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ENERGY COMMISSION**



**ENERGY RESEARCH AND DEVELOPMENT DIVISION  
FINAL PROJECT REPORT**

**Los Angeles Regional Energy  
Innovation Cluster Interim Report**

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## **ACKNOWLEDGEMENTS**

The Los Angeles Cleantech Incubator works to connect the entire cleantech entrepreneur ecosystem. You can see that in the breadth of projects, connections and diverse individuals who have contributed to the success and complete milestones of the Los Angeles Regional Energy Innovation Cluster Project over the past five years. These key stakeholders include startups, government agencies, corporate businesses, utilities, investors, nonprofits, and other accelerators, national labs, and universities. The connections facilitated by Los Angeles Cleantech Incubator over the past half decade have supported the adoption of best practices and new technology trends to be shared throughout the ecosystem strengthening the collective efforts to combat climate change and reduce ratepayer costs across the state. For that reason, the Los Angeles Cleantech Incubator would like to acknowledge current and former cluster partners, including the California Energy Commission, and Los Angeles Cleantech Incubator staff that have contributed to the success of this project. A comprehensive list of individuals can be found in Appendix B.

# PREFACE

The California Energy Commission's (CEC) Energy Research and Development Division supports energy research and development programs to spur innovation in energy efficiency, renewable energy and advanced clean generation, energy-related environmental protection, energy transmission, and distribution and transportation.

In 2012, the Electric Program Investment Charge (EPIC) was established by the California Public Utilities Commission to fund public investments in research to create and advance new energy solutions, foster regional innovation, and bring ideas from the lab to the marketplace. The EPIC Program is funded by California utility customers under the auspices of the California Public Utilities Commission. The CEC and the state's three largest investor-owned utilities—Pacific Gas and Electric Company, San Diego Gas and Electric Company, and Southern California Edison Company—were selected to administer the EPIC funds and advance novel technologies, tools, and strategies that provide benefits to their electric ratepayers.

The CEC is committed to ensuring public participation in its research and development programs that promote greater reliability, lower costs, and increase safety for the California electric ratepayer and include:

- Providing societal benefits.
- Reducing greenhouse gas emission in the electricity sector at the lowest possible cost.
- Supporting California's loading order to meet energy needs first with energy efficiency and demand response, next with renewable energy (distributed generation and utility scale), and finally with clean, conventional electricity supply.
- Supporting low-emission vehicles and transportation.
- Providing economic development.
- Using ratepayer funds efficiently.

For more information about the Energy Research and Development Division, please visit the [CEC's research website \(www.energy.ca.gov/research/\)](http://www.energy.ca.gov/research/) or contact the Energy Research and Development Division at [ERDD@energy.ca.gov](mailto:ERDD@energy.ca.gov).

# ABSTRACT

The *Los Angeles Regional Energy Innovation Cluster* submits its Interim Report of the ten-year Project. For this Project, the Los Angeles Cleantech Incubator (LACI) leveraged its experience as a cleantech organization for Los Angeles County to form a new clean energy cluster management program, the Los Angeles Regional Energy Innovation Cluster (LA REIC), which encompasses the Los Angeles Region (defined as Santa Barbara, Ventura, Los Angeles, and Orange Counties).

LA REIC has driven the region's efforts to meet its statutory energy goals by creating a framework that both assesses and addresses regional energy needs while supporting and accelerating new clean energy technologies. The goals of the LA REIC are to support and accelerate:

- Investor-Owned Utilities (IOU) ratepayers' access to beneficial new clean energy innovations.
- The Los Angeles region's fulfillment of California's statutory energy goals.
- The development and commercialization of clean energy technologies that can overcome the region's barriers to achieving the state's statutory energy goals.

Over the past five years, the cluster worked to support cleantech innovation, and the impact is clear:

- LACI startups raised over \$834.2M in capital.
- Fifty-seven (57) companies graduating from LACI's Innovators program, benefitting from mentorship, business tools, and valuable introductions to investors - resulting in these 57 startups raising over \$46M of follow-on funding.
- Hosting 130+ events in the region to connect the innovation ecosystem.
- Referring over 220 startups to other incubators and accelerators.

In the years to follow, LACI will leverage LA REIC follow-on support to expand its programmatic reach, increasing its founder diversity through strategic partnership and engagement with the goal of supporting over 230 startups over the next five years.

**Keywords:** *Los Angeles Regional Energy Innovation Cluster Report*, Innovators, clean energy, zero emissions transportation, sustainable cities, inclusive green economy

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# Executive Summary

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## Introduction

The research, development, and commercialization of clean energy technologies requires a multitude of resources and multi-stakeholder support. Clean energy entrepreneurs face unique business and technical barriers to commercialization, ranging from a limited understanding of their target customers' needs to laboratory or pilot facility access. At the beginning of this Project, in 2016, navigating the complex clean energy ecosystem was daunting for clean energy entrepreneurs. Although there was significant clean energy technology discovery in the Greater LA region, the region's clean energy entrepreneurs struggled to bring their technologies to market.

Clean energy innovation and commercialization in California is integral to meeting the state's statutory clean energy and climate goals. To assist the state with the development of clean energy technology solutions, the Los Angeles Cleantech Incubator (LACI) examined the clean energy ecosystem in the Los Angeles region (defined as Santa Barbara, Ventura, Los Angeles, and Orange Counties) and found the following major barriers:

- **Hyper-local networks and services:** Knowledge, networks, and services are distinctly siloed by local communities within the four-county region. This slows down the sector's learning, breeds redundancies, stifles creativity, and limits information and funding flows.
- **Lack of dialogue between innovators and customers:** Although most clean energy technologies are developed in an academic research laboratory, most clean energy products are purchased by non-academic, non-technical customers. Therefore, the needs and concerns of the researchers, the entrepreneurs, and the end-consumers are constantly misconstrued or misunderstood.
- **Lack of regional energy needs assessment and planning:** While the four-county LA Region is largely serviced by the same investor-owned utility (IOU) electricity provider and faces similar energy needs, there is no mechanism to communicate across the region and coordinate clean energy planning and support efforts.
- **Innovation gets "stuck" in universities:** Despite the best efforts of their technology transfer offices, most universities fail to commercialize the vast majority of the innovation discovered on their campuses. While some of this is due to the lack of a viable commercial use for the technology, many technology transfer offices simply do not have the staff time, the specific skill set, or the comprehensive networks necessary to get a technology to market. In addition, sometimes the inventor/researcher would prefer to remain at the university - rather than departing to personally develop their technology - and therefore, there is no one available to commercialize the technology and bring it to market.



- **Uneven access to service and entrepreneurs across the region:** Some areas of the region are simply more economically vibrant than others, and therefore offer more resources per square mile than their neighbors. While the density of clean energy entrepreneurs and resources will never be equal across the region, there is a need to develop the capacity to at least inform and recruit clean energy entrepreneurs and researchers in the more remote sections of the region.

To address these challenges, LACI's strategy was to leverage its experience as a cleantech organization for Los Angeles County and form a new clean energy cluster management program, the Los Angeles Regional Energy Innovation Cluster (LA REIC - Formerly Energizing California), which encompassed Santa Barbara, Ventura, Los Angeles, and Orange Counties. The LA REIC Project's (known as "the Project") design was heavily influenced by research on cluster-driven economic development and the recommendation to use cluster management organizations as "backbone" organizations to spur economic development across a region (Porter, 1998).

## **Project Purpose**

The Project's purpose centers on driving the region's efforts to meet its statutory energy goals by creating a framework that both assesses and addresses regional energy needs, while also supporting and accelerating new clean energy technologies. The goals of the LA REIC are to support and accelerate:

- IOU ratepayers' access to beneficial new clean energy innovations.
- The Greater Los Angeles region's fulfillment of California's statutory energy goals.
- The development and commercialization of clean energy technologies that can overcome the region's barriers to achieving the state's statutory energy goals.

To accomplish the goals of the Project, LACI created a regionally inclusive, robust, entrepreneur-centric clean energy technology development and commercialization program. Through partnerships with organizations that perform critical acceleration and business services, the LA REIC proposed to do the following:

- Consolidate research on regional energy use and needs and determine regional clean energy technology priorities to maximize benefit to IOU ratepayers.
- Uncover and catalog local clean energy resources and assets (such as technical services or accelerator programs) and address service gaps for clean energy entrepreneurs.
- Create an efficient business and technical referral service for LA REIC Members.
- Work with stakeholders in the Los Angeles, Orange, Santa Barbara, and Ventura Counties to ensure coordination across the cluster.
- Partner with "downstream" clean energy stakeholders to close the product design feedback loop between entrepreneurs and their target end-user customers.
- Form and leverage regional Technical Advisory Committees (TAC) to provide the LA REIC with advice and strategic direction.

- Identify additional laboratories, plug 'n play office spaces, pilot locations, commercialization assistance programs, and advisory services for clean energy entrepreneurs.
- Ensure “disadvantaged” and underrepresented populations were incorporated into the regional clean energy economy.

Although incorporating “disadvantaged” and underrepresented populations was not an explicit goal of this Electric Program Investment Charge (EPIC) funding opportunity, it is a critical LACI value that underpins our mission to build an inclusive green economy. For that reason, LACI proposed that the LA REIC would support the incorporation of “disadvantaged” and underrepresented populations into clean energy research, deployment, investment, and benefits. Numerous studies have confirmed that the participation rates of underrepresented populations (specifically, people of color, women, and other populations facing barriers to employment) struggle to partake in the clean energy economy – as employees, entrepreneurs, investors, or even customers. In addition, academic research continues to document how negative environmental impacts, particularly pollution and health hazards, disproportionately impact disadvantaged communities.

This research can be used by a variety of stakeholders (for example, public officials, accelerators, incubators, academics, and investors) whose goal it is to advance clean energy commercialization and deployment, advance an equitable green economy, and build impactful organizations that help provide clean energy startups with services.

## Project Approach

The Project built the infrastructure necessary to “connect the dots” among clean energy stakeholders, wove together the available programs and services, established regional technology priorities, and connected local communities with the technologies that solved for their energy needs. Specifically, the Project took the following approach:

- **Regional Energy Analysis:** cataloging and analyzing the regional clean energy ecosystem’s assets, strengths, and gaps.
- **Regional Stakeholder Connections:** actively seeking and connecting the region’s clean energy sector stakeholders via convenings, dissemination of information, and thought leadership events.
- **Regional Commercialization Service Assessment, Referrals, and Coordination:** linking clean energy entrepreneurs and researchers to appropriate clean energy commercialization services to accelerate their entry to market.
- **Regional Clean Energy Technology Prioritization:** identifying and prioritizing new clean energy technologies that meet the California Energy Commission’s priorities, addressing the technological barriers to achieving the state’s statutory energy goals, and matching clean energy innovations with the energy needs of IOU ratepayers.

The Project formed two TACs in October 2019 and August 2021 to provide strategic guidance, review clean energy technology priorities, inform startup recruitment and selection, and provide recommendations on pathways to accelerate clean energy technology research and

commercialization. The TACs consisted of representatives from the following organizations: 3INSYS, Advanced Energy Analytics, Amazon Web Services, BlocPower, BloombergNEF, California Energy Commission, California Independent System Operator, California State Senate, Carson Hybrid Energy Storage, City of Santa Barbara, Clean Coalition, Clean Power America, Grid Alternatives, Intel, Itron, Johnson Controls, Los Angeles City, Los Angeles Cleantech Incubator, Los Angeles County, Los Angeles Department of Water Alliance, CPower Energy Management, Edison International, ElectricFish, Enel X, ENGIE North and Power, Meritage Homes, NeoCharge, Sacramento Municipal Utility District, Schneider Electric, Southern California Public Power Authority, Sunrun, and Swell Energy.

