Project Applicant:** Western Riverside Council of Governments (WRCOG)

**Project Title:** Western Riverside County Municipal Green Zones Pilot Project

- **Project Name:** Western Riverside County Municipal Green Zones Pilot Project (Project)
- **Applicant Name:** Western Riverside Council of Governments (WRCOG)
- **Project Partners:** City of Banning, City of Moreno Valley, County of Riverside Transportation and Land Management Agency (TLMA) Transportation Department, and Riverside County Purchasing and Fleet Services
- **Proposed Project Description and Location:** The Project will advance zero-emission commercial vehicle fleet deployment in Riverside County jurisdictions supported by electrical vehicle (EV) charging, workforce development, and community and stakeholder engagement. WRCOG will provide its Project Partners with the technical knowledge, EV experience, and funding to acquire and deploy technologies by the State mandated deadlines.

A unique aspect of WRCOG's project is the diversity in the ZEVs being deployed from five manufacturers for a wide variety of uses:

- A transit van for public transportation;
  - A street sweeper and dump truck to clean priority population and city streets;
  - A pickup truck and SUV with off-roading capabilities employed in remote County areas;
  - Highly efficient sedans and truck for use within urban areas; and
  - Solar-powered chargers and Level 2 chargers to power the proposed multi-use ZEVs.
- **Total Project Cost:** \$2,708,231
  - **Requested Funding Amount:** \$1,351,560
  - **Match Amounts Proposed:** \$1,356,671; WRCOG and its Project Partners will provide at least a 1:1 match, consisting of both cash and in-kind.
- **Expected Emission Reductions from the Entire Project:** Particulate Matter 2.5 (PM2.5) 230 pounds (lbs.); Nitrogen Oxide (NOx): 4,690 lbs.; Reactive Organic Gases (ROG): 78 lbs.; and greenhouse gases (GHG): 2,716 metric tons of carbon dioxide equivalent (MTCO<sub>2e</sub>).
  - **Disadvantaged Community Benefits:** All Project Partner jurisdictions have areas that are considered disadvantaged, and the proposed project area contains 16 disadvantaged Census Tracts, as defined through the CA SB535 mapping tool (<https://oehha.ca.gov/calenviroscreen/sb535>). These areas are not simply

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economically disadvantaged but are often located along heavily traveled freight and highway corridors and are disproportionately impacted by poor air quality. Each project partner has committed to deploying funded projects in a way that directly benefits these communities, and engagement activities occurring as part of this grant will help guide those decisions. Measured impacts of the project can be scaled to better understand how widespread deployment of ZEVs can positively impact these areas, and municipal project partners are taking a leadership role in demonstrating this.

- **Workforce Training:** Fleet ZEV operators will receive hands-on and classroom style electric vehicle and charging station operations and maintenance training through the established Long Beach Clean Cities Coalition program. According to the State of California Employment Development Department's Unemployment Rate and Labor Force Data, the Riverside County unemployment rate (5.4%) was higher than the state (5.1%) and national (3.9%) averages, as were the City of Banning (6.6%) and City of Moreno Valley (5.4%) unemployment rates. The proposed Project's workforce training will benefit workers in areas that have higher unemployment and labor force loss rates than the state and national averages.

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**Project Applicant:** Wolf Technology Inc.

**Project Title:** Electric Container Drayage Chassis (ECDC)

This project will deliver two zero-emission Electric Container Drayage Chassis (ECDC) that comprise an E Axle, 200 kWh Battery system, 700 volt rated power electronics, Smart Kingpin, and telematics to facilitate bi-directional charging to truck operators for drayage application from and around the Port of Los Angeles and Port of Long Beach. The ECDC will operate 100 percent at the port and within the Disadvantaged Communities based on Cal Enviro Screen 4.0. Wolf Technology Inc., as the lead applicant, will lead the development of the ECDC, which will extend the class 8 electric truck range by 25% to 50%, depending on the load and route, and will help logistic companies accelerate the adoption of fully electric fleets.

The Electric Container Drayage Chassis Project has been conceived and developed by the partners and will utilize support from the logistics industry with 50+ years of industry experience. The project partners have over 30+ years of advanced technology experience to oversee and ensure the success of this demonstration. Each project partner is a leader in their respective industry and will provide clean, cutting-edge technology that will have immediate positive impacts through adoption by logistics in and around the Port of Los Angeles and Port of Long Beach.

ECDC overarching goals:

- Advance the economic viability of ECDC towards widespread commercialization and adoption in California and beyond.
- Demonstrate ECDC under challenging duty cycles in a rigorous seaport setting.
- Achieve significant greenhouse gas (GHG) and air pollutant emission reductions.
- Communicate the benefits ECDC will have on the port community and meaningfully benefit disadvantaged communities.
- Extend the range of zero-emission trucks to utilize ECDC to increase their distance and/or time operational capabilities.
- Implementing onboard power eliminates the need for Gensets to power reefer containers at the Port of Los Angeles & Port of Long Beach.

ECDC project team objectives:

- Design, Manufacture, and deploy two pre-commercial ECDC units.
- Install/Identify sufficient electric charging infrastructure to support the operation of the ECDC units in service.
- Demonstrate the proposed equipment in service for at least one year and collect real-world data on the equipment's performance.
- Comprehensive training program for the workforce to use ECDC in their operations and safety.



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**Grantee:**

Wolf Technology Inc.

**Partners:**

N/A

**Grant Amount:**

CARB CONTRIBUTION REQUEST: \$4,471,847.33

Matching Funds: \$795,326.00

Project Total: \$5,267,173.33

**Vehicles/Equipment Funded:**

- Two Zero-Emission Electric Container Drayage Chassis integrated by Wolf Technology Inc.
- Modular E-Axle
- Modular 200 kWh Battery System which is bi-directional and able to be used as a mobile microgrid application
- Modular Smart Kingpin
- Telematics to monitor and collect data on the challenging duty cycles for one year

**Emission Reductions:**

Expected emissions reduction based on fully utilized two ECDC for ten years is equal to: 218.4 lbs of Particulate Mater 2.5 (PM2.5), 9,679.6 lbs of Nitrogen Oxide (NOx), 198.8 lbs of Reactive Organic Gases (ROG), 453.6 lbs of Diesel Particulate Matter (DPM), and 2,247 MTCO2e Green House Gases (GHG).