



**Building an Inclusive Green Economy**



Los Angeles Cleantech Incubator's 2023

# **CLEANTECH MARKET LANDSCAPE REPORT**

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## EXECUTIVE SUMMARY

The Los Angeles Cleantech Incubator (LACI)'s mission is to create an inclusive green economy by unlocking innovation, transforming markets, and enhancing community. LACI aims to build a regional innovation ecosystem that supports the discovery and commercialization of clean technologies by:

- supporting innovative startups,
- derisking the go-to-market process,
- convening transformative partnerships, and
- helping companies successfully deliver market-ready cleantech solutions along with accompanying jobs in the greater Los Angeles region and beyond.

LACI's Cleantech Market Landscape Report is one of our two annual reports that analyze the current cleantech landscape as reflected in recent policy, investment activity, and corporate and government agency activities. Based on these findings, we provide an industry forecast covering key market signals, emerging technology trends, and projected industry growth. These findings allow us to confirm LACI's key 'Sector Gaps' for the coming year that need to be solved for within each of our three priority areas: Clean Energy, Zero Emissions Transportation, and Sustainable Cities.



This year has been transformative in the cleantech sector. In the year following the passage of the Inflation Reduction Act (IRA), we have seen unprecedented research, development, deployment, and investment across LACI's priority areas. **This historic year has seen some of the biggest activities to date in cleantech:** multiple major automakers announced plans for new EV battery plants in the US, the largest electric school bus order to date in the US was quickly surpassed by an even bigger order within months, and standalone energy storage development increased 14% with a third of battery storage growth in California.<sup>1,2,3,4</sup> Additionally, while catalytic in spurring cleantech deployment and investment, the IRA is also projected to create 170,000 new jobs nationwide.<sup>5</sup> These actions will have wide-ranging impacts across LACI's priority areas, including the following highlights:

### CLEAN ENERGY

This year, efforts to advance building decarbonization and deploy battery storage have picked up even greater momentum following passage of the IRA. All-electric appliances and retrofit measures are rolling out across homes and government buildings, with many IRA funds targeting low-income households. Building emissions have already dropped by an impressive 8.4% by the first half of 2023.<sup>6</sup> Coal power generation fell nearly 30% during the same period, and California specifically has grown its battery storage by a factor of 10x in the past three years.<sup>7</sup> This battery storage has proved invaluable in avoiding extreme heat-related blackouts in California.<sup>8</sup> However, challenges in these two sectors persist in California and beyond. Berkeley's groundbreaking gas ban from 2019 was struck down in 2023, sparking concern throughout the region, and California and New York decided to keep 5 total gas plants online that had been scheduled for retirement in 2023 and 2025, respectively.<sup>9,10</sup> Going forward, energy storage systems offering capacity during evening periods will continue to be critical to support a reliable transition to a clean energy grid.

### ZERO EMISSIONS TRANSPORTATION

Light, medium, and heavy-duty zero emissions vehicle deployment continues to rise at a promising pace, as California hit its goal of selling 1.5 million EVs in 2023, almost two years ahead of schedule.<sup>11</sup> The IRA has encouraged this growth significantly, and has impacted domestic EV battery manufacturing in new ways as well. More projects have been announced and built not only for battery manufacturing, but also for raw battery materials, given the IRA's priority on domestic supply chains. These projects have the opportunity to address long-standing environmental and human rights issues associated with the battery supply chain, though it remains to be seen how these challenges will be handled. Interestingly, automakers are beginning to engage directly with these minerals for the first time, either by investing in mineral processing facilities or even breaking ground directly on mines. These activities divert from traditional business models which relied on third party, usually foreign, mineral providers. Additionally, automakers are now partnering with battery recycling companies to reduce reliance on raw mineral supply chains and improve circularity, while many are also exploring innovative materials and technologies offering longer battery ranges and lifecycles.<sup>12,13,14,15</sup> In light of this increasing EV adoption, charging infrastructure requires more grid planning, deployment, and maintenance, especially to support medium and heavy-duty vehicles.