Through the two TAC meetings in 2019 and 2021, LACI found a need to support the modernization of the local electric distribution grid with an emphasis on greater load automation, integration of distributed resources, microgrids, and building decarbonization. This finding was further validated by the need for greater load flexibility from residential and commercial customers during the rotating outages that occurred in 2020. LACI used this guidance to inform its startup recruitment and has also used it as a guiding point for pilot technology demonstration with partners and thought leadership conversations and events in the region. After two years, these recommendations are now recognized in the development of LACI's Clean Energy Partnership, multifaceted Pilots Program, and in the zero emissions transportation efforts and leadership of the LACI-convened Transportation Electrification Partnership.

In LACI's second TAC meeting, regional stakeholders aligned on recommendations to prioritize microgrid and distributed energy resource deployments as an opportunity to tackle several clean energy challenges currently faced and anticipated in the Los Angeles region. To implement these findings, LACI is actively working with its public-private Clean Energy Partnership to develop a Clean Energy Roadmap that aims to support the development of a large virtual power plant in the Greater Los Angeles Region by 2028.

To further connect the ecosystem cluster and gain a broad understanding of localized and regional needs, the Project incorporated the following key organizations:

- **LACI:** oversaw the administration and execution of this Project. It developed the startup program - Innovators - to ensure entrepreneurs were connected and had access to free technical and business services in the Cluster (LACI, 2022).
- **Los Angeles County - Southern California Regional Energy Network (SoCalREN):** partnered with LACI on the "Pathway to Zero" Program to connect public agencies with entrepreneurs and their technology solutions (SoCalREN, 2019).
- **California State University of Northridge (CSUN) and California State Polytechnic University, Pomona:** partnered with LACI to produce the 2017 LACI Disadvantaged Community Report (LACI, 2017). This report focused on identifying and understanding current methods and tools used to qualify communities as "vulnerable" and underserved and provide levels of comparison between communities and explored ways to improve the identification and prioritization of underserved communities in California. Additionally, CSUN contributed to the Project by launching the "Sustainable Fashion Academy" (CSUN, 2021). The academy sought to inform students about

sustainable fashion practices, including the high energy and resource consumption of fast fashion and its environmental implications - which make up 10 percent of global greenhouse gas (GHG) emissions (UNECE, 2018). Furthermore, the academy provided ways to begin a company by connecting them to LACI's entrepreneurs and other regional stakeholders.

- **University of California of Los Angeles:** partnered with LACI to assess the regional energy needs of the four (4) counties. The assessment included an evaluation of energy mix, clean energy program adoption, and vulnerable communities in the region to help inform the priorities of the Cluster.
- **Community Environmental Council of Santa Barbara (CEC-SB):** helped identify and recruit clean energy entrepreneurs in Santa Barbara and Ventura County and connect startups to potential customers. Through a Port of Hueneme Electrification Assessment, CEC-SB is working to promote a clean energy transition at the region's port and provide guidance and direction for how transportation stakeholders and fleet operations can prepare to meet the state's clean mobility regulations. To ensure the counties have an adequate workforce to keep up with demand, CEC-SB formed a working group to develop guidance and identify occupational and training needs for the clean energy transition. Lastly, CEC-SB inventoried the energy needs of "disadvantaged communities" in Santa Barbara and Ventura County and is working to develop a report to support clean energy initiatives and workforce development priorities in Santa Barbara and Ventura County.
- **Sustain Southern California:** helped identify and recruit clean energy startups in Orange County, connected entrepreneurs to investors and potential customers, and hosted events to promote clean energy commercialization.
- **California Institute of Technology (Caltech):** LACI partnered with the Caltech Rocket Fund (Formerly Flow out West Program) to support clean technology entrepreneurs with grant funding through a startup competition. Through this partnership, LACI was also able to source and recruit startups for its cleantech programs and identify a potential funding source for existing Innovators. Over the Project's duration, six LACI startups received a Rocket Fund Award.

Over the five years, this Project faced a number of technical and non-technical challenges that were largely successfully addressed due to the guidance, operational flexibility, and support from the California Energy Commission. This Project faced two primary challenges – unforeseen operational barriers by the subcontractor organizations and the COVID-19 health and economic pandemic, which had everyone pause their operations and reevaluate how to meet their deliverables. For the first key barrier, LACI sought and received the approval of a budget modification in 2019 that allowed for the shift of funds between subcontractors and LACI to account for staff turnover and organizations having a difficult time documenting in-kind matches. In regard to the COVID-19 pandemic, the Project was able to receive an extension, providing more time to complete the Project. This was helpful across all organizations given the uncertainty and operational challenges that came with the pandemic.

# Project Results

The Project achieved the majority of its quantitative and qualitative objectives and goals. It supported over 57 startups through LACI’s Innovators Program in the Southern California Region since 2016 and collected and analyzed data that shows the following economic impacts to the region:

**Table 1: LA REIC Key Performance Indicators - Proposed & Accomplished**

Metric	Proposed KPI + Benefits	Accomplished KPI + Benefit
# of Startup Cohorts	5 Cohorts	5 Cohorts
#new green jobs	400 new green jobs	394 new green jobs
# of clean energy technology pilots,	15 clean energy technology pilots	45 Clean Energy Pilots
73 Cleantech Pilots		
Total \$ in aggregated annual revenue from Cluster Member companies,	\$70M in aggregated annual revenue from Cluster Member companies	\$172 M in aggregated annual revenue from Cluster Member companies*
Total \$ in clean energy capital investments through debt or equity instruments	\$80M in clean energy capital investments through debt or equity instruments	\$91.3M in clean energy capital investments through debt or equity instruments**
Return on investment	Range from 50:1 to 438:1	Ranging from 34:1 to 94:1 return on the investment***

\* \$124M in baseline funding and \$48M follow on funding  
 \*\* LACI Debt Fund and Incubation Program startups  
 \*\*\* 34:1 included the innovators and Incubation Program 94:1 Includes all LACI programs.

**This table provides information on the originally proposed key performance indicators that LACI set forth in 2016 and the associated performance metrics goals. The third column illustrates the actual performance of the program tasks and outputs over the 5 years.**

Source: LACI Internal Data

The major lessons learned at this midpoint of the Project are:

1. It takes a multitude of resources, partners, and collaboration to support the research, development, and commercialization of emerging clean energy technologies.
2. Technology demonstration(s) with a public or private sector partner is critical for a startup’s development.
3. Establishing and integrating best practices and goals to improve diversity, equity, and inclusion is necessary to make meaningful progress.
4. Alternative funding is critical to support startups in the prototype and seed stage.
5. Curated programs for entrepreneurs based on startup’s development stage improve and can accelerate a startup’s success.

These key lessons verify California’s comprehensive approach in the EPIC program to scale up energy technology innovation of key existing and emerging technologies to accelerate the transformation of the electricity sector to meet the state's energy and climate goals.

In addition to the results mentioned above, LACI collected other metrics to help guide the success of the Project. For instance, since 2016, LACI increased its overall startup diversity with a 24 percent growth in its women founders and 45 percent growth in its support of diverse founders. Of our Innovator company founders, 30 percent are underrepresented founders, 22 percent are women founders, 2 percent are LGBTQAI+ founders and 3 percent are Veterans. Importantly, to understand the wide reach of the cluster, LACI and its partners hosted over 150 events raising awareness of emerging technologies, showcasing cleantech entrepreneur companies, and providing startups with the opportunity to demonstrate and validate their innovative technologies.

Since launching its formal Innovators program in 2016, LACI developed additional programs to support cleantech entrepreneurs at various total readiness levels and fundraising goals. This emerged from the need to curate programs based on entrepreneur development stages as well as ensure opportunities to demonstrate technology through Pilots and small-scale demonstrations. These programs provide a pipeline that supports entrepreneurs from the concept and working prototype stage through the pilot and commercialization phase. The formal Incubation Program not only provides startup entrepreneurs with funding to support small-scale pilots, but also supports startup founders’ knowledge of environmental, social, and economic impacts related to their technology deployment. This pilot model aims to provide the startup with a demonstration opportunity and inform them how to measure and scale impact in their business for the long-term.

## **Technology/Knowledge Transfer**

To ensure the knowledge gained, experimental results, and lessons learned were made available to the public and key decision makers, LACI developed a Final Project Fact Sheet and developed a Technology/Knowledge Transfer Plan. The objective was to build the regional institutional infrastructure needed to coordinate, promote, and commercialize clean energy innovation for the maximum benefit of California’s ratepayers, and this objective holds true five years later.

Knowledge gained, Project results, and lessons learned were made available to key stakeholders, public officials, community partners, and the general public. The primary methods of outreach and education were:

- Social media publication through Facebook, Twitter, Instagram, LinkedIn, etc.
- Participating in LA REIC Partners’ key events (for example, conferences and showcases) by sponsoring a booth and participating as a panelist or speaker.
- Disseminating the information among the LA REIC partners’ networks.
- Meeting privately with organizations.
- Hosting thought leadership events.

Under the LA REIC Project, LACI created several opportunities to disseminate lessons learned, key findings from Projects, and best practices that can support and strengthen the clean energy ecosystem in the years to come.

## **Benefits to California**

The Project fostered the commercialization of clean energy solutions that will support reduced ratepayer costs over the useful life of the technologies impacted. Examples of these benefits can be seen below in the impact and advancements to commercialization LACI's startups have made over the past five years.

FreeWire Technologies delivers clean and fast EV charging that is readily available and easy to deploy. FreeWire estimates a savings of 21.4 metric tons of CO<sub>2</sub> avoided over a one-year period of using its products. Quantifying that, LACI estimates that FreeWire's technology will help avoid 107 metric tons of CO<sub>2</sub> over the next five years. Based on the \$50 social cost of carbon, this translates to \$5,350. This is a very conservative estimate as FreeWire recently scaled their operations with partnerships and developed its Boost Charger, which delivers fast charging up to 120-kilowatt output, while minimizing stress on the grid with the help of a built-in 160-kilowatt-hour battery.

Envoy Technologies provides an electric vehicle (EV) car-sharing platform and "mobility as a resource" to communities. The company's technology provides benefits to ratepayers by reducing electricity demand, GHG emissions, and vehicle congestion through a decrease in the number of vehicles on the road and the need for car ownership. Envoy customers save about \$500 a month by using Envoy instead of owning a vehicle. Envoy achieved 1.2 million electric miles in June 2020. As every mile traveled by internal combustion engine vehicles generates 411 g CO<sub>2</sub> per mile, it's estimated that this milestone resulted in a reduction of 543 Tons of CO<sub>2</sub> over that time period. With EVs on the rise, LACI expects the number of rides provided by Envoy to double, resulting in over 1,000 tons of CO<sub>2</sub> emissions no longer being generated as a result of EV use (translating to \$250,000 monetary savings over five years for ratepayers).

The ChargerHelp! application eliminates the high cost of station downtime by enabling on-demand repair of EV charging stations. The company's technology leverages the local Certified Technician workforce to meet the real-time demand of EV Charging station providers and reduces the overall cost of the maintenance by 35 percent. This benefits ratepayers by ensuring that access to EV chargers is minimally interrupted by station outages. California residents enjoy increased confidence in EV ownership, reduced barriers to entry, lower maintenance costs and greater economic mobility within all communities. On average, the cost of annual EV maintenance for a single station is \$300, and the cost of servicing a down EV charging station can vary depending on the issue. Over the next four years, ChargerHelp! estimates the electric vehicle supply equipment (EVSE) industry will miss out on \$3-5M in new sales due to offline and down chargers. ChargerHelp!'s technology application, servicing, and expansion has the potential to both reduce the economic burden of electric vehicle charging downtime and increase new EVSE sales by \$1M over the next five years.

