AB 118 Regional Industry Clusters of Opportunity

ADVANCED TRANSPORTATION DIAGNOSTIC PACKAGE

Orange and Los Angeles Counties

September 2013

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INTRODUCTION

Transportation is a vital part of the California economy, connecting businesses and communities across the state with highways, railways, shipping, and aviation routes. This vast transportation network also takes a tremendous amount of energy to run, most of which comes from petroleum. Burning this fuel creates air pollution such as particulates, air toxics and smog, contributing to air quality problems in many California regions.

Given the impact of the transportation sector, California state and local policymakers have implemented a number of laws and programs for more efficient, renewable, and innovative transportation fuels and vehicles. The California Alternative and Renewable Fuel, Vehicle Technology, Clean Air, and Carbon Reduction Act of 2007 (Assembly Bill (AB) 118) is an important part of California's transportation strategy. AB 118 created the Alternative and Renewable Fuel and Vehicle Technology Program in the California Energy Commission (The Commission) to fund projects to develop and deploy innovative technologies that transform the state's fuel and vehicle types to help attain the California's climate goals.

The California Workforce Investment Board and the Commission, working in coordination with the California Labor and Workforce Development Agency, is funding this AB 118 Regional Industry Clusters of Opportunity (RICO) grant program to develop and implement strategies to advance regional economies and workforce in targeted alternative fuel and vehicle clusters.

Transportation fuels are the leading source of greenhouse emissions in California, accounting for 38 percent California's total greenhouse gas emissions.

RICO OVERVIEW

This Diagnostic Package is a part of the first of four stages in the RICO process. Below is an overview of the entire RICO process for your reference. These dates offer a general guide to the timing, but are flexible. The stages listed are excerpts from the RFP; please consult the original RFP for details.

STAGE 1
Clusters of Opportunity Diagnosis
July-September 2013

Collaborative Economics and the regional team work together to develop a regional diagnostic package of relevant research and analyses, to increase understanding of the region's economic and workforce opportunities in the alternative fuels and vehicles cluster

Action Clinic #1 in Sacramento - September 2013

STAGE 2
Collaborative Priority-Setting
October 2013-March 2014

Regional teams design and implement a collaborative cluster engagement process, in which they identify, invite, and host employers in cluster meetings to develop the Industry Sector Partnership. Meetings are designed to elicit (1) priority opportunities for cluster growth, (2) priority requirements to capitalize on those opportunities (both workforce and economic development related), and (3) employer "champions" who will work with community partners to design and implement a cluster investment strategy and sustainability plan.

Action Clinic #2 in Sacramento - January 2014
Site Visits by Technical Assistance team - #1 November 2013 and #2 March 2014 (or as needed)

STAGE 3
Clusters of Opportunity Investment Strategy
April-July 2014

The Industry Sector Partnership will identify and connect specific investments and commitments of local, state, and federal government partners, as well as private firms, industry associations, non-profit partners, private foundation partners, and others to advance the competitive position of regionally targeted clusters of opportunity. This activity should produce a cluster investment strategy with specific organizational commitments and champions organized around shared cluster priorities, which should be aligned with regional resources to form career pathways in alternative fuel and vehicle technology industries.

Action Clinic #3 in Sacramento - May 2014
Site Visits #3 by Technical Assistance team if needed

STAGE 4
Sustainable Implementation
August-December 2014

The Industry Sector Partnership will develop the support for long-term sustainability and growth, which should produce a set of broader organizational and policy changes to sustain and expand regional cluster of opportunity strategies, as well as a lasting mechanism to support ongoing collaboration among all the partners. Regional teams will produce an action plan, including a cluster investment strategy and sustainability plan, to be approved by the State Board. Regions are expected to begin implementation before the grant period ends on December 31, 2014.

Showcase Event in Sacramento - September 2014

HOW TO USE THE DIAGNOSTIC PACKAGE

The goal of the RICO process is to develop and implement alternative and renewable fuel and vehicle (ARFV) regional clusters of opportunity strategies, mobilizing employers and regional partners to advance the competitive position of targeted clusters. This RICO initiative is a structured process that supports Regional Economic and Workforce Development Networks. These Networks consist of economic and workforce development practitioners and industry, forming Industry Sector Partnerships and developing action plans to support and advance targeted industry clusters. Regions are focusing on one or more established and/or emerging clusters of opportunity in the alternative fuel and vehicle transportation sector.

