



2024 CLEANTECH GAPS & OPPORTUNITIES

REPORT

Accelerating & Unlocking Innovation to Achieve 100% Clean Energy,
Zero Emissions Transportation, and Sustainable Cities in Greater Los Angeles and Beyond

TABLE OF CONTENTS

ABOUT LACI	3
EXECUTIVE SUMMARY	5
KEY TERMS IN THE REPORT	10
CLEAN ENERGY	11
Diverse & Sustainable Energy Storage Systems	12
Flexible Load Technologies	15
Building Decarbonization	19
Vehicle-to-Grid (V2G) & Vehicle-to-Building (V2B)	24
ZERO EMISSIONS TRANSPORTATION	26
Zero Emissions Delivery & Curb Solutions	27
Electric Vehicle Sharing, Charging Infrastructure, & Other Access Solutions	29
Electrification of Last-Mile Goods Delivery	33
Electrification of School & Transit Bus Fleets	35
Electric Heavy-Duty Truck Infrastructure	38
Battery Life Cycle of Lithium-Ion Batteries	42
SUSTAINABLE CITIES	44
Software & Infrastructure Solutions to Reduce Waste	45
Reclaimed Materials via Upcycled Waste & Technological Innovation	47
Zero Waste Goals & Waste Diversion	50
CONCLUSION	53



About LACI

CREATING AN INCLUSIVE GREEN ECONOMY FOR LA AND BEYOND

Los Angeles Cleantech Incubator (LACI) is creating an inclusive green economy for the people of the Los Angeles region by unlocking innovation and working with startups to accelerate the commercialization of clean technologies by transforming markets through our Clean Energy (CEP) and Transportation Electrification Partnerships (TEP) alongside policymakers, innovators, market leaders, and by enhancing communities through workforce development, pilots, and other programs. This year, we're proud to launch our Sustainable Cities Partnership (SCP), which will continue to grow efforts around waste reduction, circularity, and sorting technologies.

**LACI
Impact**
since 2011:

506
portfolio companies

\$1B
funding raised

\$350M
in revenue

2,626
jobs created

Founded as an economic development initiative by the City of Los Angeles and Los Angeles Department of Water & Power (LADWP), LACI is recognized as one of the most innovative business incubators in the world by UBI Global. Since 2011, LACI has helped 475 portfolio companies raise \$1 billion in funding, generated \$350 million in revenue, and created 2,626 jobs throughout the Los Angeles region, with a projected long-term economic impact of more than \$733 million.

An aerial photograph of a city skyline at sunset, featuring numerous skyscrapers and buildings. The sky is a mix of orange, pink, and blue. The text "Executive Summary" is overlaid in large, white, bold letters across the center of the image.

Executive Summary

OUR UNIQUE APPROACH

Each year, the Los Angeles Cleantech Incubator (LACI) generates two reports on the cleantech ecosystem: the Cleantech Market Landscape Report and the Gaps & Opportunities Report. These resources examine the current cleantech market sector and how LACI and its partners can prioritize work that overcomes barriers and leverages opportunities to accelerate cleantech adoption. Through the Market Landscape Report, LACI identifies the key ‘Sector Gaps’ that need to be solved for within its three priority areas: Clean Energy, Zero Emission Transportation, and Sustainable Cities. Once identified, these ‘Sector Gaps’ are further examined in this Gaps & Opportunities Report. First, the report identifies ‘LACI & Regional Leadership’ activities, which highlights key actions that LACI, its startups, and partners have taken over the previous year to address these important gaps. The report then goes further to analyze the strategic ‘Opportunity Areas’ that exist across technology, business models, workforce development and policy. These specific areas require immediate action to bridge the ‘Sector Gaps’ and advance LACI’s mission to build an inclusive green economy.

This year, across all topics outlined, there have been areas of considerable value-add from LACI, its startups, and its partners across the regional ecosystem. Additionally, a few areas within these industries stand out as notable areas to watch.



Clean Energy

Clean energy investments by the Inflation Reduction Act (IRA) are driving historic domestic manufacturing and development. Notably, more than 3.4 million U.S. families saved more than \$8 billion on home energy upgrades in 2023 and 40 battery factories and 40 solar-related factories have started or been announced in 41 states.^{1,2} Similarly, LACI and its partners have made significant progress in key areas that will accelerate our decarbonization goals: the California Energy Commission (CEC) leveraged and continues to operate a 1 gigawatt (GW) Demand Side Support Program that taps customers who opt-in for load reduction or backup generation to support the state's electrical grid during extreme events; LACI Clean Energy Partner, Sunrun, continued to expand its distributed power plant programs in California; LACI startup ElectricFish opened a new manufacturing facility in California that will allow for faster production of their innovative battery technology, and LACI finalized its induction stove retrofit and air quality analysis pilot in which it found strong favorability for the technology and clear findings linking gas stoves to high emission rates of nitrogen dioxide.

Zero Emissions Transportation

As we continue to electrify cars, trucks and buses, our workforce will need to be prepared to meet the growing needs of electric vehicle (EV) maintenance and charging infrastructure, especially when we consider that 34% of all new zero emission vehicles sold in the U.S. are in California.³ One exciting development is LACI's partnership with one of our alumni startup companies, ChargerHelp!, opening up the nation's first Multi-Manufacturer EV Charger Reliability Training Hub, in South Los Angeles. This endeavor, which was made possible through the support of Representative Sydney Kamlager-Dove (CA-37) and from funding through the State of California, allows interested participants to learn how to manage and maintain EV charging stations from a wide range of suppliers without needing to travel out of state or town. Further, this hub will boost the development of the charging infrastructure needed in the Los Angeles region and will be a catalyst for enabling zero emission travel.

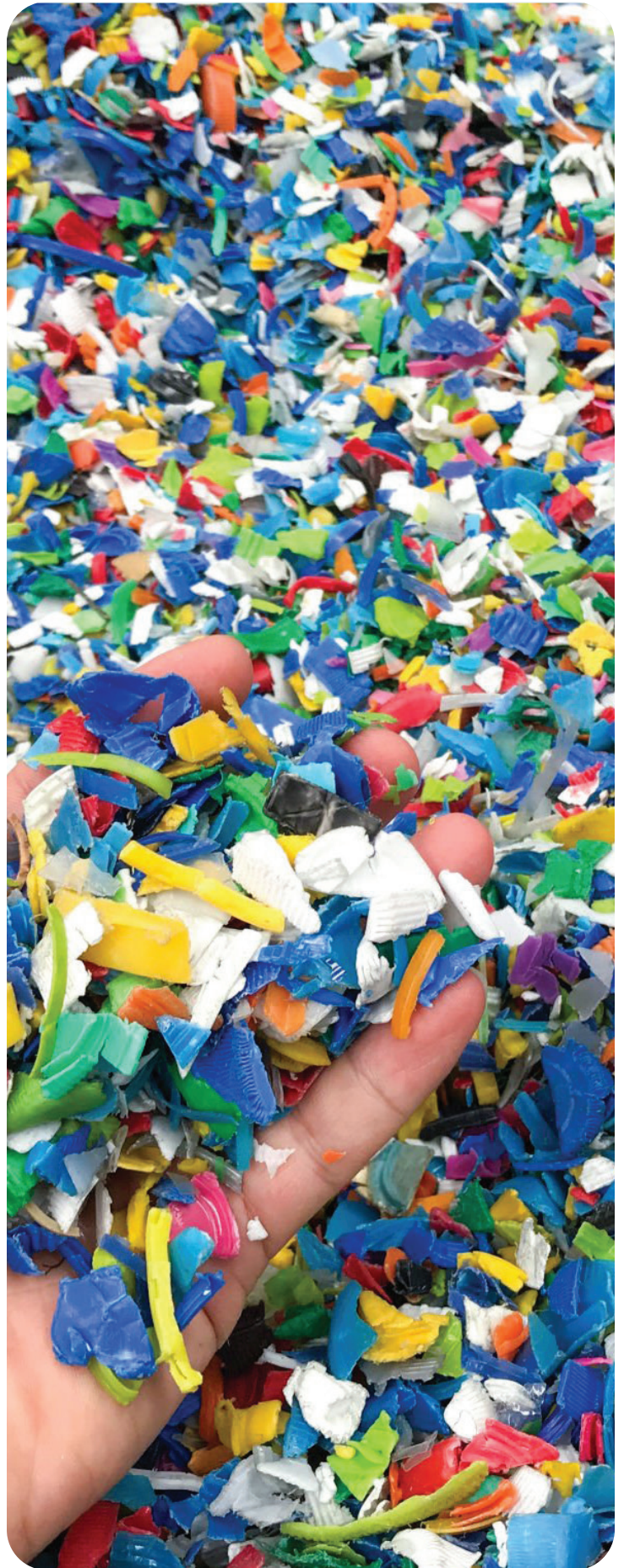


Sustainable Cities

Lastly, when it comes to building and encouraging Sustainable City practices, LACI is supporting new, innovative startups and entrepreneurs that look to disrupt what is arguably one of the region's biggest challenges: waste.