Electrum (formerly Pick My Solar) provides a residential solar marketplace that connects homeowners with installers to reduce rooftop solar acquisition costs. Through LACI's Incubation

Program, Electrum doubled revenues year over year, and raised substantial capital from early-stage investors and leading strategic partners. Recently, the startup rebranded as Electrum to reflect its expanded product offerings, which include energy storage, hybrid electric water heaters, electric vehicle charging stations and electrified heating, ventilation, and air conditioning. This expanded service will accelerate and facilitate the adoption of additional electrification products to further reduce GHG emissions and particulate matter for California ratepayers. In 2018, Electrum's installment of a 150-kW solar array was projected to offset 28,959 lbs. of CO<sub>2</sub> per month. Overall, the company estimates they have avoided 107,644 lbs. of carbon resulting from the installation of a 556-kW array over a 3-year period. Based on this current estimate, Electrum will, at minimum, avoid 538,220 lbs. (\$12,200 in monetary savings) over the next five years. This is a very conservative estimate as the startup will be selling four additional electric products on its marketplace.

These are just a few of the numerous examples of how the Project supported clean energy entrepreneurs and technology in Southern California that advance progress towards state goals as well as local initiatives.

In regard to environmental benefits, the Project originally anticipated 165 – 1,409 GWh savings, 46,831 – 398,663 million metric tons of avoided GHG emissions, and \$254M – \$2,191M in energy savings for ratepayers. These benefits were difficult to isolate and quantify over the past five years, but a few examples from the Project's startups demonstrate how LACI was able to achieve and exceed these environmental results. Further examples of calculated GHG emissions reductions, energy efficiency advancements and other environmental benefits resulting from startups' technologies can be found in Chapter 3.



# CHAPTER 1: Introduction

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## Status of Clean Energy Development and Commercialization in 2015

To summarize the status of the development and commercialization support available to Los Angeles regional clean energy researchers and entrepreneurs in 2015, the Los Angeles Cleantech Incubator (LACI) relied on two frameworks to assess and monitor its cleantech incubator and cluster management programs and convert them to focus only on clean energy. Below is a short summary of each framework, the Clean Energy Commercialization Model and the Clean Energy Entrepreneur-Centric Cluster Model, used to assess the current status of the Los Angeles Region’s clean energy ecosystem.

### Clean Energy Commercialization Model

The LACI Commercialization Model (Figure 1) illustrates the complex suite of technical and business services needed to support each stage of a clean energy company’s development. The key to assisting clean energy companies through each commercial stage – from genesis to expansion– is to provide the right mix of commercial and technical support services at the right time.

**Figure 1: Clean Energy Commercialization Model**



Source: LACI

To expand this Model for the four-county region of the Los Angeles Regional Energy Innovation Cluster (LA REIC), LACI developed a plan and system to oversee an asset inventory of clean energy support and acceleration services in each county. Since then, LACI continues to regularly update and inventorize a digital list of technical and business services, and assets available in the four-county region. LACI disseminates those assets and services identified to its startup entrepreneurs to support their business development.

### Clean Energy Entrepreneur-Centric Cluster Model

Within the Clean Energy Cluster Model in Figure 2 below, the LA REIC focused on the Clean Energy Entrepreneur’s needs at the center of all of its cluster activities and assessed the LA REIC’s services from the entrepreneur’s perspective to fully support the needs of a clean

energy entrepreneur. By adopting this method of cluster management coordination, it enabled oversight and connection across the region and in the statewide cluster’s ecosystem. As a result, the ecosystem’s cross-referral process became more efficient and service redundancy reduced as impact increased.

**Figure 2: Clean Energy Cluster Model**

### CLEAN ENERGY CLUSTER MODEL



Source: Michael Porter’s cluster model

As the grant duration was over six years at the time of application, LACI anticipated that the region’s clean energy focus areas would evolve over time and the periodic clean energy asset inventory surveys of the four-county region to assess the region’s capacity and strengths would be needed. Over this time period, LACI conducted these assessments to inform the clean energy decision making stakeholders and leadership, ensuring the LA REIC’s program continues to strengthen its nimble and strategic approaches and administration.

## CHAPTER 2: Project Approach

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Prior to 2016, LACI and the LA region's ecosystem didn't have a formalized structure in the way that it does today for its cleantech entrepreneur programs. At that time, LACI's startup programs had open application cycles enabling startups to join at different time periods and different Total Readiness Levels (TRL) levels. This resulted in administrative challenges due to a mismatch of business support services needed for startups at different TRL and fund status levels, while accepting all technology related to cleantech with minimal definition.

Similarly, in the greater ecosystem, there was a lack of formalized community, meaning that many startup services were siloed, it was difficult to identify a cleantech incubator, diversity was not a priority or emphasized in recruiting efforts in the ecosystem, and navigating resources, referral and network connections was difficult as one founder or organization. Moreover, in LACI's work to improve its models and services for startups programs, LACI identified the following barriers:

1. Innovation gets "stuck" in universities: Most universities fail to commercialize the vast majority of the innovation discovered on their campuses.
2. Uneven access to service and entrepreneurs across the region: Some areas of the region are simply more economically vibrant than others, and therefore offer more resources per square mile than their neighbors.
3. Hyper-local networks and services: Knowledge, networks, & services are distinctly siloed by local communities within the four-county region.
4. Lack of dialogue between innovators and customers: Although most clean energy technologies are developed in an academic research laboratory, most clean energy products are purchased by non-academic, non-technical customers.
5. Lack of regional energy needs assessment and planning: No mechanism to communicate across the region and coordinate clean energy planning and support efforts.

To execute this Project, monitor progress, and ensure the Project's success, the LA REIC was designed with the following key elements in mind:

1. Building a regionally-inclusive, entrepreneur-centric cluster.
2. Developing a network access program for early-stage entrepreneurs.
3. Using research to identify strengths and gaps.
4. Creating a robust referral network to leverage the quality services currently available.
5. Connecting the LA REIC with other regional clusters and the statewide Social Entrepreneurs for Economic Development (SEED) Initiative.

6. Leveraging all networks to promote and support LA REIC members and share the LA REIC's findings.

## **Built a Regionally-Inclusive, Entrepreneur-Centric Cluster**

The Project's design is heavily influenced by Economist Michael Porter's research on cluster-driven economic development and his recommendation to use cluster management organizations as "backbone" organizations to coordinate cluster efforts across a region (Porter, 1998). As noted earlier, the region lacked a coordinated strategy and method to convene and engage the region's key clean energy stakeholders. This significantly slowed down clean energy commercialization and, eventually, market adoption. To ensure the Project served all four counties, the LA REIC formed Technical Advisory Committees (TAC) of representatives from each county with connections to their local clean energy communities. The TACs were responsible for identifying the challenges and opportunities to California's acceleration towards a 100 percent clean energy future. LACI used this information to target startup recruitment and market signals needed to grow the clean energy ecosystem.

The first TAC was held in 2019 ahead of LACI's Annual Power Day Forum where attendees spoke about 12 different categories to achieve a zero-carbon grid and identified which could be supported by solving for the following barriers: policy, technology, finance, incentives, and/or deployment. The next TAC meeting took place in 2021 and brought together clean energy stakeholders to identify pain points, prioritize needed solutions, and explore ongoing collaboration to advance the transition to a resilient, innovative, and equitable zero-carbon grid in the Greater Los Angeles Region and beyond. Specifically, TAC members explored clean energy solutions that advance local job creation and grid modernization with distributed energy resources, smart grid management that enables load flexibility, and building electrification.

## **Ecosystem Partners**

**California Institute of Technology (Caltech):** Many early-stage clean technology companies need capital to support their prototype development and funding for technology demonstrations to reduce investor risk and support product validation. CalTech's Rocket Fund (Formerly FLoW) works to support startups by hosting a university-based cleantech business competition for teams of entrepreneurs.

To support the Project, LACI partnered with CalTech to provide program sponsorship to CalTech to support their Rocket Fund recruitment and award process. Over the past five years the LA REIC supported four rounds of Rocket Fund Awards - with REIC funding, technical review committee participation, and guidance for technology priority for each year - that has yielded 26 awards. LACI also supported the program and the clean energy ecosystem by providing over 35+ referrals to the Rocket Fund program. CalTech also supported the ecosystem by providing LACI with four lists of applicant companies - totaling over 450 startup companies. This supported LACI's recruitment directory for its various startup programs and opportunities to provide referrals to other Regional Energy Innovation Clusters.

**Community Environmental Council of Santa Barbara (CEC-SB):** CEC-SB has been the Project's County leadership in Santa Barbara and Ventura County over the past five years. In that time, they supported the Project in a number of different ways:

- Connecting startups with opportunities to participate in local events, meet with potential customers and government officials, and identify opportunities for pilot deployments in the region.
- Conducting surveys and listening sessions to understand the clean energy needs of "disadvantaged communities" specifically in the Santa Barbara and Ventura region.
- Leading a Project to assess the feasibility of electrifying two sites at the Port of Hueneme and potentially establishing a shared-use depot charging opportunity at two or more additional sites.
- Developing a workforce development strategy for Ventura and Santa Barbara County and building a model for workforce development similar to LACI's Green Jobs Programs, utilizing local training infrastructure and job/intern placements.
- Referring startups from Santa Barbara and Ventura Counties to the Project.
- Providing office space to the LACI Regional County Representative.

CEC-SB continues to support and champion cleantech industry and entrepreneur advancement in Santa Barbara and Ventura counties. They plan to complete a community level energy needs assessment by the end of 2022 that will focus on the energy needs of "disadvantaged" and overburden communities in Ventura County, as well as to complete their Port electrification assessment.

**Sustain Southern California:** In the Project proposal, Sustain SoCal (at the time known as "Cleantech OC") was to act as a significant OC branch for the LA REIC. However, the original scope proved to be a challenge and for that reason all Project parties decided to adjust Sustain SoCal's scope to be in service of the overall LA REIC program's goals. Sustain SoCal championed ongoing entrepreneur outreach and connectivity through the OC region through their many clean energy events and workshops, which facilitated numerous important energy stakeholder connections for LACI, clean energy startups, and beyond. In total Sustain SoCal hosted over 60 Events in the past five years.

**Los Angeles County- Southern California Regional Energy Network (SoCalREN):** LACI partnered with Los Angeles County and SoCalREN to conduct an assessment on community-level energy needs and launched the Pathway to Zero program. Los Angeles County's participation in the Project helped support their work by understanding clean energy adoption opportunities for residential and commercial building owners. This informed their programs and initiatives that support energy efficiency and lower utility costs by helping save energy. The launch of the Path to Zero program enabled Los Angeles County to develop a roadmap to support public agencies to achieve zero net energy utilizing the integration of distributed energy resources, maximizing energy efficiency opportunities for low-income, rural, and disadvantaged communities, and providing education, project management assistance and support for eligible public agencies.