### SUSTAINABLE CITIES

Circular economy principles and the zero waste movement continue to gain legislative and investor attention. This year, the EPA announced grants funded by the largest recycling investment in 30 years under the Bipartisan Infrastructure Law, reflecting the national priority on improved waste and recycling infrastructure.<sup>16</sup> Moreover, IRA tax credits and rebates encouraging domestic supply chain buildout are expected to accelerate circular economy markets. These financial signals can simultaneously incentivize activities focused on material reclamation and recycling, even for hard-to-recycle materials, as part of a larger effort to build out domestic access to low-cost, locally sourced materials necessary for clean energy and transportation technologies.<sup>17,18</sup> Additionally, 2023 has reflected considerable momentum concerning extended producer responsibility (EPR), which seeks to hold corporations accountable for a more significant portion of their products' life-cycles, from production to disposal, in a way that minimizes negative socio-economic and environmental impacts. At least 6 states this year adopted an EPR policy addressing specific waste materials.<sup>19</sup> Simultaneously, startups creating new, upcycled materials from waste products or technological innovation continue to proliferate, yielding exciting new solutions.

# LACI'S SECTOR GAPS

Based on 2023 market activity, LACI is looking into several specific sector gaps in 2024:

## CLEAN ENERGY

- Diverse & Sustainable Energy Storage Systems
- Flexible Load Technologies
- Building Decarbonization
- Vehicle-to-Grid (V2G) & Vehicle-to-Building (V2B)

## ZERO EMISSIONS TRANSPORTATION

- Curb, Congestion & Pollution Pricing Solutions
- Electric Vehicle Sharing, Charging Infrastructure, & Other Access Solutions for Residents of Multi-Unit Dwellings
- Electrification of Last-Mile Goods Delivery
- Business Models & Charging Infrastructure for Electrification of School & Transit Bus Fleets
- Business Models for Electric Heavy-Duty Truck Infrastructure
- Battery Life Cycle of Lithium-Ion Batteries

## SUSTAINABLE CITIES

- Software & Infrastructure Solutions to Reduce Waste
- Reclaimed Materials via Upcycled Waste & Technological Innovation
- Zero Waste Goals & Waste Diversion

# LACI WILL FOCUS ITS 2024 CLEAN ENERGY PRIORITIES ON



## Diverse & Sustainable Energy Storage Systems

### THE WHAT

Non-lithium-ion (li-ion) batteries, reduced mineral usage, increased efficiency li-ion batteries, long-duration storage.

### THE WHY

Creates sustainable forms of batteries and related clean energy jobs, and enables the US to curb dependence on the international supply chain. The last 20% of a carbon-free grid will require long-duration energy storage solutions. Additionally, following passage of the IRA, domestic battery manufacturing and research and development of storage technologies have begun to increase.



## Building Decarbonization

### THE WHAT

Electrification of appliances, energy efficiency, shifting of energy usage with smart technology, and retrofits of existing buildings.

### THE WHY

Buildings account for roughly 40% of GHG emissions in the US. The electrification and development of smart buildings is necessary to enhance the grid's resilience and to meet our 100% zero-carbon grid goals. This is timely as more cities, including LA, are implementing restrictions or outright bans on gas infrastructure in new buildings, solidifying focus on building electrification and efficiency measures. Additionally, these measures are impactful as decarbonization retrofits alone can slash a building's emissions up to 70%.<sup>20</sup>



## Flexible Load Technologies

### THE WHAT

Grid-responsive, bundling distributed energy resources (DERs), energy efficiency, virtual power plants (VPPs), acceleration of smart grid.

### THE WHY

As California continues moving to a 100% clean energy grid and maximizes renewable generation and large-scale energy storage, flexible load technology is an integral piece to meeting this goal, especially during peak energy demand periods. With DERs increasingly embraced by utilities and energy agencies, and advanced coordination software, their potential for smart, automated load flexibility should be harnessed and coordinated on greater levels through microgrids and virtual power plants for maximum impact.



## Vehicle-to-Grid (V2G) & Vehicle-to-Building (V2B)

### THE WHAT

Bidirectional charging capabilities, increased electrification levels, smart/electrified buildings.

### THE WHY

Better integration of DERs are necessary as we reach greater electrification levels. Clearer regulation, especially regarding V2G technologies, is also necessary as electric vehicle manufacturers from light duty to school buses are now integrating these technologies into their vehicles. With some of the first commercial V2G programs coming online after years of developing the technology, capturing real-world learnings and policy best-practices will be critical for attaining maximum grid benefits.



# LACI WILL FOCUS ITS 2024 ZERO EMISSIONS TRANSPORTATION PRIORITIES ON



## Curb, Congestion & Pollution Pricing Solutions

### THE WHAT

Introducing policies to implement price access to curbs and streets and prioritize zero emission vehicle use to reduce congestion and reduce pollution.

### THE WHY

Congestion increases pollution in urban cores. Dynamic digital approaches for curb reservations, street access, and fee exemptions for zero emission vehicles will usher in a new means of reducing this congestion.