LACI's nascent Sustainable Cities Partnership (SCP), focusing on circular economy, aims to address these challenges by leveraging strategic partnerships, innovative technology and policy advocacy to organize and convene key stakeholders to meet zero waste goals by the time of the 2028 Games. A combination of education, resource-matching, and state policy will be needed to enable broader public participation in more sustainable and circular methods of waste management. Moreover, corporations and small businesses have the ability to influence remanufacturing opportunities by incorporating clean waste as a raw feedstock back into its supply chain.

On a larger-scale, new smart technologies need to be deployed to more Material Recovery Facilities (MRF) and recycling facilities to improve the accuracy in sorting processes to autonomously decipher which materials are best suited for upcycling, reducing the amount of cradle-to-grave waste. In conjunction with these efforts, additional education on standards for industrial, commercial and residential waste can support a more efficient method of waste management and opportunities for circularity.



INTRODUCTION: LACI's 2024 Cleantech Gaps & Opportunities Report is a resource that highlights clean technology wins over the past year in the Greater Los Angeles (LA) Region, and the gaps and challenges that require continued innovation and advancement.

THE GOAL OF THIS REPORT

To identify the **marketplace gaps** that must be addressed in order to accelerate progress toward:

**100%
Clean Energy**

**A circular economy in the
Greater LA Region and beyond**

**Zero Emission
Transportation**

Key Terms in This Report:

SECTOR GAPS: Following LACI's analysis of the current market landscape, these are the specific barriers within each of LACI's Priority Areas that LACI has identified for further innovation and market adoption.

LACI & REGIONAL LEADERSHIP

Key contributions in the Greater LA Region or market advancements that LACI, its partners, and key stakeholders are advancing to support each Sector Gap.

INNOVATION

Current and alumni LACI startups whose activities are driving impact across the 2024 Sector Gaps.

PILOTS

Demonstration projects by LACI, startups, and partners deployed in the Greater LA Region studying how cleantech can drive impact.

WORKFORCE DEVELOPMENT

Projects and LACI partnerships that are focused on building a skilled cleantech workforce.

PUBLIC & PRIVATE SECTOR

Cleantech activities and advancements driven by LACI partners and other influential stakeholders across the Greater LA Region.

OPPORTUNITY AREAS

Critical opportunities where emerging technology, business models, workforce development and policy can seek to address Sector Gaps.

BUSINESS MODEL

Frameworks for the successful operation of a business that enables market adoption.

TECHNOLOGY

Specific areas of technology that require further research and development in order to address critical cleantech needs.

POLICY

Regulatory or legislative actions that will support innovation and market adoption of cleantech.

WORKFORCE DEVELOPMENT

Opportunities where advancements in cleantech priorities are aligned with and will simultaneously create new workforce opportunities.

Clean Energy

CLEAN ENERGY

DIVERSE & SUSTAINABLE ENERGY STORAGE SYSTEMS

To advance resiliency planning and battery manufacturing aligned with our climate targets, California will need to diversify sources of storage and methods of resiliency. The following points touch on a few innovative ideas as well as forward-thinking examples.

LACI & REGIONAL LEADERSHIP

Key contributions in the Greater Los Angeles Region or market advancements that LACI, its partners, and key stakeholders are advancing to support battery energy storage systems (BESS) development and adoption.

Innovation: LACI Startups

WAYSIDE ENERGY

Offers an immersion cooled battery energy storage system, tested their novel thermal management system for large scale Battery Energy Storage System (BESS) earlier this year that compared immersion vs. non-immersion cooling under hot and cold weather conditions that respectively resulted in 3-5x more efficient battery storage systems than current industry standards. These early results have demonstrated favorable potential to boost efficiency in commercial size sites.

CZAR POWER

Offers an all-in-one smart energy solution to support the deployment of clean energy sources and fast-charging. Last year pilot funding from LACI supported the completion of the design and construction of CZAR-Power's first fully functional Solar Strike system, resulting in expanded battery & policy partners.

ELECTRICFISH

Has recently opened its new high-tech manufacturing facility in the Bay Area with nearly \$2 million in support from the CEC. This new facility will allow for faster production of their innovative battery technology that can quickly charge EVs without the need for breaking ground, as well as potentially act as a microgrid during the event of a power outage; the latter of which is currently being tested.⁴

Public & Private Sector

- CEP partner Southern California Edison (SCE) and Leeward Renewable Energy (LRE) have entered into a 15-year power purchase agreement for LRE's 126MW Antelope Valley BESS facility in Kern County, CA. The facility will be LRE's first standalone BESS and will be capable of storing over 500MWh of power to be dispatched during peak load. Its storage capacity will enable it to power the equivalent of more than 100,000 homes for up to four hours.⁵
- CEP partner Scale Microgrids will build and install a microgrid pairing 1.5MW of rooftop solar and a 6MWh energy storage system for the Soboba Band of Luiseño Indians. The tribe is based in Riverside County, California, and the project will be installed at its Soboba Casino Resort.⁶
- CEP partner, the California Independent Systems Operator (CAISO), reported more than 11,200MW of battery storage capacity online and fully integrated into the electrical grid, a 20x increase from 2020.⁷



Opportunity Areas

Critical opportunities where emerging technology, pilots, workforce development and policy can seek to address sector gaps.

Technology

- The CEC, a LACI CEP partner, recently found that California will need up to 37GW of long-duration storage by 2045 to retire gas resources, meaning a much larger, diverse, and mature array of clean energy storage systems will need to be deployed before that date.⁸ While California has impressively increased battery energy storage, continuing to scale mature energy storage, especially with 10+ hour duration, is an urgent need to meet clean energy goals. Advanced alternatives to lithium-ion batteries, such as sodium or zinc-based batteries, lithium-iron, or flow batteries to diversify the battery supply chain and utilize resources that are more widely available. Overall costs can be driven down through this more diverse array of battery technology, especially when paired with financial incentives in the IRA for utility-scale storage and residential-scale battery storage.
- Clean energy manufacturing has seen enormous growth since the IRA was passed, with battery manufacturing seeing the largest investments.⁹ While lithium-ion batteries remain dominant, scaling alternatives such as sodium or zinc-based chemistry, lithium-iron, and flow batteries have received significant research and development and are necessary to diversify the battery supply chain and avoid over-dependence on environmentally and ethically controversial battery minerals. Such efforts are backed by the IRA-created Section 45X Advanced Manufacturing Production Credit that spurs \$1.2B loan investments to domestic battery production.^{10,11}

Business Model

- As California and other states struggle with carrying out all scheduled gas plant retirements, the need for peaker and traditional centralized power plants relying on coal or fossil gas can be reduced by strategically deploying virtual power plants (VPPs) and distributed energy resources (DERs).¹² These technologies can also provide energy bill savings while increasing local community energy resilience.
- Battery asset automation and monetization is a growing opportunity area for private companies, as involvement within the energy field continues to expand beyond exclusive utility control.¹³

Workforce Development

- One incentive for corporations to lead in workforce development efforts lies in the IRA's energy storage Investment Tax Credit (ITC) which incentivizes apprenticeship and prevailing wage requirements to further reduce project costs. Since launching these requirements in January 2023, the Department of Labor has been working with partners to connect contractors more to the country's apprenticeship system.¹⁴ LACI is a valuable collaborator for private companies who are seeking to build up workforce programs through our proven processes under the Enhancing Communities team.

Policy

- As IRA funds continue to be deployed, stakeholders are encouraged to provide greater information and guidance to energy consumers around how to take advantage of, and install, residential energy solutions. Significant savings are included in projects that are aimed at energy efficiency upgrades, rooftop solar and storage, and electric appliances, particularly for Low-to-Moderate Income (LMI) and tribal communities who can gain additional funding. Leveraging these incentives to expand access to clean energy resources will ensure that the residents of the Los Angeles area will also benefit economically from switching over to electric generation.



CLEAN ENERGY

FLEXIBLE LOAD TECHNOLOGIES

Flexible load technologies are critical in advancing a zero-carbon grid as they are needed to strategically shift electricity demand, especially during peak demand events.

LACI & REGIONAL LEADERSHIP

Key contributions in the Greater Los Angeles Region or market advancements that LACI, its partners, and key stakeholders are advancing to support energy storage development and adoption.

Innovation: LACI Startups

Ashipa Electric

Developing renewable-based microgrids and software solutions to revolutionize the bidirectional interaction between utility consumers and producers, increase availability, and improve costs. Ashipa recently concluded a pilot project that demonstrated a 68% reduction in the cost of power for their client, while maintaining reliability and resiliency.