## **Developed a Network-Access Program for Early-Stage Entrepreneurs**

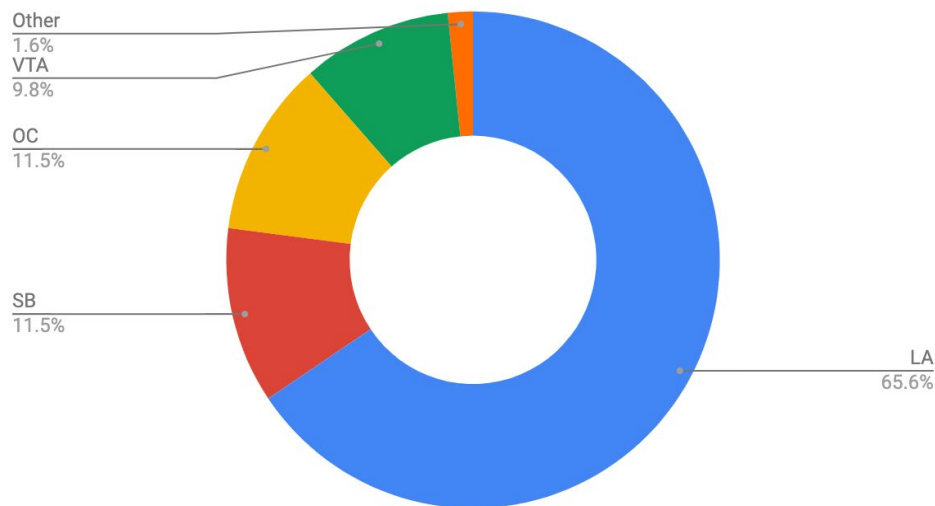
LACI established the 12-month Innovators Program for companies based in the LA REIC Cluster to help startups access opportunities across the state. The program was developed to cater to early-stage ventures that are pre-SEED or pre-prototype with at least some proof of concept. As part of the Program, LACI provides the following services to early-stage entrepreneurs:

- Regular updates on ecosystem opportunities.
- Access to platforms and resources and discounts to industry events.
- Check-ins with a LACI staff member and an assigned Executive in Residence.
- Curriculum development opportunities in expert-led workshops and pitch clinics.
- Invitations to participate in LACI events and showcases.
- Promotion to LACI's network and ecosystem.
- Visibility within California Energy Commission's network.
- Discounted access to desk space and LACI's Advanced Prototyping Center where entrepreneurs can ideate, design, and build innovative products, and subsequently test and certify their technology.

At the beginning of the grant period, LACI appointed Cluster Navigators for each of the four counties to successfully identify the members of the region's clean energy community, develop and administer an outreach and engagement strategy, and encourage applications to the LA REIC for services. This model supported LACI's broad outreach effort to various areas and cities, supporting LACI's recruitment efforts and ensuring entrepreneurs throughout the region could access incubation services. Over the period of the five years, LACI relied on this representative type of model.

To identify key clean energy community stakeholders, LACI developed a Stakeholder Engagement Plan to support the marketing and communication engagement strategy for each region. With these products and the support of the Cluster Navigators, LACI was able to recruit one-third of its innovator startup entrepreneurs outside of Los Angeles County (Figure 3).

**Figure 3: Startups by Geographic County Location 2016-2021**



**This figure illustrates the diversity of Innovator start-ups related to their geographical location in 4 county LA REIC Region.**

Source: LACI

## **Intake, Selection, and Technology Identification Process**

LACI developed its Annual Confirmation of the Electric Program Investment Charge's (EPIC) Technology Focus Areas Report to guide its technology recruitment areas. This report outlines the EPIC technology focus areas for each year and the priorities that overlap with LACI's technology priorities. For background, as an organization, LACI has three priority areas – Clean Energy, Zero Emissions Mobility, and Sustainable Cities. LACI produces an annual Market Landscape Analysis that informs the technology areas within the priority areas. These technologies when compared with the EPIC Technology focus areas included the following over the past five years:

1. Generation technologies
2. Transmission & Distribution technologies
3. End-Use technologies
4. Energy sustainability and efficiency via advancement of "closed loop" practices
5. Grid resiliency and safety technologies

LACI excluded the following technologies of the past five years as they do not align with LACI's priority areas:

1. Natural gas vehicles
2. Alternative fuel infrastructure (not including electric vehicle charging)
3. Natural gas cooking, natural gas water heater, boilers not used for electricity generation
4. Bioenergy whose primary purpose is petroleum replacement
5. Combined heat and power prime mover technologies using natural gas or natural gas replacement fuels

6. Nuclear
7. Fuel cell
8. Technologies replacing natural gas with hydrogen
9. Carbon capture and storage

Additionally, LACI established its REIC Intake Protocol, which included four steps to intake applications, review, decline, and refer startup entrepreneurs. The steps included: 1) Conducting outreach and a marketing plan to increase awareness about clean energy and the REIC program; 2) Engaging entrepreneurs to encourage them to become a REIC Member and apply to the program; 3) Screening candidate applications following an acceptance and rejection criteria; and 4) Convening the TAC review committee to make a final decision on accepted companies and following up on rejected startups with the rejection protocol outlined below, and providing referrals to companies whose technology development may be better supported by other incubator or accelerator programs.

To efficiently accommodate the volume of REIC Member applications, LACI created a rejection process for REIC Member applications that were not a fit for the program. In addition, the REIC took the opportunity to share a list of other resources in and outside of the LA region that the company could seek.

**Table 2: Rejection Criteria and Protocol**

<b>Rejection Criteria</b>	<b>Rejection Protocol</b>
Technology not applicable	Send rejection email indicating technology outside of scope. Include a list of regional startup support resources available.
	May recommend non-cleantech incubator or accelerator programs, if applicable.
Company not located in Santa Barbara, Ventura, Los Angeles, or Orange County region	Located in CA: Refer to another REIC cluster
	Located outside CA: Refer to list of nation resources (ex: IncubatEnergy Network).
Not target company stage	Too early: Refer to pre-acceleration resources (ex: academic research centers).
	Too mature: Refer them to LACI’s later stage programs- Incubation or Market Access- to facilitate later stage activities such as full demonstrations.
	Close to target stage: Encourage companies to re-apply in future. Follow up with the company within a specified timeframe to see if milestones have been met.
Startup’s leadership team anticipated to be noncompliant or “uncoachable”	Send rejection emails encouraging startups to seek additional resources before reapplying. Include a list of regional startup support resources available.

**This table shows the rejection criteria and related protocols LACI executed for its Innovators Program.**

Source: LACI



If company candidates did not meet the application criteria, LACI provided the candidates with a) reason applicant is not accepted; b) suggestions for other resources; and c) specific referral plan is outlined, including suggestion to have a follow up call to review the referral process.

### **Enrollment and Metrics**

Once enrolled in the Innovators Program, LACI did an initial assessment of the companies using the *Initial LA REIC Member Assessment Template*, which allowed the Cluster Navigators to document the following information about each new company. The Template assessed:

- Date of acceptance into the LA REIC.
- Basic member information.
- Description of technology and commercial status.
- A schedule of 1:1 follow-up “check-in” coaching meetings.
- Projected ratepayer benefits.
- A list of technology and commercial milestones.
- Members and their Cluster Navigator.<sup>1</sup>
- An exit protocol for unsuccessful members.

This base helped to inform LACI's Market Transformation team and its Executives in Residence (EIR) on how best to support each startup company based on their specific technology and business development needs. Following this assessment, the companies would attend a cohort kickoff meeting and participate in a meet and greet with their EIR. As an additional resource, LACI provides its startup companies with a welcome packet and works to schedule introductory meetings with the startups and the California Energy Commission to welcome them into the EPIC cluster system.

As part of this Project, the California Energy Commission provided the *Semi Annual Benefits Tool* to record an assortment of metrics related to startups' initial and business development progression over the course of their program. This Tool was a foundation for LACI's metric reporting through the course of the Project over the past five years. LACI submitted seven reports to the California Energy Commission covering its six Innovator cohorts and 69 cleantech startups. As LACI was closing out Cohort 6 in 2022, some of the metrics are not included in Chapter 3 of this Interim Report.

### **Research Utilized to Identify Ecosystem Strengths and Gaps**

Following Michael Porter's dictum to base a cluster's strategy on the target region's strengths and assets, this Project integrated regular assessments of the region's clean energy assets, energy needs, greenhouse gas (GHG) emissions, and disadvantaged community needs to the strategy and planning for the LA REIC. By sharing these reports with the Advisory Committees, as well as the larger regional clean energy community and public officials, the clean energy community was informed with the critical information necessary to drive an effective regional strategy based on evidence-based decision-making. Through a combination of the TAC's recommendations and the California Energy Commission's input on the state's clean energy

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<sup>1</sup> Please note LA REIC cluster dissolved appointed individual cluster Navigators as of August 2019 and moved to a place-based organizational model.

technology priorities, the LA REIC set regional clean energy priorities, determined areas needing additional acceleration and commercialization support, and established clean energy technology focus areas for the LA REIC activities. Thus, the Project built a feedback loop to ensure the LA REIC's programming adapted to the region and state's changing clean energy needs and priorities over time.

## **Disadvantaged Community Reports**

### **Underserved Communities Assessment**

The first disadvantaged community report developed in 2017 focused on identifying and understanding current methods and tools used to identify communities and provide levels of comparison between communities. This existing system survey and review was used to identify best practices and issues with current methodologies. At the beginning of this Project Proposal, LACI decided to rely on the CalEnviroScreen to identify "Disadvantaged Communities." The report found that while the CalEnviroScreen was a good way to determine the pollution burden in a community, it was sometimes an incomplete description of the "on the ground" conditions in a community. This finding was similar to what LACI heard from community members who lived in disadvantaged communities.

To catalog a comprehensive overview of community data resources and develop an assessment and prioritization methodology, LACI worked with the CSU5, which consists of the five Los Angeles County California State University (CSU) campuses: CSU, Dominguez Hills; CSU, Long Beach; CSU, Los Angeles; CSU, Northridge; and CSU, Pomona (CSU5, n.d.). The CSU5 partnered with the CSU Water Resources Policy Institute (WRPI), a CSU system-wide institute working at all 23 of the CSU campuses on issues related to water and energy. Through the development of the CSU5 geographic information system assessment database tool, the Project developed a database that could identify and analyze the vectors between clean energy innovation and deployment and the unique needs and opportunities found in underserved communities. In 2019, LACI worked with CSUs Pomona and Northridge and WRPI to develop the first iteration of a new methodology to define underserved communities that was found to be needed in 2017. This new methodology allowed for the Project to explore better ways of identifying and prioritizing underserved communities in the Region and California.

These initial reports helped to identify factors that could impact the health of individuals living in disadvantaged communities beyond those outlined in the CalEnviroScreen Tool. The goal was to use these reports as a baseline for disadvantaged community analysis and build upon those reports every year. Following the conclusion of this report, it was brought to LACI's attention that the CSU5 and Water Resources Policy Institute would no longer be able to participate in the Project due to issues with grant funding reimbursements timing as well as the match contributions. For that reason, the CSU5 collaboration was dissolved, and the LA Project continued to operate and partner with the CSU Northridge in an alternative capacity.

## **SoCalRen LA REIC Regional Community-Level Energy Needs and Engagement Assessment**

LACI also conducted a community-level needs assessment with the SoCalRen that is part of Los Angeles County. The goal of that community level assessment was to better understand a community's perspective for clean energy adoption. For the assessment, local stakeholders were surveyed on what clean energy, zero emissions mobility and sustainable city solutions they valued by rank and significant barriers preventing them from proactively participating in the clean energy transition. Surveyed Stakeholders included: building owners, public agencies, equipment suppliers, cleantech contractors/businesses, utilities (IOUs), financial institutions, and other stakeholders as identified and beneficial. Key findings from the community-level needs reports included:

- The majority of cleantech adoption decisions were financially motivated, taking into account return on investment and cost of technology.
- Respondents ranked lack of better business models as the most significant barrier to achieving 100 percent renewable energy followed by a lack of better technologies.
- Cost ranked as the most significant challenge to achieving net zero buildings.
- Respondents ranked the following as the most sustainable strategies by category:
  - Energy management: energy and water efficiency
  - Building use: energy-saving opportunities by auditing and retrofitting existing buildings
  - Transportation: car and bike shares.