## Electric Vehicle Sharing, Charging Infrastructure, & Other Access Solutions for Residents of Multi-Unit Dwellings

### THE WHAT

Increased access and availability of EV charging stations, car share programs and other solutions to provide access to EVs for populations living in multi-unit residential developments.

### THE WHY

In California, less than 40% of the population of residents living in multi-unit dwellings have access to charging infrastructure.<sup>21</sup> Focusing on charging solutions and overall access to EVs, including but not limited to ownership, for these residents is critical for increasing equitable access to the benefits EV technologies offer.



## Electrification of Last-mile Goods Delivery

### THE WHAT

Form factors and business models for reduced pollution, emissions, congestion and noise associated with urban goods delivery.

### THE WHY

Cities continue to struggle with air pollution and congestion as a result of last-mile goods delivery. Startups and companies are beginning to address this issue through a multitude of electric last-mile delivery technologies.



## Business Models & Charging Infrastructure for Electrification of School & Transit Bus Fleets

### THE WHAT

Form factors, adoption incentives, and business models that support decarbonizing bus fleets, charging infrastructure and access, software solutions, & backup or battery power capabilities.

### THE WHY

As California recently passed a state mandate to require all new school bus purchases be electric by 2035 and federal grant programs have prioritized funding for school bus electrification, districts are seizing the moment to improve air and health quality by electrifying their fleets. Fleet electrification supports significant fuel and maintenance cost savings and, reduced pollution in vulnerable communities. Integrating software advancements, on-site battery storage, and V2G technology support grid reliability opportunities and provide financial incentives.



# LACI WILL FOCUS ITS 2024 ZERO EMISSIONS TRANSPORTATION PRIORITIES ON



## Business Models for Electric Heavy-Duty Truck Infrastructure

### THE WHAT

Widespread, accessible, affordable charging infrastructure is needed to facilitate full transition to battery-electric trucks for all fleets.

### THE WHY

Today's charging business models are difficult for traditional fleet operators to adopt given standard duty cycles. As fleet business models develop, charging infrastructure business models will also need to adapt.



## Battery Life Cycle of Lithium-Ion Batteries

### THE WHAT

Second life battery utilization & recycling models, developing models for sustainably sourced battery supply chains.

### THE WHY

Establishing recycling and repurposing models and standards for electric vehicle batteries is necessary to ensure environmental and social sustainability of battery production, reduce waste and increase accessibility of priority metals.



## LACI WILL FOCUS ITS 2024 SUSTAINABLE CITIES PRIORITIES ON



### Software & Infrastructure Solutions to Reduce Waste

**THE WHAT** Hardware and software technologies that provide data for organized collection, sorting, tracking and analyzing textiles and organic waste, virtual 3-D modeling and lifecycle tracking tools, identification tools for material composition, waste management systems and platforms, smart water technologies, and supply chain modeling or carbon accounting.

**THE WHY** Unstandardized and limited collection and tracking for reusable waste materials has resulted in poor connectivity between vendors and buyers in the recycled waste streams supply chain. Collection and sorting tools can manage the diversity of these materials and increase their likelihood for reuse. Tracking and modeling tools can help predict the waste generated throughout the supply chain that would benefit from circularity. While challenging, innovation in the water utility sector is necessary for water security, reducing cost burdens for water processing, and supporting new infrastructure investments.



### Reclaimed Materials via Upcycled Waste & Technological Innovation

**THE WHAT** New sustainable textiles and fibers, sustainable housing and other materials, consumer products made from post consumer waste, and high performance competitive plastic alternatives.

**THE WHY** The opportunities for second life cycle of textiles, fibers and other materials containing reusable elements are regularly not maximized as those viable materials often make their way into landfills. Incorporating post-consumer waste materials into new products can be costly compared to new materials, making it difficult for manufacturers to adopt cradle to cradle and circular design business models. Competitive sustainable alternatives, at scale, are needed to transform the market and reduce non recyclable/compostable materials.



### Zero Waste Goals & Waste Diversion

**THE WHAT** Diverting waste from landfills via recycling, extended producer responsibility, source reduction, composting, product life extension and circular design principles. Developing non-landfill based infrastructure to support material diversion. Creating a circular supply chain for organic and precious metal waste streams.

**THE WHY** In recent years waste has grown, with only 6% of US plastic waste recycled and 85% to landfills.<sup>22,23</sup> In the US, food is the single largest component in landfills and, in California, a third of landfill waste is compostable materials. Non-circular supply and value chains are exhausting landfills, releasing toxic pollution and GHG emissions, and creating the need to source new raw materials.<sup>24,25</sup>



# ENDNOTES

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