Public & Private Sector

- CEP partner Sunrun expanded its peak power reward program with Pacific Gas & Electric. The Energy Efficiency Summer Reliability Program, meant to provide flexible energy to support the grid during the summer months from 7:00 - 9:00 pm, quickly expanded to 8,500 new and existing customers, around a 13% increase from the original program goal, for its residential solar-plus-storage systems and 34MW of power.¹⁵
- The CEC approved a new, statewide VPP program to expand the Demand Side Grid Support program. The program is activated during moments of grid strain and high electricity demand, and can now tap into thousands of distributed residential and commercial solar and battery storage systems with a combined capacity of approximately 1GW of power. This new, flexible power source will provide critical support to avoid power outages and grid emergencies, especially during hot summer months.¹⁶
- CEP partner Camus Energy, a grid orchestration software platform, announced a partnership with Vermont Electric Cooperative (VEC). The collaboration directly benefits 33,000 VEC members across 75 communities, ensuring reliability, low costs, and efficiency as the grid evolves.¹⁷



Opportunity Areas

Critical opportunities where emerging technology, pilots, workforce development and policy can seek to address sector gaps.

Technology

- Given a California Public Utilities Commission (CPUC) ruling that replaces existing net-metering structures with a 'net-billing' structure that reduces payments to new customers for excess rooftop solar power, there is an opportunity to increase residential battery storage deployment to improve the economics of having rooftop solar and maximize DER benefits.¹⁸
- Enabling solar and storage as a service will allow consumers to pay for energy service as it is used, and avoid costly upfront capital investment, an opportunity that is opened through the Self-Generation Incentive Program (SGIP).¹⁹
- Building-to-grid communications and transparency can be improved through increasing access to and deployment of smart devices including meters, thermostats, water heaters, and automated load management software in EV charging. These DERs enable load flexibility by allowing utilities to incentivize consumers to shift their energy usage to off-peak times, simultaneously providing greater bill savings to customers.
- Establishing advanced distribution system management (ADSM) platforms for utilities would improve communications and cybersecurity capabilities that could deliver safer, more reliable, and efficient power to utility customers.²⁰
- With the growing capabilities of AI, there are many areas that would improve energy optimization. A few examples include opportunities in forecasting energy use in buildings utilizing online, learning-driven models to improve energy efficiency and load shifting during peak demand, providing grid operators with more certainty on balancing load demands and significantly improving grid management. However, rigorous validation methods would need to be enforced before implementing AI-driven technology to ensure we do not cause new risks to the grid.²¹



Business Model

- By reducing the need for traditional centralized power plants through strategic deployment of solar + storage VPPs and aggregating DERs, utilities could provide further energy savings to customers while increasing local community resilience, thereby lessening the need for interconnection applications that may be hindered through lengthy queues.²² Additionally, VPPs have gained significant traction this year in utility and private sector actions and investments, since the technology can provide the same resource adequacy as gas peaker plants and utility-scale batteries, but for only about 40-60% of the net cost.²³
- Providing local, distributed clean energy solutions, including microgrids, can improve resiliency in areas at higher risk for power outages or wildfires. Utilities, in particular, are recognizing the renewable and reliability benefits of microgrids and are beginning to integrate the technology more into their planning, further supported by financial incentives from the IRA for utility-deployed microgrids.²⁴
- Incentives for customer participation and increasing education in demand response programs, including dynamic pricing to reduce electricity use when demand is unusually high would improve customer outreach, awareness, and deployment of solar and storage where priority should be given to lower-income customers to ensure they are not inadvertently penalized.

Policy

- As IRA programs are implemented, the Greenhouse Gas Reduction Fund (GGRF) will expand access to rooftop and community solar through its \$7B Solar for All Fund, with an additional \$20B in financing for building decarbonization and other clean energy and transportation projects that were recently released. The latter funding will create a national network of nonprofits, community lenders, and other financial institutions to fund clean energy and climate projects. Importantly, the GGRF is required to allocate 70% of funding to low-income and disadvantaged communities (DAC).²⁵
- Position DER technologies to provide capacity and ancillary services for both the distribution and transmission systems.
- Create an open-access distributed system operator to maximize value of DERs and the local grid.



CLEAN ENERGY

BUILDING DECARBONIZATION

Buildings in Los Angeles account for 43% of greenhouse gas (GHG) emissions, more than any other sector.²⁶ To advance building decarbonization, the region should pursue opportunities to electrify heating and cooling systems, and to install induction stoves instead of gas stove, among other electric solutions. To improve the deployment speed, affordability, and accessibility of DERs, solutions should be bundled together.

LACI & REGIONAL LEADERSHIP

Key contributions in the Greater Los Angeles Region or market advancements that LACI, its partners, and key stakeholders are advancing to support building decarbonization.

Innovation: LACI Startups

Facil.AI

Utilizing AI and machine learning to autonomously and remotely optimize retail and commercial building energy usage, completed a pilot project with Five Below resulting in more than 19% energy savings and a 700% ROI to date.

PowerGrab

Formerly Portable Solar, a startup manufacturing ground-based solar panel mounting systems, piloted their technology to create solar-powered phone and laptop charging stations at CalState Dominguez Hills.

Thermo Shade

Tackling the problem of extreme heat by offering a passive cooling shade panel that can be affixed to an outdoor structure, resulting in up to 20 degree cooler space without the use of electricity or water systems, which was tested at the La Kretz Innovation Campus last summer.²⁷

Blip Energy

Utilizes second-life battery cells to deliver a cost-effective, reliable energy storage system that is seamlessly adaptable to any home. By prioritizing hard-to-reach households, Blip is unlocking energy equity while also providing reliable energy storage.

Workforce Development

In 2023, LACI launched its first Building Energy Management Systems (BEMS) Fellowship, in partnership with the Northwest Energy Efficiency Council, which prepared 38 participants with the skills to leverage technology when managing building efficiency measures and energy use. Through this training, graduates earned the following certifications: Fundamentals of Energy Efficient Buildings, Building Science Principles, and Home Energy Rating System (HERS). Upon completion of the Technical Bootcamp, graduates were placed in internship opportunities with LACI startups such as CZAR Power, Flick Power, and Rivieh.



Pilots

LACI, in collaboration with the Energy Coalition, Day One, and the University of California, Riverside, conducted an induction stove retrofit and air quality monitoring pilot in disadvantaged communities (DACs) in and near the LA region’s Bassett and Avocado Heights communities. The pilot examined residential building decarbonization barriers for low median income households and conducted air quality analysis to compare air quality when cooking with a gas versus an induction stove. The pilot found that gas stoves emitted significantly higher levels of nitrogen dioxide with varying degrees of effectiveness with range fans in reducing emissions across the 18 households that participated in the pilot.²⁸



Public & Private Sector

- CEP partner Sunrun has launched a new program in California that will offer an add-on storage option for existing solar customers in the state. These customers will also have the opportunity to enroll in one of Sunrun's distributed power plant programs, supporting local grid resiliency.²⁹
- CEP partner the County of Los Angeles voted to begin drafting an ordinance that would set a maximum allowable temperature for rental units across the county in order to avoid the damaging effects of extreme heat. Installing a significant number of new cooling solutions would add substantial energy load, but prioritizing heat pumps over traditional heating, ventilation, air conditioning (HVAC) units would have a lower carbon footprint and can enable a smarter, more resilient grid through demand response (DR) and participation in VPPs as a DER.³⁰ An increase of 20% in the installation of AC units could potentially reduce high-temperature mortality rates by 16% in 2025 and 33% in 2050 in the state.³¹
- CEP partner Scale Microgrids secured a 500MW community solar deal in partnership with developer Gutami on a multi-state project, which will include distributed solar and energy storage systems in California.
- After participating as an early test site for Turntide Technologies, CEP partner Wells Fargo was able to cut their energy usage associated with heating and cooling at its Charlotte, North Carolina office by more than 70%, an impressive amount that can ideally be replicated at other locations.³²
- The CEC announced that 10 of the world's largest heat pump manufacturers, distributors, and suppliers had officially signed on to support California's goal of installing 6 million heat pumps in the state by 2030.³³
- CEP Partner Sunrun announced participation of their residential battery and solar solutions within an emergency grid balancing program in Puerto Rico to mitigate potential power outages and retain backup power to meet essential household needs.^{34,35}

Opportunity Areas

Critical opportunities where emerging technology, pilots, workforce development and policy can seek to address sector gaps.

Technology

- Given the maturity of many electric, decarbonized home appliances, ensure that manufacturing is appropriately scaled to support local and national deployment goals.
- As the Greater LA Region, and many other parts of the world, experience record high temperatures and deploy more cooling solutions, continued maturation and validation of combination heat pumps providing both space and water heat will be critical, including residential cold climate heat pump technology.
- To avoid costly electrical panel upgrades and encourage flexible loads, research and development of additional electric appliances with 120V capability and/or battery capacity will be needed to ensure balanced loads on the electric grid.