Since reporting on these findings, LACI's pilot programs took strides to address e-mobility pilot opportunities in Los Angeles County, including both electric vehicle car share and multi-modality e-mobility pilots. In fall of 2021, the Market Transformation team leveraged findings from this study and other stakeholder engagement and recognized opportunities to improve energy and water efficiency as well as retrofitting opportunities, making plans to pursue building decarbonization pilots in 2022.

Moreover, the two reports were used to inform LACI's other regional research reports - UCLA's Regional Energy Needs Assessment and Community Environment Council of Santa Barbara's Disadvantaged Communities' Clean Energy Needs Assessment of Santa Barbara and Ventura County that is anticipated to be published in late 2022.

## **Disadvantaged Communities' Clean Energy Needs Assessment**

### **Southern California Regional Energy Needs Assessment**

In 2021, LACI worked with the University of California, Los Angeles to assess how energy use, community vulnerability, and clean energy technology adoption varied across the four counties: Los Angeles, Orange, Santa Barbara, and Ventura. Specifically, the Assessment evaluated the following categories in the Region: electric consumption, clean energy supply, GHGs, disadvantaged communities, median income, future high heat days, and adoption rates

for solar rooftop, electric vehicles, and storage (Trumbull and DeShazo, 2021). Some of the key findings in the Assessment were:

- **Clean Energy Technology Adoption:** Related to technology adoption and geographic variation, Ventura County had the highest per-capita solar adoption rates, while Los Angeles County had the highest per capita energy storage adoption rate. Additionally, Orange County had the highest per-capita electric vehicle adoption as well as electric vehicle charging stations. A positive finding was that electric vehicle charging stations were reasonably evenly spread across the region.
- **Predictive Energy Program Adoption:** When analyzing income data with clean technology adoption rates, median income was the strongest predictor of energy program adoption for solar, electric vehicle, and storage adoption – the higher the median income of the census tract, the higher the uptake of these energy programs.
- **Forecasted High Heat Days:** Geographic locations that will have the largest number of high heat days (between 76-154 days of temperatures over 90 degrees) in the future include southern and southeastern Ventura County, inland, and northwestern Los Angeles County, and northern Orange County. Importantly, these areas will likely experience greater increases in energy needs in the future.

The report will support regional planning efforts to prioritize climate and energy transition opportunities for vulnerable populations in the Greater Los Angeles Region. These insights will also inform decisions about how cities and local stakeholders can best ensure benefits that mitigate climate solutions are distributed equitably across the region and enable areas most burdened by climate change to adequately access the environmental benefits of the clean energy transition.

## **Clean Energy Technology Prioritization**

### **Created a Robust Referral Network to Leverage the Quality Services Currently Available**

Unlike many other areas of the state, the County of Los Angeles already had a fairly sophisticated and robust clean energy ecosystem where the major clean energy ecosystem stakeholders (government agencies, academia, entrepreneur associations, investor networks, incubators, consumer advocates, and so on) already knew each other and coordinated efforts to accelerate the commercialization of new clean energy technologies. Therefore, identifying the service providers in other areas of the region and connecting them to LA REIC Member companies seeking support resulted in a larger, higher quality pipeline of early-stage clean energy companies ready for LA REIC Partner Organizations' programs. This in turn helped the region continue to overcome its barriers to meet the state's statutory energy goals more quickly. Furthermore, the LA Region continued to build on those existing connections to ensure its pipeline blankets the four-county region and continues to provide new opportunities for entrepreneurial advancement in and outside the cluster ecosystem.

## **Connected the LA REIC with Other Regional Clusters and the Statewide SEED Initiative**

The Project committed to cross-referring LA REIC Member companies with the other regional cluster awardees - Cleantech San Diego, BlueTechValley, Cyclotron Road, CalSEED, and CalTestBed – in order to leverage each region’s unique programs and strengths. LACI referred over 220 startups to other REIC Clusters and other incubators in the Country. LACI also served as a Technical Review Committee member for the CalSEED Accelerator Application Processes. Over the past five years, LACI supported CalSEED ushering five cohorts of Cleantech startups (over 55 individual companies) through its application process. These companies have gone on to receive curriculum training, mentorship guidance and entrepreneurial resources to support their commercialization journey or concept development. This partnership enabled LACI to support and bridge the startups into the Energy Innovation pipeline for CalSEED and other Cleantech programs. In addition to supporting application reviews for CalSEED, LACI served as a Technical Reviewer for the Caltech Rocket Fund, Tech Stars, InnovateMASS, and Greentown Labs.

## **Leveraged All Networks to Promote and Support LA REIC Members and Share the LA REIC’s Findings**

As articulated above, the Cluster has extensive access to a wide variety of networks and stakeholders. The Project leveraged these networks to promote and support the Cluster members and share the LA REIC’s findings over the five-year grant period. The Project took several strategies to accomplish this. For example, as part of its event strategy, LACI developed the *Clean Energy Community Events Matrix* that provides a targeted list of events and activities that LACI anticipated either hosting, co-hosting, or cross-promoting on behalf of its partners. This living document continued to evolve over time to adapt to the Project’s changing energy landscape and accommodate the REIC program’s shifts in priorities. Currently, LACI continues to keep record of an annual calendar that includes anticipated events, activities, and stakeholders that support key regional stakeholders as well as the needs of its cleantech entrepreneurs. In order to maintain an understanding of the magnitude of events and activities generated by the Project, LACI reported on a six-month basis the *Semi-Annual Calendar of Key LA REIC Activities*. This report lists events that were sent to the energy entrepreneurs within LACI’s Innovators Program as part of the monthly “startup resources” email or listed on LACI’s public events calendar.

One of the main ways LACI was able to share findings from the Project was through its annual Power Day Forum. The Forum was purposely developed to share knowledge and lessons learned with key stakeholders in the cleantech ecosystem and the general public. Over the past five years, LACI hosted four Power Day events, two in-person and two virtual due to the COVID-19 pandemic. Each year, the event brought together startups, policymakers, industry leaders, and advocates to discuss the latest advancements and barriers in the clean energy sector. The forum also served as a showcase for LACI’s startup companies in the Innovators Program and core Incubation Program, which is designated for pre-SEED and SEED stage startups, respectively. Innovators have had the opportunity to discuss their clean energy

technologies as well as share how the Program enabled them to advance their technological and business development.

## **Developed and Grew Funding Stream to Support the LA REIC**

From the beginning of the Project, LACI sought to identify and attain non-EPIC funding sources to support the Project beyond the grant period. In order for LACI to meet its goal, LACI continually sought out additional funding sources as well as encouraged its REIC grant partners to do the same. Over the past five years, LACI received over 23 funding awards related to clean energy innovation. Several of these grants were and are part of a larger effort by LACI to operate as a pilot catalyst for emerging energy and transportation companies, as well as to provide additional services and resources for historically underrepresented entrepreneurs. More information on the funding awards LACI was granted to support clean energy innovation can be found in Appendix A - Table A-1 LA REIC Funding Support.

# CHAPTER 3:

## Project Results

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This Project nearly met or exceeded most of the results it originally set out to meet in 2016. The table below compares the goals of the Project compared to the results over the five-year period. To summarize, the Project was able to make the following impact to the Region since 2016:

- 394 new green jobs
- 30 clean energy technology pilot deployments
- \$126 M in aggregated total revenue prior to joining LACI’s Innovators Program
- \$62 M in follow on funding from clean energy capital investments
- 220 referrals to other Incubators and Accelerators
- 130 cluster hosted events

**Table 3: LA REIC Key Performance Indicators - Proposed & Accomplished**

Metric	Proposed KPI + Benefits	Accomplished KPI + Benefit
# of Startup Cohorts	5 Cohorts	5 Cohorts
#new green jobs	400 new green jobs	394 new green jobs
# of clean energy technology pilots	15 clean energy technology pilots	45 Clean Energy Pilots 73 Cleantech Pilots
Total \$ in aggregated annual revenue from Cluster Member companies	\$70M in aggregated annual revenue from Cluster Member companies	\$172 M in aggregated annual revenue from Cluster Member companies*
Total \$ in clean energy capital investments through debt or equity instruments	\$80M in clean energy capital investments through debt or equity instruments	\$91.3M in clean energy capital investments through debt or equity instruments**
Return on investment	Range from 50:1 to 438:1	Ranging from 34:1 to 94:1 return on the investment***

\*\$124M in baseline funding and \$48M follow on funding

\*\* LACI Debt Fund and Incubation Program startups

\*\*\* 34:1 included the innovators and Incubation Program 94:1 Includes all LACI programs.

**This table provides information on the originally proposed key performance indicators that LACI set forth in 2016 and the associated performance metrics goals. The third column illustrates the actual performance of the program tasks and outputs over the five years.**

Source: LACI Internal Data

A comprehensive analysis of the social, environmental, and economic benefits from this Project are difficult to isolate and quantify over the past five years, but through data collection LACI can provide examples of calculated GHG emissions reductions, energy efficiency

advancements and other environmental benefits resulting from its startups' technologies to provide a sense of the greater environmental and ratepayer savings impact:

- **Blue Box Air** is a foam injection technology that makes it possible to penetrate a pH neutral, enzymatic foam through heating, ventilation, and air conditioning (HVAC) coils, restoring coils to their original design specifications and restoring a coil's heat transfer efficiencies. Blue Box can deliver efficiency improvements of commercial HVAC systems by up to 90 percent and result in cost reductions exceeding \$10,000 (per unit per year). In addition, Blue Box's unique ability to restore coils can eliminate capital expenditures of \$50,000+ (per unit). In 2018, Blue Box serviced over 50 million cubic feet per minute in air handler capacity, delivering an average pressure reduction (across the coils) of 50 percent, resulting in annualized energy costs savings of \$3,695,356 and removing an estimated 45,709,501 million lbs. of carbon dioxide (CO<sub>2</sub>).
- **Fil2R** sells sustainable water filtration solutions for at home use. One of their filter cases saves 7,200 plastic bottles, enabling customers to reduce their carbon footprint by 1,323 lbs. over four years. As of July 2021, Fil2R sold 500 filters and reduced consumers' carbon footprint by 650,000 lbs. CO<sub>2</sub>.
- **SimpliPhi Power** designs and manufactures a portfolio of efficient, non-toxic, and reliable energy storage and energy management systems that optimize and seamlessly integrate power from any generation source, on- or off-grid without any risk of overheating, thermal runaway, or fire. SimpliPhi Power's customers saved \$12,451,522 since beginning to deploy energy storage systems in 2010, offsetting 401,662 metric tons of CO<sub>2</sub>.
- **Swell Energy** – Swell Energy is a distributed energy resources platform, providing a one-stop shop that makes it easy to buy and install batteries from global manufacturers. Swell Energy's residential storage and paired solar photovoltaic (PV) systems reduce customer energy costs by 20 percent or more. Swell Energy's pipeline of 35 megawatt hours (MWh) of residential storage and paired solar PV provides clean energy and demand reduction and offsets the use of traditional fossil fuel resources. Notably, Swell Energy partnered with Southern California Edison (SCE) to deploy virtual power plants in Orange, Santa Barbara, and Ventura Counties to improve grid reliability, while offsetting fossil fuel. One of Swell Energy's projects was deployed in response to Senate Bill 801 (Dodd 2019) which directed SCE to deploy energy storage to help regions affected by the partial shutdown of the Aliso Canyon Natural Gas Storage Facility.
- **Xeal Energy** - Xeal Energy is the first electric vehicle charging company to develop an offline electric vehicle charging solution. Customers make \$1,000 in profit per charger annually because of their energy efficiency technology, which leads to six tons of CO<sub>2</sub> reductions per charger annually. With a target of 8,000 electric vehicle chargers on Xeal Energy's platform in 2021, Xeal Energy offset over 48,000 tons of CO<sub>2</sub> per year.
- **TBM Designs** - Using no energy to save energy, InVert™ Self-Shading Windows incorporate smart materials to automatically block solar heat from entering the building, reduce air conditioning energy use, and increase human wellness, with a 15 percent