Business Model

- Advance financial mechanisms to reduce costs and increase speed of electrification and energy efficiency retrofits for residential, commercial, and/or institutional buildings in low-income communities and communities of color, to reduce emissions and improve overall home health.
- Incentivize customers and contractors to consider and plan for future electric load needs when upgrading their residential electrical panels.
- Utilize measures recently passed in the IRA to accelerate technologies enabling commercial building electrification, including solar and storage ITC and rebates for energy-efficient systems installations.
- Encourage building owners and managers to invest in smart, efficient HVAC and lighting, as this combined load can account for 50% of energy use in commercial buildings.³⁶



Workforce Development

- Given that LA City is considering requiring air conditioning for all rental units, there could be a massive opportunity to deploy heat pumps in place of traditional window AC units.³⁷ Training and supporting the workforce needed to deploy this clean technology in the Greater Los Angeles Region is an opportunity for manufacturers to partner with other green job pipeline efforts.
- The US Department of Energy (DOE) has rolled out \$150M in IRA-funded grants for states to train residential energy contractors, providing funding to support a new pipeline of contractors focused on decarbonization.³⁸

Policy

- While some cities and states, like Boston and New York State, continue to pass building decarbonization legislation, many West Coast building electrification policies have been paused or even pulled as governments sort through the ramifications of the Ninth Circuit Court of Appeal's decision striking down Berkeley's gas ban.^{39,40} Instead, policymakers can pursue alternative policy options to achieve the same goal, including indoor air quality standards and zonal gas system decommissioning.
- As numerous studies have been published blasting the negative health impacts of gas stoves, there is a clear opportunity to develop policies from a public health perspective to urge the transition to electric kitchen and home appliances.⁴¹
- Ensure property owners are not passing along building decarbonization costs to renters by designing policies that pair building decarbonization with housing affordability and preservation. Existing LA City laws allow landlords to increase rent as much as 10% annually to recover building decarbonization costs, which can disproportionately impact or evict low-income renters.⁴²





CLEAN ENERGY

VEHICLE-TO-GRID (V2G) & VEHICLE-TO-BUILDING (V2B)

Increasing EV deployment and ownership in the Greater Los Angeles Region, paired with improving V2G and V2B technologies, provides a unique opportunity to strengthen DERs and grid resiliency. These strides must be encouraged through incentivized participation for residential, commercial, and industrial customers.

LACI & REGIONAL LEADERSHIP

Key contributions in the Greater Los Angeles Region or market advancements that LACI, its partners, and key stakeholders are advancing to support EV infrastructure and V2G/V2B deployment.

Public & Private Sector

After years of testing and piloting, in the past year original equipment manufacturers (OEMs) are demonstrating their intent to roll out V2G and V2B capabilities within their EVs. TEP partners Audi and BMW Group, as well as other major automakers Kia, Hyundai, GM Energy, Toyota, Ford, and Honda are among the companies leading or launching partnerships to advance the technology.^{43,44,45,46,47}

Opportunity Areas

Critical opportunities where emerging technology, pilots, workforce development and policy can seek to address sector gaps.

Technology

- Integrate standard bi-directional technology capabilities into EVs, which can simultaneously make home energy storage more accessible as some EVs are less expensive than home batteries and can provide power and reliability via V2B.
- Evaluate the impact of V2B technology to battery degradation and any potential implications for battery warranty provisions.
- Update grid infrastructure to support larger amounts of bi-directional energy flow.

Business Model

- With a greater number of fleets going electric, particularly school buses and public transit buses, explore V2B and V2G opportunities at fleet charging depots as the charging schedule is more predictable than that of many light-duty private EVs.
- Institute incentive models to study owner participation and whether financial incentives in V2G/V2B could positively impact consumer decisions to purchase an EV.

Policy

- Develop and implement bi-directional charging standards to allow for mass consumer adoption, paired with greater consumer education around storage and other benefits of EVs with V2B and V2G capabilities.
- Prioritize the integration of bi-directional capabilities for fleets of light-duty EVs, electric school buses, or at multifamily households with EV car share programs.
- Deploy V2B in affordable housing developments adjacent to vulnerable communities, particularly to provide greater resiliency in regards to power outages/public safety power shutoffs, and critical operations.





ZERO EMISSION TRANSPORTATION

ZERO EMISSION DELIVERY (ZED) & CURB SOLUTIONS

Cities have the ability to manage curbs in different ways to achieve a wide variety of goals central to mitigating the impacts of climate change in a just and equitable manner. Dynamic curb management solutions can accelerate adoption of zero emission transportation, and create more efficient transportation systems that benefit local residents and businesses as well as delivery operations at the curb.

LACI & REGIONAL LEADERSHIP

Key contributions in the Greater Los Angeles Region or market advancements that LACI, its partners, and key stakeholders are advancing to support ZED and curb solutions for delivery management platforms.

INNOVATION: LACI STARTUPS

Emissionless is developing a more efficient and safer freight transportation system through software that utilizes data and algorithms for electric freight carriers. Their approach eliminates the need for a 13-hour roadside rest and enables drivers to save time by simplifying dispatch and route planning, allowing for a more sustainable approach to supply chain movements.

LACI ALUMNI AUTOMOTUS

has been working to advance the commercialization of its automatic license plate recognition (ALPR) technology to support in-street curb management in multiple US cities. Thanks to funding from the US DOE earlier this year in the City of Pittsburgh, Automotus deployed the first in nation in Street automated enforcement software that has enabled the City to reduce its double parking incidents by over 70%.

PILOTS

LACI, in partnership with Climate Mayors and C40, has launched the National Zero Emission Cities Climate Innovation Challenge. Joining anchor partners LA, Pittsburgh, and Santa Monica are: Louisville, Miami-Dade County, New York City, Oakland, Portland (OR), and Washington D.C. The challenge aims to develop and deploy zero emission climate innovations that can help reduce emissions from e-commerce and goods movement sectors in individual city contexts.

Opportunity Areas

Critical opportunities where emerging technology, pilots, workforce development and policy can seek to address sector gaps.

Technology

- Collect reliable, real-time curb usage data for cities to implement accurate pricing schemes.
- Address cities' data security concerns via greater transparency from tech providers, and consider implementing minimum data-sharing standards.
- Identify key locations for passenger loading, and provide EVs free or reduced access to these curbs based on curb traffic data. Pair this information with a campaign to provide shared EVs for low-income ride hail drivers.

Business Model

- Adopt models that balance vehicle ownership versus public service access to reduce single car rides.

Workforce Development

- Build a network of non-electrician technicians to support smart infrastructure, address outages and maintain equipment, with a focus on attracting underemployed individuals.

Policy

- Develop citywide policies that enable effective curb management policy enforcement and federal policies encouraging zero emission zones.
- Clarify or revisit existing city policies surrounding license-plate reading technologies in order to enable the benefits of curb congestion and pricing technologies while taking into consideration privacy concerns.
- Adopt consistent standards and tracking across jurisdictions to better accommodate IoT and smart devices on public infrastructure to encourage smart city solutions.
- Reconsider existing zoning ordinances to allow for simpler placement of delivery hubs close to residences.
- Cities and regions should examine possibilities to implement Indirect Source Rules to provide incentive and penalty framework for logistics' centers attracting internal combustion engine (ICE) vs zero-emission vehicle (ZEV) trucks.
- Promote adoption of data standards such as the Curb Data Specification from the Open Mobility Foundation.
- Introduce policies that improve delivery driver education and training regarding curb management policies.





ZERO EMISSION TRANSPORTATION

ELECTRIC VEHICLE SHARING, CHARGING INFRASTRUCTURE, & OTHER ACCESS SOLUTIONS

Disadvantaged communities and residents of multi-unit dwellings (MUDs) often face additional barriers to driving EVs, related to access to charging infrastructure. Given the high percentage of low-income residents in the Greater Los Angeles Region who live in MUDs, it is critical to identify innovative solutions to ensure access for these residents to charging solutions and/or EV car sharing options.

LACI & REGIONAL LEADERSHIP

Key contributions in the Greater Los Angeles Region or market advancements that LACI, its partners, and key stakeholders are advancing to support EV sharing programs, charging infrastructure, and other access solutions.

**Innovation:
LACI Startups**

It's Electric and Alumni ChargerHelp!

Will partner to implement a \$1.5 million award from the U.S. Joint Office of Energy and Transportation to deploy innovative, community-centered, public EV charging solutions.

LACI Alumni NeoCharge

Helping improve access to affordable, at-home EV charging while avoiding costly panel upgrades, NeoCharge has reached an exciting milestone by officially having their smart splitter technology available for purchase at BestBuy.⁴⁸

Stak Mobility

Offering efficient EV infrastructure, energy storage, and carousel parking solutions, Stak Mobility will pilot their closed loop energy generation and emergency storage system in Beverly Hills, CA.

Bluedot Technologies

Offering a single payment platform for EV drivers and fleets to charge cars while managing expenses, Bluedot concluded their pilot program testing their fleet operations service and engaging with their inaugural customer base. Bluedot concluded their pilot demonstrating the viability of their solution, facilitated expansion into new markets, added team capacity, and unveiled a unique opportunity for a Software as a Service (SaaS) business model to represent a large percentage of expected revenue.



Workforce Development

- LACI launched an electric vehicle supply equipment (EVSE) Infrastructure Project Management Training Course, in partnership with GreenWealth Energy and Gordon & Turner LLC, which prepared 34 participants with the skills to manage projects as they relate to EVSE infrastructure deployment. Participants performed a site visit at the Housing Authority of the City of Los Angeles (HACLA) new Pico Garden EVSE Infrastructure site - Las Casitas. Participants also learned about common permitting and electrical challenges that project managers face in clean energy project management. Additionally, 81% of trainees received their industry-recognized OSHA-10 Certification and are receiving ongoing continuing education to support them in preparing for the PMI-CAPM or PMP certification exam.
- LACI and ChargerHelp! launched the nation's first multi-manufacturer EV charger reliability training hub. Located in South Los Angeles, the facility provides a dedicated space for LACI and ChargerHelp! with dozens of chargers and equipment dedicated for EVSE charger reliability training. The new facility will also serve as the Los Angeles headquarters for LACI alumni company ChargerHelp! as the company continues to scale.



Public & Private Sector

- TEP partner Waymo received state approval from the California Department of Motor Vehicles to expand into Los Angeles, bringing the company a step closer to providing driverless vehicles to Angelenos.
- IONNA, the partnership of eight automakers, including TEP partner BMW Group, aims to install at least 30,000 chargers in urban areas and alongside highways. The first stations are scheduled to open by the summer of 2024 and will be accessible to all EV customers regardless of vehicle brand. Stations will include both NACS and CCS connectors to support all BEV drivers.⁴⁹
- TEP partner Uber, in partnership with Ford, launched Ford Drive, a project leasing program offering rideshare drivers access to electric vehicles in San Diego, Los Angeles, San Francisco.⁵⁰

Opportunity Areas

Critical opportunities where emerging technology, pilots, workforce development and policy can seek to address sector gaps.

Technology

- Develop integrated hardware solutions in EV charging equipment that reduce the need for time and equipment-intensive construction in older buildings.
- Deploy innovative curbside charging infrastructure in partnership with municipalities.
- Introduce direct current fast charging (DCFC) for electric transportation network companies (TNC) drivers and a pathway for EV ownership by the drivers.

Business Model

- Create marketplaces and platforms for rental of private, residential EV charging stations (peer-to-peer) to provide non-ownership access to EVs.
- Prioritize development of fast charging and light duty electric mobility hubs in centralized community areas for TNC and delivery drivers to have access.
- The IRA is positioned to encourage this development through mechanisms including the Alternative Fuel Infrastructure Tax Credit, which offers a 30% tax credit with a cap of \$100K if the infrastructure meets wage and apprenticeship requirements and is installed in a low-income or rural census tract.⁵¹

Workforce Development

- A recent study, conducted in part with TEP partner the International Brotherhood of Electrical Workers (IBEW), found that the expansion of EV charging infrastructure across the country is expected to generate about 160,000 jobs by 2032. Nearly half of these positions will focus on electrical installations, maintenance and repairs, underscoring the focus of LACI alumni ChargerHelp! on EV maintenance training.⁵²
- Capitalize on the momentum of massive investment in EV infrastructure, which will provide many opportunities, such as EV charger technicians installing these chargers and software developers creating the systems to enable monitoring/regulation of charging systems. These occupations are accessible to individuals with different education levels and can offer above-average pay.

Policy

- Develop electrical infrastructure upgrade incentive programs for MUD property owners to accommodate additional energy load from EV charging on-site.
- Offer new rate structures that make EV charging more affordable and pricing predictable.
- Demonstrate infrastructure-lite curbside charging for accelerated public EVSE deployment and EV adoption in low-income communities and communities of color.
- Streamline and standardize permitting and interconnection processes for charging infrastructure to keep pace with EV demand.
- Provide funding for ongoing EVSE maintenance and upkeep, not only initial capital costs for new installations, to ensure investments have lasting value.



ZERO EMISSION TRANSPORTATION

ELECTRIFICATION OF LAST-MILE GOODS DELIVERY

The electrification of last-mile urban goods delivery has tremendous potential to reduce congestion, climate emissions, and air pollution.

LACI & REGIONAL LEADERSHIP

Key contributions in the Greater Los Angeles Region or market advancements that LACI, its partners, and key stakeholders are advancing to support electrification of last-mile goods delivery.

Innovation: LACI Startups

Biliti Electric

Recently opened up a new electric three-wheeler (e-3W) and battery pack facility that spans 13 acres in the city of Hyderabad, India.⁵³ This facility will add to the growing number of assembly plants already established in the US, Portugal, and Kenya. Biliti anticipates the new facility will produce 2,000 e-3Ws per month and create 10,000 local job opportunities.



Opportunity Areas

Critical opportunities where emerging technology, pilots, workforce development and policy can seek to address sector gaps.

Technology

- Scale production of batteries to reduce price and increase range of delivery vehicles, including cargo e-bikes and electric delivery vans.
- Implementing en-route charging through charging integration in warehouses or curbs.
- Electrify medium-duty goods movement rapidly with electrified hubs and EV rentals or co-operatives to provide more access.

Business Model

- Act upon opportunities to grow a network of zero emission microdelivery hubs.
- Consider replacement of medium-duty trucks in urban delivery settings with alternate forms such as e-cargo bikes.

Workforce Development

- Engage with leaders in the micromobility space, such as Super Pedestrian, to provide ongoing education and employment opportunities for workforce training graduates.

Policy

- Enact local policies designating road or curb space for zero emission mobility solutions to allow smaller form-factors (like e-cargo bikes) to be adopted and used successfully.
- Resolve zoning changes that allow for last-mile hubs located close to commercial and residential deliveries to improve efficiency and density of good movement networks.





ZERO EMISSION TRANSPORTATION

ELECTRIFICATION OF SCHOOL & TRANSIT BUS FLEETS

Reducing the high upfront costs of electric buses and deploying EV charging infrastructure are key areas of opportunity to accelerate transit and school bus fleet electrification.

LACI & REGIONAL LEADERSHIP

Key contributions in the Greater Los Angeles Region or market advancements that LACI, its partners, and key stakeholders are advancing to support school & transit bus electrification.

Public & Private Sector

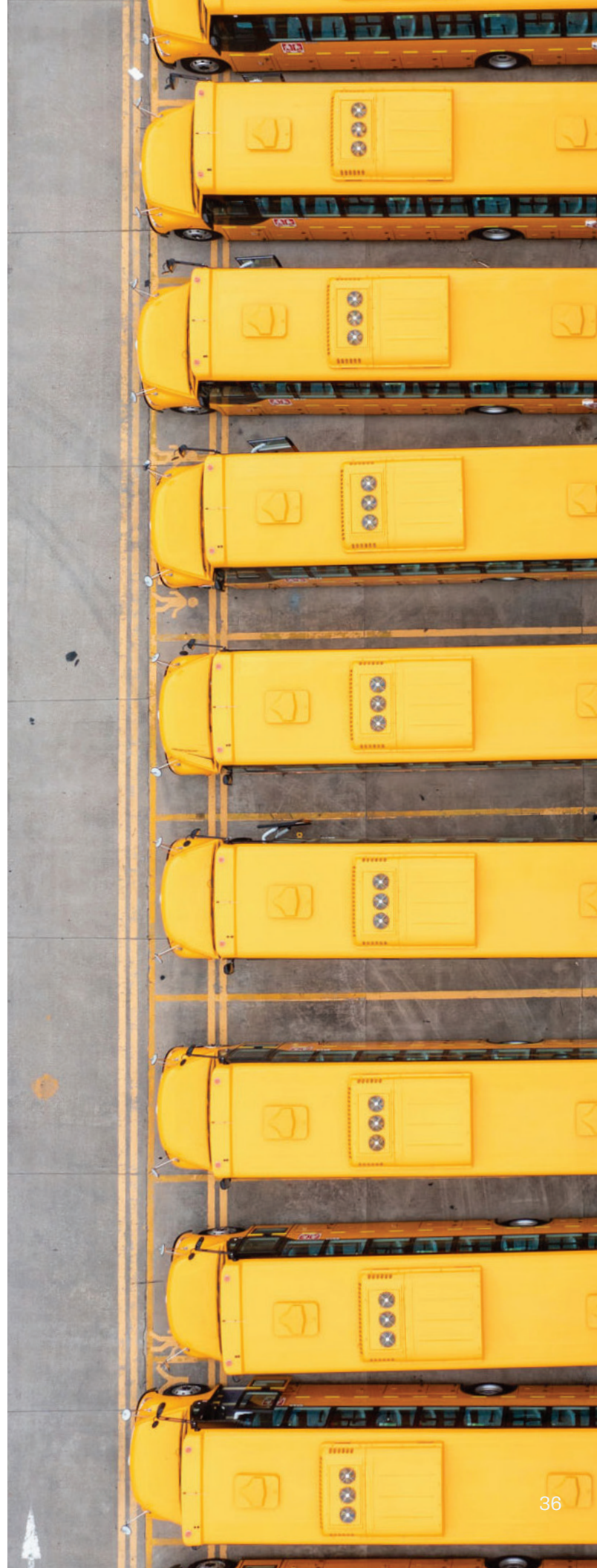
- TEP Partner, The Los Angeles Unified School District (LAUSD) has placed an order for 180 battery-electric school buses from Blue Bird Corporation. This marks the largest order of electric school buses from a school district in Blue Bird's history, and the buses are expected to be delivered by 2025.^{54,55}
- TEP partner Los Angeles County Metropolitan Transportation Authority LA Metro has received \$77.5 million in funding from the Federal Department of Transportation to expand workforce development programs, buy battery electric buses, and install new chargers at its West Hollywood bus yard.⁵⁶
- TEP partner, Highland Electric Fleets, received \$150 million from the U.S. Environmental Protection Agency (EPA) Clean School Bus program to support 62 districts across the country deploy over 500 electric school buses.⁵⁷

Opportunity Areas

Critical opportunities where emerging technology, pilots, workforce development and policy can seek to address sector gaps.