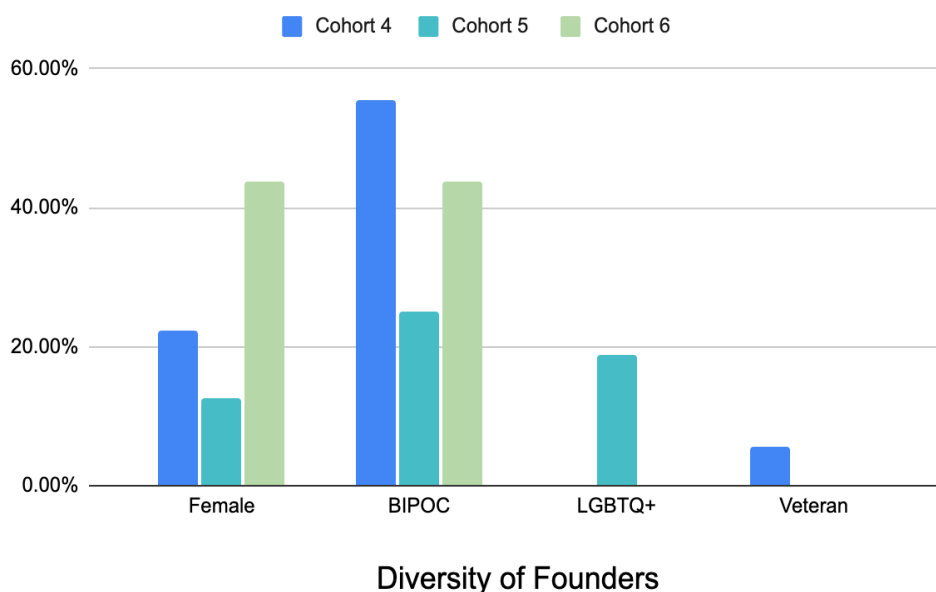


reduction of air conditioner use in buildings. Quantifying this number, a 12-story build clad with InVert will save 360 metric tons in one year.

## Underrepresented Communities - Incorporating Diversity, Equity, and Inclusion

Since 2016, LACI took serious steps to integrate practices and goals that value and represent diversity, equity, and inclusion in its organization to ensure the Project meets its mission of creating an inclusive green economy. As part of this Project, LACI set targets to increase the diversity of its startup founders in the Innovators Program. For a comprehensive view of LACI's diversity in all of its startup programs – including Incubation and Market Access – LACI increased startup diversity with a 24 percent increase in its women founders and 45 percent growth in its support of underrepresented people of color founders. In fall 2019, LACI updated its recruitment processes to collect information on startups related to demographic diversity. These statistics can be seen below in Figure 4. LACI continues to build its network – identifying and connecting with founders from diverse and underrepresented backgrounds – to ensure all communities have access to entrepreneurial resources, can participate in service opportunities, and benefit from cleantech industry advancements.

**Figure 4: Diversity of Cleantech startup founder from 2019-2022**



**This chart shows diversity information related to LACI's Innovators Program from 2019 through 2022**

Source: LACI internal data

## Innovators Graduating to LACI's Incubation Programs

After two startup cohorts of Innovators, LACI saw the need to provide startups with more hands-on services as LACI sought to overcome challenges to commercialize and deploy technologies. In 2019, LACI launched its two-year Incubation Program (See Table 4), which offers hands-on incubation services to support pre-SEED and SEED stage cleantech startups'

growth in Southern California. The first six months of the program are dedicated to intensive curriculum workshops, one-on-one sessions, and roundtables focused on Market and Investor Readiness. After the initial six-month period, the program focuses on achieving the objectives outlined in a custom roadmap around fundraising, product development, market access, team growth, and partnerships. In this period, startups are also provided access to up to \$20,000 each in funding for small-scale pilot deployments to demonstrate their technology solutions in California.

**Table 4: LA REIC Funding Support Leveraged 2016-2021**

Founders Business Accelerator	Innovators Program	Incubation Program	Market Access Program
Businesses with Impact	Energy, Transportation & Circular Economy	Energy, Transportation & Circular Economy	Energy & Transportation
Accelerator for small businesses in the city of LA focused on economic development and impact	Light-touch network access program to plug early-stage cleantech entrepreneurs into California ecosystem	Hands-on program for support cleantech startups in Southern California through market access and business services	Pilot and investor focused program to scale cleantech companies in Southern California through large scale pilots & partnerships
10-week	12-month	2-year	1 to 2- year
Small Business	Pre-prototype	Pre-Seed & Seed	Series A+

**This table outlines the LACI’s various startup entrepreneur programs including its cleantech programs as well as its Small Business program.**

Source: LACI

With the pilot demonstration, startups are subject to an approved and rigorous planning process, including sound contingency planning, ability to complete and support the defined project, defined learning objectives, and sufficient funding. The second Program, Market Access, launched in 2020, was designed specifically to help companies de-risk technology deployment through coordination with LACI staff and community partners, provide proof points and market traction, enable companies to scale operations, enter new markets, and serve overburdened communities. Since 2020, LACI launched five pilots with community partners and Market Access companies. Although these two programs were not part of the Project, they were in large part developed because of the support LACI received through the EPIC REIC award. Since 2019, the Project already saw nine companies from the Innovators Program transition to the other Incubation Programs.

**Acquired Startup Companies and Commercialization Implications**

Over the past five years, LACI graduated a significant number of startup companies. A number of those Alumni matured and fully commercialized - including Swell Energy and Freewire

Technologies. Additionally, some of those alumni were acquired after successfully scaling their business.

- **Ampaire announced acquisition by Surf Air for \$100M** (February 2021 and April 2022) – Surf Air Mobility, a platform for regional air travel, announced their agreement to acquire hybrid electric aviation technology pioneer Ampaire. The addition of Ampaire's proprietary hybrid electric powertrain technology is a critical component in Surf Air Mobility's plans to dramatically improve the affordability, accessibility, and environmental footprint of aviation, beginning with regional travel. In a statement from April 2022, Ampaire said it decided to “move forward as an independent company” as it prioritizes efforts to bring hybrid-electric versions of the Cessna Grand Caravan to market.
- **Homeboy Electronics and Recycling, formerly Isidore, acquired by Homeboy** (Feb 2017) – Nonprofit Homeboy Industries acquired Los Angeles-based Isidore Electronics Recycling, which is now dubbed Homeboy Recycling Powered by Isidore. The deal closed in November and was financed entirely by donations. Isidore Electronics Recycling will be staffed by former inmates going through Homeboy’s 18-month training program, which includes counseling, tattoo removal, and other services.
- **SimpliPhi acquired by Briggs & Stratton** (September 2021) – Briggs & Stratton announced it acquired SimpliPhi Power, a California-based manufacturer of energy storage and management systems that store solar, grid and wind power for future use by residential, commercial, and industrial customers. Through this acquisition, Briggs & Stratton will accelerate its growth into the energy storage system market, expanding the business to offer a comprehensive range of products that provide safe, reliable, and affordable energy solutions to a broader group of customers.
- **AMPLY Power Acquired by BP** (December 2021) – BP, in its efforts to electrify in the US, acquired AMPLY Power, an electric vehicle charging and energy management provider for fleets that operate trucks, transit, school buses, vans and light-duty vehicles. This investment is aligned with BP’s plan to scale-up next generation mobility solutions, providing a convenient network of charging and digital solutions for customers, including drivers and fleet operators. Under the terms of the agreement, AMPLY Power will continue to operate independently as part of BP’s global portfolio of businesses under the name bp pulse fleet.

# CHAPTER 4:

## Technology/Knowledge/Market Transfer Activities

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### Network and Knowledge Transfer Activities

As mentioned in Chapter 3, LACI hosts an annual energy conference to promote its key learnings to the broad ecosystem and provide an opportunity for its cleantech startups to showcase their technologies. In building on the LA REIC Project through the additional follow-on funding award, LACI continues to disseminate best practices, technical expertise, market insights and dynamic initiative models to the clean energy ecosystem to ensure that other incubators and organizations can support the work needed to create an inclusive green economy.

The Los Angeles Cleantech Incubator is uniquely positioned in the Southern California Clean Energy Ecosystem. LACI's organizational model works to unlock innovation in the cleantech space through its startup programs, bolster market transformation through policy advocacy, partnership development and pilot deployment, and enhance communities by bridging workforce development with emerging cleantech opportunities and supporting the inclusion of underrepresented individuals in the clean energy transition. In working to scope, strategize and implement programs that support this mission, LACI established a few recurring programs and thought leadership events that served as a model to the clean energy ecosystem. Below are some examples of how LACI supported partners in the ecosystem by disseminating existing program and initiative models or inviting external stakeholders to its exclusive events:

- **Specialized corporate partnership and potential customer events:** To support market adoption, LACI provides its partners with opportunities to learn about its cleantech startups and their technologies through a number of different events and exposure opportunities. Throughout the year, LACI hosts introductory events with its corporate or utility partners with the goal of helping those organizations understand the technologies of LACI startups and provide the startups with an opportunity to engage with a potential customer or partner. These events enable public, private, and philanthropic agencies to gain insights into LACI's initiatives and program advancements for its startups.

On occasion, these meetings result in follow up discussions related to a specific technology solution, collaborative convenings, or a potential demonstration opportunity. These connections help to catalyze and strengthen the innovation ecosystem by amplifying and building upon regional achievements.

- **Investor Talks:** Every two weeks, the LACI Investments Team hosts investors from different sectors to share tips on fundraising. This model provides an additional opportunity for entrepreneurs to gain access to investor operational practices and expectations. These Talks were a direct result of the COVID-19

pandemic. LACI wanted to ensure founders still had the opportunity to intimately connect with investors. LACI extended invitations to these events to other REIC clusters two to three times a year. This extension of offering this private event to external partners enables LACI to support connections for startups throughout the state.

- **Women in Cleantech:** LACI's Women in Cleantech (WICT) program started in 2016 with the goal of elevating female founders in the cleantech space. Since its inaugural year, the program helped support over 70 women founders in Southern California. In the spirit of elevating female entrepreneurs throughout the state and nationally, LACI's WICT steering committee formed relationships with other incubators and accelerators to elevate female founders in their ecosystems. LACI supported disseminating its female founder inclusion and community building model with these groups and works to collaborate with those partners on an annual or biannual basis. Lastly, WICT continues to invite those external partners to participate in LACI hosted WICT events as well as its due diligence process for onboarding new founders.
  - **Rocket Fund:** LACI and the Caltech Rocket Fund have had a longstanding relationship even prior to the LA REIC. In recent years, The Rocket Fund communicated a desire to diversify its candidate base and identify opportunities to expand its recruitment efforts to attract more women and underrepresented founders. In working to do so, LACI's WICT staff met with the Rocket Fund to discuss best practices and recruitment tips to establish a base metric and work to create realistic targets to achieve those desired outcomes. Since this inquiry, LACI worked to further include the Rocket Fund as well as New Energy Nexus in all of its WICT events. The Rocket Fund continues to attend and support WICT as it works to strategize its female founder recruitment efforts.
  - **Blue Tech Valley:** LACI and Blue Tech Valley (BTV) have also grown closer over the last few years related to female founder recruiting. While the number of women in cleantech is a slow growing number, those in cleantech and the agriculture sector can be quite limited. For that reason, BTV reached out to LACI to learn more about its WICT Program and determine how they could replicate a similar model in the Central Valley REIC.
- **Cleantech Market Research Reports:** LACI annually conducts two research exercises to better understand the landscape of the clean technology industry. LACI gathers and tracks papers, articles, announcements, and policies (proposed and passed) that support cleantech commercialization, create market signals or provide insights on the current and future state of the industry. The Cleantech Market Landscape report analyzes the past year's events related to three topic areas - policies, business models, and emerging technology – to gauge and understand what the priorities should be for the following year. Based on this exercise and these activities, LACI publishes its cleantech priorities for the next year related to zero emissions transportation, clean energy, and sustainable cities with a focus on a circular economy. These priorities are then made available to the public and support LACI's recruitment efforts with the aim of

identifying startups that support the technology needs, business models, or policy objectives recognized in the prior year.