Technology

- Improve energy efficiency in HVAC systems on electric buses to conserve electricity for range.
- Develop technological innovations for more energy dense batteries that can be manufactured and sold with BuyAmerica regulations to accelerate bus manufacturing and sales at scale for longer range bus routes.
- Introduce compact charging infrastructure across all form factors (conductive, inductive, pantograph) to save space given limitations at existing transit and school bus depots.
- Explore microgrid integration at EV fleet charging sites.



Business Model

- Pilot V2G/V2B opportunities for electric school bus fleets to utilize school bus batteries as alternative revenue source, or backup power provision.
- Increase funding dedicated to battery electric buses and infrastructure for transit agencies, addressing balance of capital expenditures and operating expenses.
- Momentum and funding are gaining, as the Infrastructure Investment and Jobs Act allocates \$5B to school bus electrification over the next five years, prioritizing this transition for disadvantaged and rural communities.⁵⁸ Additionally, the IRA sets aside billions, including \$1B for local governments to purchase zero emission heavy-duty vehicles, including school and fleet buses, \$4B in grants to states, localities and municipalities to reduce local GHG emissions, and \$60M to reduce diesel emissions.⁵⁹

Workforce Development

- Provide workforce training opportunities focused on electric school and transit bus maintenance.⁶⁰

Policy

- Focus funding programs for buses on technology that prioritizes GHG reductions, in addition to targeting reductions in nitrogen oxides (NOx) or sulfur oxides (SOx) reductions, to prioritize electric buses.
- Explore flexible interconnection and its relevance for transit districts.
- Create statewide contract standards across all technologies for improved purchasing power or other means of expediting procurement.





ZERO EMISSION TRANSPORTATION

ELECTRIC HEAVY-DUTY TRUCK INFRASTRUCTURE

To encourage improved electric heavy-duty truck infrastructure, business models must be carefully assessed. This includes considering: pay-per-minute or per-kWh models; ensuring fast, predictable permitting and installation timelines; and offering standardized time of use rates and rate designs that incentivize adoption and accommodate typical truck operations. Additionally, there is a need for strong manufacturer and fleet regulations, all the while ensuring sufficient grid capacity.

LACI & REGIONAL LEADERSHIP

Key contributions in the Greater Los Angeles Region or market advancements that LACI, its partners, and key stakeholders are advancing to support electrification of heavy-duty infrastructure.

Innovation: LACI Startups

Evolectric

Focused on truck electrification, Evolectric is now a recognized OEM under the California Air Resources Board's Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP). In April, Evolectric opened up its new headquarters and production facility in Rancho Dominguez, maintaining a close proximity to the Port of Long Beach, with whom it is partnering to convert ICE vehicles to electric.⁶¹

Public & Private Sector

- LACI secured \$5M from the CEC for the deployment of charging infrastructure and battery-storage at two sites identified in LACI's Investment Blueprint for Heavy-Duty Charging to Support Battery-Electric Drayage along the I-710 Corridor.⁶²
- TEP partner Ava Community Energy, formerly known as East Bay Community Energy (EBCE), one of the country's top clean energy providers, has approved \$4.5 million in financing to Forum Mobility to develop a community charging depot on a 4.4-acre site off I-580 in Livermore. The electric truck charging depot will be able to charge up to 96 trucks at once and will service fleets moving cargo to and from the Port of Oakland and will connect to a new network of electric truck charging depots that Forum Mobility is building for drayage carriers.⁶³
- TEP partner Voltera, in partnership with freight mobility company Einride launched its first Class 8 drayage charging depot in fall 2023 in Lynwood in Los Angeles County. The site will feature 65 chargers with capacity to charge up to 200 vehicles a day. This site is the largest operational charging site for electric heavy-duty freight in North America.⁶⁴
- South Coast Air Quality Management District (SCAQMD) secured \$400 million from the U.S. EPA to advance infrastructure and vehicle incentives to deploy zero emission vehicle technologies in the region.⁶⁵

Opportunity Areas

Critical opportunities where emerging technology, pilots, workforce development and policy can seek to address sector gaps.

Technology

- Develop universal interoperability across software and hardware to ensure charging compatibility between chargers and truck OEMs.
- Improve battery densities to increase range for all trucking applications.
- Implement cost-effective microgrid management solutions for electric fleet charging to reduce grid impacts of large depots.

Business Model

- Prioritize sufficient charging infrastructure in ports, warehouses and transit corridors to support early adopters and smaller fleets.
- Clarify demand charges for energy service providers to make long-term investments.
- Develop insurance policies at comparable rates to internal combustion engine trucks to prevent insurance-based barriers to adoption.

Workforce Development

- Enhance knowledge base of new technologies, usage and systems amongst both customers and stakeholders.
- Ensure that truck drivers receive competitive benefits and a living wage salary, across both independent contractors and employees.





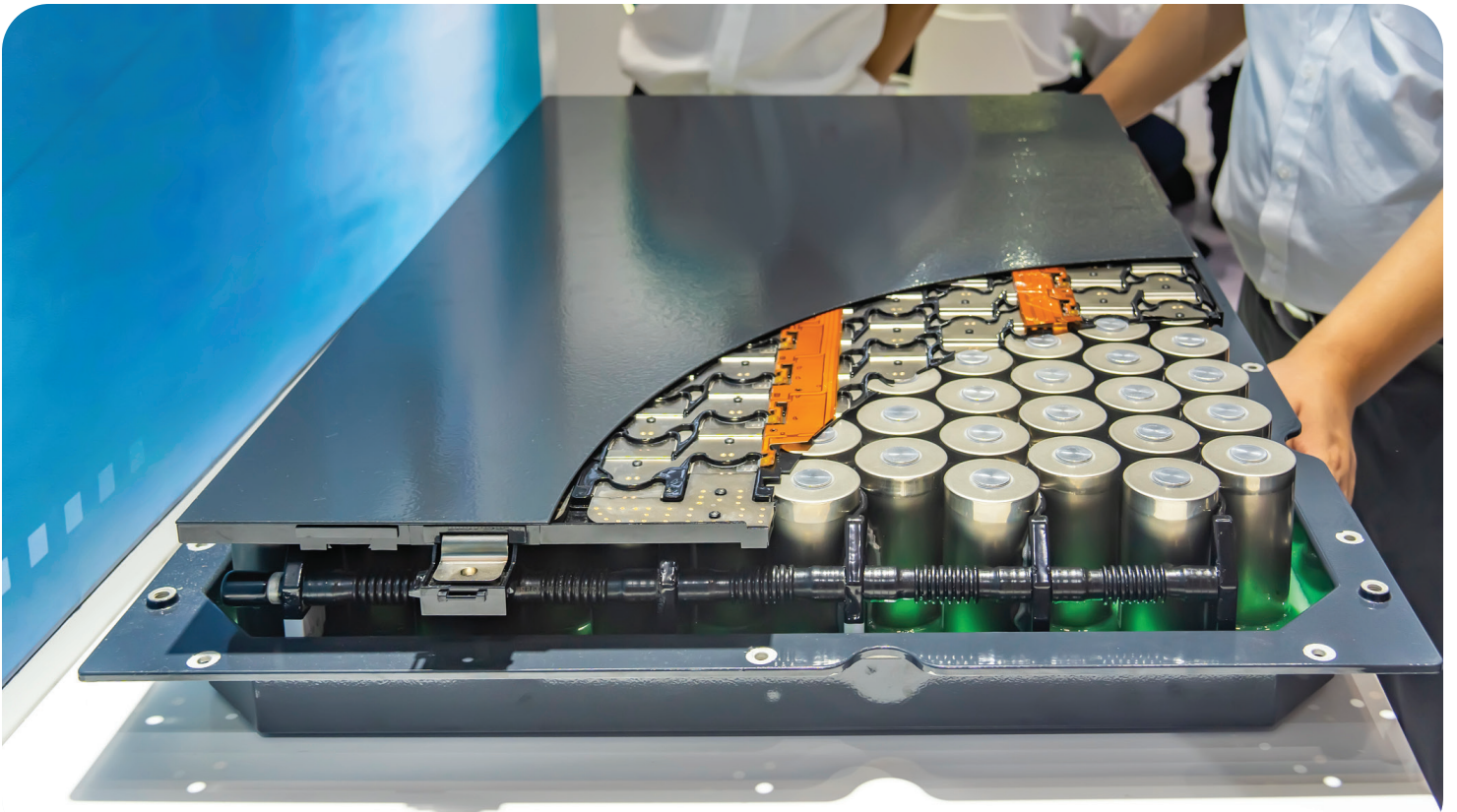
Opportunity Areas

Critical opportunities where emerging technology, pilots, workforce development and policy can seek to address sector gaps.

Include repurposed batteries as eligible for battery storage incentives to increase availability of energy storage.

Policy

- Consider making EV charging a 'primary use' for purposes of zoning, instead of 'ancillary' use.
- Implement flexible interconnections where possible to increase near-term deployments.
- Streamline and standardize interconnection protocols and permitting for charging infrastructure and energy storage systems to keep pace with EV demand.
- Consider developing land use priorities, in alignment with grid capacity and/or with support from utilities, for zero emission truck charging given the space requirements for heavy-duty charging.
- Allow utilities to make 'least-regrets' investments in infrastructure to ensure power availability for fleets when requested.



ZERO EMISSION TRANSPORTATION

BATTERY LIFE CYCLE OF LITHIUM-ION BATTERIES

Lithium-ion batteries are seeing new innovation and growth across their life cycle, from growing focus on socially and environmentally responsible battery mineral extraction practices, attention to battery health monitoring, and second-life applications.

LACI & REGIONAL LEADERSHIP

Key contributions in the Greater Los Angeles Region or market advancements that LACI, its partners, and key stakeholders are advancing to support the life cycle of lithium-ion batteries.

Innovation: LACI Startups

Batteryze

Focused on a battery health diagnostic platform enabling battery circularity, Batteryze is currently deploying a pilot that will focus on developing battery health standards for e-bikes, resulting in analytics on post-crash battery impacts.

Relyion Energy

Recently published their impact findings on their second life lithium-ion batteries, which show that with the help of their AI technology battery life can be extended by 20+ years, cost is 30-50% cheaper compared to new batteries, and emit 60% less carbon per MWh.⁶⁶

Opportunity Areas

Technology

- Improve monitoring for battery usage and state of health, which will also support the used EV and second-life battery markets and clarify residual values for new vehicle leases.
- Implement circular, cradle-to-cradle hardware standards for batteries.
- Emphasize the need for battery diversity by exploring alternative non-Li materials.
- Embed circular economy principles throughout the product value chain.
- Improve battery pack design and data sharing to enable repair and damage assessment, while providing better information on battery capacity for second life applications.⁶⁸

Business Model

- Develop and implement second-life battery models for reuse, recycling and disposal to create a secondary market for batteries.
- Source sustainable raw materials needed for batteries, in close coordination with local communities.

As domestic mineral production is poised to expand following incentives offered through the IRA, the environmental impacts and pollution from mining and extraction practices may disproportionately impact vulnerable populations, especially Indigenous communities, making it critical that local communities are closely engaged in any sourcing plans. In the US, 79% of lithium sits within 35 miles of Indigenous lands.⁶⁷ This proximity could also provide an economic development opportunity for tribal groups, if executed properly.

Workforce Development

- Provide training on EV battery maintenance, disposal, and hazards, including for first responders.

Policy

- Enact regulations defining and ensuring safe and sustainable battery disposal and recycling.

Integrate findings from California's Lithium-Ion Car Battery Recycling Advisory Group, which submitted policy recommendations to the State Legislature in 2022, into consideration under California's 2025 legislative session.

- Designate protocols for logistical handling of used batteries. As a hazardous waste, battery handling commands a level of scrutiny and associated costs that raises barriers to entry for entrepreneurs to become involved in reverse logistics of batteries.

An aerial photograph of a city skyline, likely Los Angeles, featuring a large body of water with a prominent fountain. The foreground shows a marina with several boats and a small building. The background is filled with various skyscrapers under a blue sky with scattered clouds. The text 'SUSTAINABLE CITIES' is overlaid in large, bold, white letters.

SUSTAINABLE CITIES

SUSTAINABLE CITIES

SOFTWARE & INFRASTRUCTURE SOLUTIONS TO REDUCE WASTE

Standardized procedures for waste-related supply chain benchmarking and monitoring, as well as agile, demand-led models for materials sourcing and product placement, are key digital tools that can enable creation of an equitable and circular value chain.

LACI & REGIONAL LEADERSHIP

Key contributions in the Greater Los Angeles Region or market advancements that LACI, its partners, and key stakeholders are advancing to support waste reduction through software integration and infrastructure solutions.

Innovation: LACI Startups

Encora

With a smart collection system for reusable food and beverage containers, Encora utilizes inventory management software, smart collection bins, and enhanced QR codes to increase the use of National Science Foundation (NSF)- & BPA-free containers to reduce single-use food packaging waste in the food & beverage industry.

Lasso Loop

Offering an at-home recycling solution, Lasso Loop will pilot real-world testing and education hosted at the Los Angeles Department of Water & Power's La Kretz Innovation Campus in downtown LA.

Opportunity Areas

Critical opportunities where emerging technology, pilots, workforce development and policy can seek to address sector gaps.

Technology

- Improve tracking and sorting of feedstocks and recycled products with hyper/multi-spectral imaging, and/or QR and Radio Frequency Identification (RFID) technology that allows tracking of product materials and easier sorting and recycling at end-of-life.
- Create automated, digital materials databases at regional and city levels that can track and bridge material needs across siloed industry supply chains.

Business Model

- Include product-specific sustainability information at the point of sale to provide consumers with product environmental facts and accredited circularity certifications.
- Utilize agile, demand-led models and applications for materials sourcing and product procurement.
- Implement seamless digital connectivity across vendors, retailers, and international suppliers to ensure equitable and sustainable practices. This will provide greater industry transparency across supply chains and encourage greater identification of 'deadstocks' and other materials for upcycling.
- Establish an open data platform to support reverse logistics mapping to enable closed loop circularity.

Workforce Development

- Design and streamline manufacturing processes, and develop tools to recover products with a mirrored recycling process in mind, which can be used to train and scale a workforce to support extended producer responsibility and circular material reutilization.

Policy

- Standardize procedures for collecting, managing, and storing waste-related supply chain data for benchmarking and monitoring waste reduction targets. This will also create transparency as to what standard post-industry materials exist and can be utilized as raw material for other products.
- Administer digital product passports for textiles and require companies to digitally 'tag' materials.⁶⁹
- Support extended producer responsibility by standardizing criteria to easily measure sustainability and circularity performance at the company manufacturer and product-level.
- Provide financial and other incentives to encourage circular financing, designs, and processes.





SUSTAINABLE CITIES

RECLAIMED MATERIALS VIA UPCYCLED WASTE & TECHNOLOGICAL INNOVATION

In order to enable next generation products and materials to reduce waste, 100% accurate and efficient autonomous waste stream sorting is key, paired with a cradle-to-cradle design thinking during product development processes.

LACI & REGIONAL LEADERSHIP

Key contributions in the Greater Los Angeles Region or market advancements that LACI, its partners, and key stakeholders are advancing to support upcycling waste through reclaimed materials and tech innovation.

Innovation: LACI Startups

Circular Fashion LA

Creating customizable and unique clothing and home goods on a mass scale using only post-consumer and post-industrial textile and clothing waste, Circular Fashion LA has worked with LACI's Advanced Prototyping Center (APC) to create a Cut and Sew Lab, as well as a mobile ReDye workstation used to store dyes and supplies.

Symmetry Wood

A manufacturer creating high-performance, petroleum-free alternatives to precious woods often found in the tropics and damaged through logging efforts.⁷⁰

Hamilton Perkins Collection

Tackles the annual problem of 350 million tons of plastic waste head on by upcycling billboard vinyl, recycled water bottles, apparel, and using pineapple leaf fiber to create new, high-end bags and small accessories.

Eorte

Closed the textile waste loop by turning gently-used bed sheets into high-quality, hand-crafted, and eco-friendly hospitality uniforms. They've innovated an end-of-life and fiber-sensor-strip system, which sorts garments into their respective categories in seconds.⁷¹

Workforce Development

- LACI launched its first Supply Chain Management & Logistics training that focused on how to integrate sustainable industry practices based on the reuse and regeneration of materials or products, compete with existing supply chains, and promote the adoption of future sustainability practices.

Opportunity Areas

Critical opportunities where emerging technology, pilots, workforce development and policy can seek to address sector gaps.

Technology

- Develop and promote widespread availability of cost-competitive and quality-competitive sustainable materials.
- Identify cost-effective, local recycling opportunities for all plastics (Levels 1-7) with an emphasis on plastics 3,4,6,and 7⁷², especially as new reports show that no plastic product meets a common industry standard for recycling.⁷³
- Improve the identification, sorting, and recordkeeping of textile waste through technologies, including RFID and blockchain, that can track and recycle textiles that would otherwise go to landfill.

Business Model

- Incorporate circular economy principles and concepts into existing economic, social, and sustainability policies to support cradle-to-cradle resource and material use.