Dovetailing that report, LACI's Market Transformation Team works to then determine what the gaps and opportunities are that exist within the cleantech market landscape locally in its Cleantech Gaps & Opportunities Report. The report focuses on Los Angeles County, Southern California, and California to highlight local activities, opportunities and challenges that support the priorities identified in the cleantech market landscape report through policy, pilot demonstrations, as well as partnership opportunities. Moreover, the report illustrates how LACI's portfolio companies, partnerships and local stakeholders may be able to address existing challenges.

Both reports are made available to the public and provide an educational primer as well as investor thesis on the current state of the cleantech industry from a global, national, and local perspective. Additionally, the reports support local government understanding of what policies, programs, and initiatives can complement their efforts to meet their state goals.

- **Debt Fund Research and Development with Cleantech San Diego:** In April 2021, the Southern California Energy Innovation Network (SCEIN) inquired about the creation of an impact-oriented accelerator/incubator fund and was working to conduct research through a student-led capstone that would identify best practices for impact fund design and implementation. Because of LACI's successful development and launch of its Impact fund, SCEIN connected with LACI's investments team to support the team's research on best practices for designing, implementing, and sustaining an impact fund. The LACI Debt Fund provides loans from \$20,000 - \$50,000 with interest rates at or below market for LACI companies in the Incubation or Market Access Programs, with the goal of de-risking and increasing available working capital for clean energy startups. LACI worked to meet with the student team and Cleantech San Diego to support their end goal of developing a small investment fund to invest in the startups in the SCEIN program. In fall of 2021, SCEIN announced that they were preparing to launch their own incubator fund to support their startups with equity funding.
- **LACI Power Day:** Another way that LACI supports market adoption is through its Annual Forum, *LACI Power Day*. Power Day is an annual celebration of the regional ecosystem accomplishments and provides startups with an opportunity to showcase their technology thought pitches and host panels on challenges faced by stakeholders in the region. This event provides an opportunity to gather stakeholders in the region and engage in conversations on how to bridge gaps in the ecosystem and inform other organizations and agencies about resources, projects, and activities supporting clean energy technology adoption in the region. The showcase provides a dual opportunity: 1) for our startups to be exposed to potential customers, investors, and government agencies and 2) allows the clean energy ecosystem to network and learn about emerging technologies, best practices, and projects in Southern California. Lastly, activities and touch points leading up to Power Day result in follow up conversations on how best to address issues impacting the industry.

- **Social Media & Newsletters:** LACI regularly publishes and promotes events, activities, and news related to the advancement of its cleantech initiatives and those of its portfolio companies on its social media accounts and newsletter platform. These resources enable LACI's internal and external audiences to stay abreast of the latest happenings in the Clean Energy Innovation Ecosystem. In addition, these outlets enable LACI to communicate about its recent report findings, latest cleantech startup companies, and special events and accomplishments.

## **CHAPTER 5:**

# **Conclusions/Recommendations**

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Since 2016, LACI's understanding of entrepreneurs' needs significantly changed. While it is still critical to connect the region and entrepreneurs to accelerate the commercialization and adoption of clean energy technologies, LACI recognized there is now an even greater need to provide direct financial and technology validation support.

The Innovators Program began accepting applications in May 2017, after the formal launch of the Project. Moving to March 2022, over 145 companies applied to the Innovators Program – eight of which were accepted into Cohort 1, seven for Cohort 2, nine for Cohort 3, eighteen for Cohort 4, sixteen for Cohort 5, and thirteen for Cohort 6, for a total of seventy-one startups. During this time period, LACI refined its intake process by analyzing year-over-year reports to further understand its recruitment activities and its yield of accepted startup founders related to their geographic, technological, financial, and commercialization characteristics. Additionally, the organization utilized its quarterly and exit interview feedback touchpoints to continually improve the Innovators program, its business support services, network connection opportunities, and its recruitment activities. The goal of these activities was to ensure that each cohort contained comprehensive cleantech startup solutions that could tackle challenges and barriers to achieving the state's clean energy goals.

Over the Project's period, LACI learned about what specific needs and niche services regional entrepreneurs needed and identified the short- and long-term energy priorities and challenges of the region. These findings enabled LACI to establish three formalized cleantech entrepreneur programs, support LADWP's LA100 study while developing the Southern California Regional Energy Needs Report, launch multiple pilots and initiatives to empower underrepresented entrepreneurs, and establish partnerships that support LACI's mission as well as the clean energy goals of local and state agencies.

## **Recommendations and Key Learnings**

To continue to support cleantech entrepreneurship in the Greater Los Angeles region, LACI recommends a number of activities and enhancements that will ensure that startups have optimal pathways to support their business development.

### **Supporting Startups by Stage and Experience**

Startup founders come to LACI at various funding stages, total readiness levels, and professional experiences with running, building, or exiting a business. Because of these broad inconsistencies from company to company and founder to founder, many startups need unique business support services. The best solution identified over the past five years was a model for multi-tiered startup programming that is essential for diverse founders. Over this same time period, LACI developed and expanded its incubation programs, adding Incubation and Market Access, which add to LACI's various levels of curated programming and support to its portfolio of entrepreneurs based on their development stage as well as their business objectives.



## **Resources & Financial Capital for Business Development**

A myriad of resources is critical to supporting entrepreneurs in their research, development, and journey to commercialization. In addition to tangible resources, access to peers, customers, investors, and utility or corporate partners is crucial to ensuring startups are able to build a customer and investor base that can help drive their product validation and strengthen their use cases to bridge one of the many “valleys of death” faced by startups.

In addition, demonstration opportunities are essential to help startups mature and move swiftly from pre-SEED to early-stage venture capital funding status. Without clear, measurable, and innovative demonstration pilots, it is difficult for startups to convey and communicate how their product’s value proposition makes a difference beyond proof-of-concept. After determining this recommendation was needed, LACI worked to not only develop but advance its pilot program to ensure its Incubation and Market access startups are able to deploy their technology for proof of validation.

Funding resources and prizes are also essential for startup capacity and development. Alternative funding can help startups complete a prototype’s development, validation, and support employment growth as well as manufacturer costs to scale. While some of those funding needs can be cumbersome, many startups need access to small amounts of capital while they work to move into a SEED or series A funding status where they can attract more investors to scale.

## **Prioritizing Diverse and Underrepresented Founders**

Fostering environmental, social and governance and diversity, equity and inclusion best practices with founders is another core recommendation from this Project. It is invaluable for startups to establish a foundational understanding of best practices related to how they can improve diversity, equity and inclusion in their workforces and customer base that are necessary to make meaningful social and economic progress, not only in the industry, but within the places they operate in Southern California. This knowledge and insight supported place-based recruitment, training and employment in the City of Los Angeles and spurred business growth in the greater Los Angeles region – including the employment of individuals who were unemployed or underemployed, workforce training programs and intentionally recruiting and deploying clean technologies in “disadvantaged” or underserved communities.

To support underrepresented founders and actively work to recruit and retain diverse founders, LACI launched two programs - Women in Cleantech and the Equity Innovation Program - leveraging new funding to complement the foundational activities of the LA REIC.

- The WICT Program works to empower women and influence institutional change. Since the program was launched in 2016, it hosted over 25 events, with nearly 2,000 participants, and supported over 70 LACI women founded companies to accelerate their entrepreneurial journey and impact.
- The Equity Innovation Program provides supplementary assistance to traditionally underrepresented and underserved founders of LACI’s Innovators, Incubation and Market Access programs. This strategic support provides these teams with additional

time for coaching and mentorship with Executives in Residence, extra curriculum tailored to obtaining capital for growth, and access to increased business support services.

## **Moving Forward**

As LACI prepares for the next five years, the organization plans to continue to support clean energy entrepreneurs and will continue to provide curriculum, guidance, business support services, and network connection opportunities in the region.

The goal and vision of this Project continues to be rooted in supporting and accelerating the commercialization of clean energy technologies and will now include components that leverage LACI's Clean Energy Program to support actionable efforts in the Southern California region and incorporate all of its Cleantech Startup Programs. To ensure this, LACI set up associated products and tasks to support these efforts in its follow-on funding proposal.

# CHAPTER 6:

## Benefits to Ratepayers

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The long-term objective of the Regional Energy Innovation Clusters Grant is to provide ratepayer benefits for Californians, as well as support the state's ability to achieve its energy and climate resiliency goals. For that reason, it is imperative that clean energy entrepreneurs are able to identify and measure their technologies' positive impacts for ratepayers. Through LACI's Innovators programming, LACI directs its startups to measure, quantify, report, and promote the ratepayer benefits they provide or will be able to provide once their technology is fully commercialized.

To support this endeavor, in 2021 LACI started to provide innovators with a curriculum that focused on measuring impact and business, centered on environmental, social, and economic factors. LACI created resource documents that provide startups with tools to calculate and quantify their sustainability and clean energy impacts. These documents ensure consistency as the curriculum also supports LACI's Equity Earn Back Program for its Incubation and Market Access companies, where it tasks its startups with establishing a baseline for impact and enables the startups to earn back equity based off of their growth and improvement in those three areas.

### Key Ratepayer Benefits

The Project supported the commercialization of clean energy solutions that have and continue to provide direct and indirect benefits to ratepayers across the state. These technologies will support reduced ratepayer costs over the useful life of the product or service. Examples of these benefits can be seen below in the impact and advancements to commercialization LACI's startups have made over the past five years:

- **FreeWire Technologies** delivers clean, quiet mobile power and fast charging that is readily available and easy to deploy. In FreeWire's most recent estimate about the impact of its products, the company estimates a savings of 21.4 metric tons of CO<sub>2</sub> avoided over a one-year period. Quantifying that, LACI believes that FreeWire's technology will help avoid 107 metric tons of CO<sub>2</sub> over the next five years. Based on the \$50 social cost of carbon, this translates to \$5,350 (Committee, 2017). This is a very conservative estimate as FreeWire has recently scaled their operations with partnerships and developed its Boost Charger, which delivers fast charging up to 120-kilowatt output, while minimizing stress on the grid with the help of a built-in 160-kilowatt-hour battery.
- **Envoy Technologies** provides an electric vehicle car-sharing platform and "mobility as a resource" to communities. The company's technology provides benefits to ratepayers by reducing electricity demand, GHG emissions, and vehicle congestion through a decrease in the number of vehicles on the road and the need for car ownership. Envoy customers save about \$500 a month by using Envoy instead of owning a vehicle. Envoy

achieved 1.2 million electric miles in June 2020. As every mile traveled by internal combustion engine vehicles generates 411 g CO<sub>2</sub> per mile, it's estimated that this milestone resulted in a reduction of 543 Tons of CO<sub>2</sub> over that time period. With electric vehicles on the rise, LACI expects the number of rides provided by Envoy to double, resulting in over 1,000 tons of CO<sub>2</sub> emissions no longer being generated as a result of electric vehicle use (translating to \$250,000 monetary savings over five years for ratepayers) (Committee, 2017).

- The **ChargerHelp!** application eliminates the high cost of station downtime by enabling on-demand repair of electric vehicle charging stations. The company's technology leverages the local Certified Technician workforce to meet the real-time demand of electric vehicle Charging station providers and reduces the overall cost of the maintenance by 35 percent. This benefits ratepayers by ensuring that access to electric vehicle chargers is minimally interrupted by station outages. California residents enjoy increased confidence in electric vehicle ownership, reduced barriers to entry, lower maintenance costs and greater economic mobility within all communities. On average, the cost of annual electric vehicle maintenance for a single station is \$300, and the cost of servicing a down electric vehicle charging station can vary depending on the issue (Property Management Insider, n.d.). Over the next four years, ChargerHelp! estimates the electric vehicle supply equipment industry will miss out on \$3-5M in new sales due to offline and down chargers. ChargerHelp!'s technology application, servicing, and expansion has the potential to reduce the economic burden of electric vehicle Charging downtime.
- **Electrum (Formerly Pick My Solar)** provides a residential solar marketplace that connects homeowners with installers to reduce rooftop solar acquisition costs. Through LACI's Incubation Program, Electrum doubled revenues year over year, and raised substantial capital from early-stage investors and leading strategic partners. Recently, the startup rebranded as Electrum to reflect its expanded product offerings, which include energy storage, hybrid electric water heaters, electric vehicle charging stations and electrified HVAC. This expanded service will accelerate and facilitate the adoption of additional electrification products to further reduce GHG emissions and particulate matter for California ratepayers. In 2018, Electrum's installment of a 150-kW solar array was projected to offset 28,959 lbs. of CO<sub>2</sub> per month. Overall, the company estimates they have avoided 107,644 lbs. of carbon resulting from the installation of a 556-kW array. Based on this current estimate, Electrum will, at minimum, avoid 538,220 lbs. (\$12,200 in monetary savings) over the next five years. This is a very conservative estimate as the startup will be selling four additional electric products on its marketplace.

These are just a few of the numerous examples of how the Project worked to support clean energy entrepreneurs and technology in Southern California that provide tangible and intangible benefits to California ratepayers.

## **Achieving the State's Energy Goals and Combating Climate Change**

In an effort to support the state achieving its climate goals, LACI continues to provide critical programming for cleantech entrepreneurs to spur innovation, drive the commercialization of clean energy technologies, and provide ratepayer benefits to Californians.

The achievements of the Los Angeles region over the last five years can be seen in the metrics listed under the report results – from the number graduated startups and total number of cohorts to the number of jobs created and pilots deployed. It is clear that the LA Cluster continues to support and center startups in a position to thrive in their entrepreneurial journey and accomplish their unique short-term goals to position them for further success. Moreover, its startups have the opportunity to continue to work with LACI, the local cleantech network, as well as the Statewide Clean Energy Innovation Ecosystem to advance their opportunities to participate in different programs, receive follow-on funding, and identify customer and investor connection that support a catalytic return on the state's investment through the EPIC program.

As LACI moves into the next five years of this program, it is excited to expand its programmatic offerings and support early-stage companies under the Regional Energy Innovation Clusters Grant and continue its work to support, elevate and educate clean technology entrepreneurs in Southern California.

## GLOSSARY AND LIST OF ACRONYMS

Term	Definition
BTV	Blue Tech Valley
CalSEED	California Sustainable Energy Entrepreneur Development Initiative
CEC-SB	Community Environmental Council Santa Barbara
CHP Prime	Combined Heat and Power Prime
CO <sub>2</sub>	Carbon Dioxide
CSU	California State University
CSU5	California State University 5
CSUN	Cal State University Northridge
DAC	Disadvantaged Communities
DEI	Diversity, Equity, and Inclusion
EPIC	Electric Program Investment Charge
ESG	Environmental Social Governance
EV	Electric Vehicle
EVSE	Electric Vehicle Supply equipment
GHG	Greenhouse Gas Emissions
GIS	Geographical Information System
HVAC	Heating Ventilation and Air Conditioning
IOU	Investor-Owned Utilities
LA	Los Angeles
LA REIC	Los Angeles Regional Energy Innovation Cluster
LACI	Los Angeles Cleantech Incubator
REIC	Regional Energy Innovation Clusters
SCE	Southern California Edison
SCEIN	Southern California Energy Innovation Network - Cleantech San Diego
SEED	Social Entrepreneurs for Economic Development (SEED)
SoCalREN	Southern California Regional Energy Network
TAC	Technical Advisory Committee
TRL	Technology Readiness Level
UCLA	University of California, Los Angeles
WICT	Women in Cleantech

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**CALIFORNIA  
ENERGY COMMISSION**



**ENERGY RESEARCH AND DEVELOPMENT DIVISION**

# **Appendix A: Additional Tables and Figures**

**April 2024 | CEC-500-2024-033**





# APPENDIX A:

## Additional Tables and Figures

**Table A-1: LA REIC Funding Support**

<b>LA REIC Funding Support Leveraged 2016-2021</b>		
<b>Los Angeles Department of Water and Power</b> \$150,000 Awarded in September 2017	<b>State Water Resources Control Board</b> \$2,331,165 Awarded in August 2016 CSU WRPI Award	<b>Santa Ana Watershed Project Authority</b> \$1,290,500 Awarded in June 2017 CSU WRPI Award
<b>Knight Foundation</b> \$1,005,000 Awarded October 2018	<b>Strategic Growth Council - Transformative Climate Communities</b> \$440,000 Awarded January 2018	<b>California Workforce Development Board</b> \$2,000,000 Allocated June 2018
<b>LA County EV Blueprint</b> \$50,000 Awarded February 2018	<b>California Energy Commission - Ventura County EV Ready Blueprint</b> ~\$273,000 Effective Date: June 2018 Ventura County Regional Energy Alliance and Sub Community Environmental Council award	<b>California Energy Commission (CEC)</b> ~\$410,000 Effective Date: October 2017 Ventura County Regional Energy Alliance & Sub Community Environmental Council Award
<b>Small Business Association Growth Accelerator Fund</b> \$50,000 Awarded September 2019	<b>California Governor's Office of Business and Economic Development (GO-Biz)</b> \$2,000,000 Awarded August 2019	<b>Wells Fargo Foundation: Innovations in Housing</b> \$50,000 Awarded August 2019
<b>PG&amp;E Better Together Giving Program</b> \$20,000 Awarded in May 2019	<b>American Made EPIC Challenge - Department of Energy Office of Technology Transitions</b> \$50,000 Awarded in September 2020	<b>Wells Fargo/NREL's IN2 Channel Partners Award</b> \$50,000 Awarded in May 2020
<b>Clean Mobility Options (CMO) - Community Transportation Needs Assessment</b> Awarded in total \$50,000; Awarded to LACI Startups -\$1,000 Awarded in September 2020	<b>DOE Energy Program for Innovation Clusters (EPIC) American Made Challenge Award</b> \$50,000 Awarded in December 2020	<b>Wells Fargo IN2 Event Sponsorship Award</b> \$5,000 Awarded in January 2021
<b>CARB CMO Grant</b> \$926,000 Awarded in March 2021	<b>BESTFIT Innovative Charging Solutions</b> \$116,000 Awarded in April 2021	<b>DoE OTT Energy Program for Innovation Clusters (EPIC) Funding</b> - \$1,000,000 Awarded in June 2021
<b>State Budget Allocation</b> \$10,000,000 Awarded in July 2021	<b>DOE's Office of Energy Efficiency and Renewable Energy (EERE) Vehicles Technology Office (VTO)</b> \$3,798,455 (Pending) Awarded in July 2021	

**Table A-2: LA REIC Funding Support Leveraged 2016-2021**

Founders Business Accelerator	Innovators Program	Incubation Program	Market Access Program
Businesses with Impact	Energy, Transportation & Circular Economy	Energy, Transportation & Circular Economy	Energy & Transportation
Accelerator for small businesses in the city of LA focused on economic development and impact	Light-touch network access program to plug early-stage cleantech entrepreneurs into California ecosystem	Hands-on program for support cleantech startups in Southern California through market access and business services	Pilot and investor focused program to scale cleantech companies in Southern California through large scale pilots & partnerships
10-week	12-month	2-year	1 to 2- year
Small Business	Pre-prototype	Pre-Seed & Seed	Series A+

**This table outlines the LACI’s various startup entrepreneur programs including its cleantech programs as well as its Small Business program.**

Source: LACI



**CALIFORNIA  
ENERGY COMMISSION**



**ENERGY RESEARCH AND DEVELOPMENT DIVISION**

# **Appendix B: Acknowledgments of Contributing Organizations & Staff**

**April 2024 | CEC-500-2024-033**



# APPENDIX B: Acknowledgments of Contributing Organizations & Staff

REIC Project Partners	LACI Staff
<ul style="list-style-type: none"> <li>• California Energy Commission</li> <li>• California Institute of Technology, First Look West</li> <li>• California State Polytechnic University, Pomona</li> <li>• California State University, Channel Islands – Host of Ventura County Hub</li> <li>• California State University, Dominguez Hills</li> <li>• California State University, Long Beach</li> <li>• California State University, Los Angeles</li> <li>• California State University, Northridge</li> <li>• California State University, Water Resources Policy Institute</li> <li>• Cleantech Open, Western Region</li> <li>• Community Environmental Council – Host of Santa Barbara Hub</li> <li>• Los Angeles Business Technology Center</li> <li>• Los Angeles Economic Development Corporation</li> <li>• Los Angeles County</li> <li>• Southern California Edison</li> <li>• Sustain Southern California – Host of Orange County Hub</li> <li>• UCLA Luskin Center for Innovation</li> </ul>	<p>Current Staff</p> <ul style="list-style-type: none"> <li>• Matt Petersen</li> <li>• Amanda Sabicer</li> <li>• Alex Mitchell</li> <li>• Mayte Sanchez</li> <li>• Lauren Harper</li> <li>• Shawn Taylor</li> <li>• Ben Stilp</li> <li>• Michelle Kinman</li> <li>• Jack Symington</li> </ul> <p>Former Staff</p> <ul style="list-style-type: none"> <li>• Neil Anderson</li> <li>• Grace Broyles</li> <li>• Debarshi Das</li> <li>• Kelly Schmandt Ferguson</li> <li>• Georgina Walker</li> <li>• Zac Pettit</li> <li>• Janine Elliott</li> <li>• Shannon Wright</li> <li>• Darien Siguenza</li> <li>• Paul Ulukpo</li> </ul> <ul style="list-style-type: none"> <li>• Shevonne Sua</li> <li>• Molly Crete</li> <li>• Clare Le</li> <li>• Vince Vicari</li> <li>• Forrest Lee</li> <li>• Jesse Clarke</li> <li>• Brenda Solorio</li> <li>• Yuri Bourgeois</li> </ul> <ul style="list-style-type: none"> <li>• Melissa Flores</li> <li>• Todd Hitomi</li> <li>• Aayushi Jain</li> <li>• Jose Hernandez</li> <li>• Emily Bjorklund Drake</li> <li>• Bob Musselman</li> <li>• Taj Eldridge</li> <li>• Keiko Cadby</li> <li>• Meg Arnold</li> <li>• Lindsey-Paige McCloy</li> </ul>