Such business models are especially important in LA's garment industry, which employs an estimated 45,000 people. Employees are vulnerable to downward pressure in textile supply chains and unsustainably low prices driven by fast fashion brands. These brands often operate with unsustainable social and environmental business practices, as they depend upon cheap, plastic-based materials for their clothing, which are often quickly discarded by consumers and never biodegrade in landfills.⁷⁴

- Target pre-consumer textile waste collection. A large portion of waste materials are generated before garments and products make their way to consumers and many can be recycled with like-products from a similar manufacturer. This approach could be a first step to unlock larger-scale textile upcycling in the industry.

Fashion For Good found that up to 56% of textiles waste generated in the US is suitable for fiber-to-fiber recycling. These findings identify a promising opportunity for mechanical and chemical textile waste recycling. The recapturing value from textile waste is estimated to be \$1.5 billion per year and expected to increase over time.⁷⁵

Policy

- Create comprehensive protections and/or policies addressing fast fashion's widespread environmental and social impacts, especially for such companies expanding operations in LA.
- Implement zero waste regulations for packaging.
- Require building materials with comprehensive, easily comparable environmental product declarations, leveraging policies like the Buy Clean California Act.
- Recognizing that less than 1% of all fabric today is made from recycled materials, develop public sector support and resources to scale recycled textile collection, sorting and preprocessing systems.⁷⁶
- Establish incentives to advance fiber origin disclosure and labeling for discarded products to create the transparency needed to support pre-consumer textile recycling.



SUSTAINABLE CITIES

ZERO WASTE GOALS & WASTE DIVERSION

In order to further encourage zero waste and waste diversion adoption, plastic alternatives must be diverse, low cost and compostable, and regulations must mandate these types of packaging and/or zero waste production for consumer products.

LACI & REGIONAL LEADERSHIP

Key contributions in the Greater Los Angeles Region or market advancements that LACI, its partners, and key stakeholders are advancing to support zero waste goals and waste diversion.

**Innovation:
LACI Startups**

Dyrt Labs Inc

Providing food waste management for businesses and municipalities, Dyrt Labs has partnered with the City of Vernon, CA in a pilot project that has put the city on track to divert 75% of the city's food waste from landfills and achieve compliance with SB 1383, organics waste legislation aimed at reducing emissions of short-lived climate pollutants (SLCP) like methane.⁷⁷

**Public &
Private Sector**

- California has chosen Circular Action Alliance as its producer responsibility organization, a significant step in the state's efforts to implement its extended producer responsibility program for plastic packaging, under SB 54 - the Plastic Pollution Prevention and Packaging Producer Responsibility Act.⁷⁸
-

**Opportunity
Areas**

Technology

- Deploy 100% accurate and efficient autonomous waste stream sorting to support optimized material recovery. This reduces landfill entry by reintroducing materials into a supply chain or diverting organics to composting facilities.
- Support technologies that prevent food loss in the early stages of the agricultural supply chain.

Business Model

- Generate aftermarkets to recover precious metals and materials, especially those from EV batteries, from waste streams. Aftermarkets for e-waste will support both state and local goals to divert all e-waste from entering landfills by 2050.
- Pivot to different operating models for landfill owners as California mandates seek to reduce organic waste disposal via landfills.
- Encourage OEM or certified repair and remanufacturing to rebuild a product to its original condition. Creating consumer products with a longer or renewed lifespans alleviates environmental impact and new sourcing needs and allows for greater innovation on circular raw materials.

Opportunity Areas (Continued)

Workforce Development

- Invest in job creation within the zero waste movement, including reuse, refill, repair and composting sectors. These positions can offer safer and more sustainable jobs compared to the solid waste sector, and can simultaneously move communities disproportionately impacted by pollution from incinerators and landfills closer to a circular economy.⁷⁹

Policy

- Develop federal baseline performance metrics for recycling and waste diversion, which will help at the local level for potential state and federal adoption.
- Improve public understanding and education around local food and e-waste incentives and programs, including composting residential food waste.
- Organize partnerships with farmers and industrial food producers to capture large units of uniform byproduct waste.
- Drive demand for sustainable products by integrating principles and concepts into existing economic, social, and sustainability policies.
- Establish state level requirements and incentives to support large furniture reuse, upcycling and end-of-life disassembly for scrap material recycling.





Conclusion

LACI's mission is to create an inclusive green economy for Los Angeles and beyond, and it is the north star of the organization, guiding all of LACI's initiatives. To accomplish this vision, a collective effort will be needed to equitably deploy pilots, resources, and thought-leadership to move the region forward with innovative climate change solutions. As temperatures and high-heat emergency risks continue to rise in parallel with the threat of wildfires and power grid instability, it is imperative that we invest, support, and advocate for the expansion of clean energy, zero emission transportation, and sustainable city practices. Doing so will ensure that Angelenos have equitable access to thrive in safe, healthy environments and communities.

The Olympic & Paralympic Games in Paris have demonstrated that smart design and implementation doesn't require building new stadiums or operating systems, but working in concert with what already exists and decarbonizing assets in strategic phases. The City of Los Angeles is in a unique position to accelerate climate and energy infrastructure goals by focusing on 2028 as a near-term milestone that will have long lasting equity impacts and benefits well before our 2030 and 2045 targets. Meeting this distinctive moment will also fold into the outlined approach from the National Renewable Energy Laboratory (NREL), LADWP, and UCLA LA100 Equity Strategies, resulting in a safe, healthy environment for our residents and world guests to thrive in.⁸⁰ By moving toward clean energy venues, electrifying our transportation system, and embracing circularity to reduce waste generation, we can amplify the message that adaptation and mitigation efforts can be achieved with calculated action and strategic investments.

LACI believes that it is possible—and essential—to work towards a better climate future while building up the workforce in Los Angeles and across the country. It's why we're so passionate about supporting entrepreneurs in cleantech, where thus far we've served a dynamic portfolio of 475 startup companies and have raised \$1B in funding to initiate market transformation with proven efforts in mitigating climate emissions. In support of LACI startups' milestones and fundraising objectives, LACI has been able to provide over \$900,000 in pilot stipends to portfolio companies, enabling founders to validate key business objectives through in-market deployments of their technologies and solutions. LACI startups have generated \$350M in revenue and have hosted 411 workforce participants, with both of those variables continuing to grow every quarter. This year we welcomed 13 new cleantech startups to our Incubation program, with 30% Women-led, 85% BIPOC, and 5% LGBTQ+ founded companies; 38% which were founded in the City of Los Angeles.

As of 2023, Crunchbase research found that \$705M in venture capital funding went to Black-founded startups, which is an over 30% reduction in funding since 2016.⁸¹ Additionally, only 7% of all climate tech investment funding went to women in 2023, a nearly 25% reduction in investments compared to 2022.⁸² These figures reflect a lack of widespread lack of commitment to uplifting founders from diverse backgrounds.⁸³

To help solve for this specific challenge, LACI has developed a robust capital stack that empowers underrepresented founders by providing essential funding, addressing disparities in venture capital, and promoting sustainable growth in climate solutions. This is achieved through the unique financing vehicles that LACI maintains, including its in-house venture funds - the LACI Impact Funds - as well as the LACI Debt Fund.



By providing founders with access to both dilutive and non-dilutive options for capital to support the growth of their startups, LACI is able to support founders in growing their companies strategically with the right sources of capital at the right time for their businesses, thereby reducing the risk of ownership dilution while providing a pathway to affordable capital. The LACI Debt Fund is particularly important in addressing historically undercapitalized and credit challenged founders, in addition to addressing the gap in the market for debt financing to cleantech startups.

We want to emphasize the urgency to address climate change and climate solutions with equity as a central, vital component. Commitment to climate equity will give form to restorative and distributive pathways towards building an inclusive green economy.⁸⁴ As many in the LA region have already begun to feel the impacts of increasing temperatures, now is the best time to act and implement emissions mitigation and climate adaptation efforts, especially in our most vulnerable communities in Los Angeles.⁸⁵ While the region prepares to host the 2028 Olympic & Paralympic Games, we must ensure that we are working to bring together diverse green, sustainable technology and spaces. Advocating for Community Benefits Agreements (CBAs) and Community Benefits Plans (CBPs) can expand access to electrification and accelerate decarbonization, leading to an economic model in which we can all participate.

**To Learn More About
How You Can Get
Involved**

Either as an entrepreneur, corporation, organization, or as an individual, please check out: lincubator.org and subscribe to our Clean Energy and Transportation Electrification [newsletters](#).



ENDNOTES

- 1 <https://home.treasury.gov/news/featured-stories/the-inflation-reduction-act-saving-american-households-money-while-reducing-climate-change-and-air-pollution#:~:text=Featured%20Stories-,The%20Inflation%20Reduction%20Act%3A%20Saving%20American%20Households%20Money%20While,Climate%20Change%20and%20Air%20Pollution&text=The%20Inflation%20Reduction%20Act%2C%20or,well%20as%20home%20energy%20efficiency.>
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