This Diagnostic Package is designed to provide data to illustrate regional progress, strengths, and emerging opportunities in a range of AB 118 areas. The data, along with your personal knowledge and experience of activities and priorities in the region, and other resources from your region if available, can allow you to make data-based decisions when determining or reviewing your RICO area of focus.

Each section of the Diagnostic Package ends with questions to help focus the conversation on identifying clusters of opportunity to prioritize in the RICO process.

Orange & Los Angeles Counties

The target region is Orange County and Los Angeles County, which together, are home to just under 13 million residents – approximately 34% of the State's population. Orange County has significant exporting capabilities with $16.7 billion in exports worldwide (2009), as well as an economy that boasts several leading related industry clusters, such as business services, trade, information technology, analytical instruments, and metal manufacturing. Los Angeles County is a nation-sized economy of nearly $580 billion, with strong assets in transportation, such as the nation's leading port complex, the world's busiest origin-and-destination airport, and a highly sophisticated intermodal transportation system.

Identifying Clusters of Opportunity

This diagnostic package presents a variety of data specific to your region that can help identify regional "clusters of opportunity" in advanced transportation. A cluster of opportunity is a combination of related sectors that are growing in terms of jobs, companies, investment, and/or innovation. Typically, a cluster of opportunity is comprised of sectors that are export-oriented, population driven, and offer occupations with career potential, creating workforce opportunities for regions in the state. The data provided in this package is focused around workforce, technology adoption, and innovation in the industry. We suggest using the following four kinds of information to help identify advanced transportation areas of opportunity in your region:

1. **Growth in employment** (e.g. jobs by segment and occupation opportunities)
2. **Growth in companies** (e.g. new establishment formation or existing business growth)
3. **Growth in technology adoption** (e.g. biofuel production projects, alternative vehicles, clean vehicle rebates, and fueling infrastructure)
4. **Growth in innovation** (e.g. investments and patents)

WORKFORCE OPPORTUNITIES

The advanced transportation industry has created jobs across the state, many of which require new training programs to prepare the workforce. This section provides an overview of employment and common occupations in the industry, as well as the educational profile for the region.

Core Employment in Regional Advanced Transportation Segments

This section examines a snapshot of the region's employment as of January 2011 (most recent year available) to profile the sector's core employment and diversity of activities. Employment data used in this analysis is built from the National Establishments Time Series database, which contains employment at the establishment level throughout the state of California. Using industry organization membership lists, private and public financing reports, local government programs and industry codes to identify specific companies active in the sector, companies were identified that are developing, producing, supplying and servicing products in the advanced transportation industry. The table below details the types of technologies included within each industry segment.

Segments of the ARFV Industry

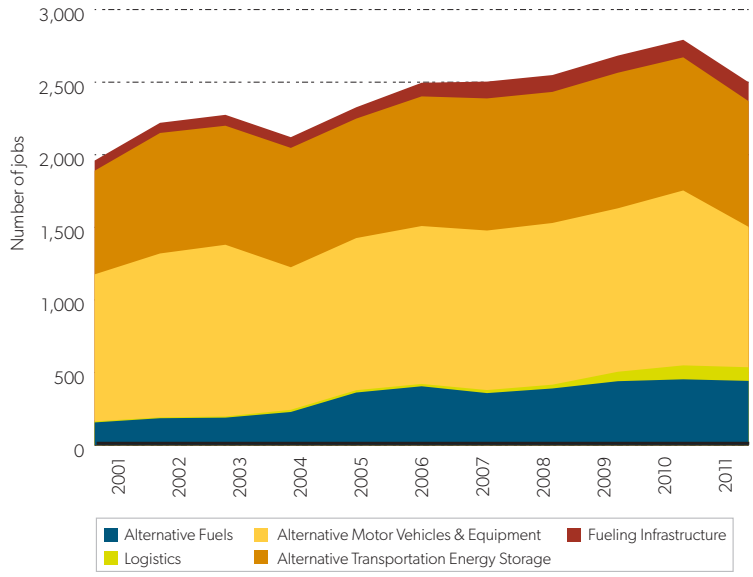
Alternative Motor Vehicles & Equipment	**Motorized vehicle and equipment technology** including, electric, hybrid and natural gas vehicles, as well as diesel technology, and efficiency-enhancing vehicle/engine components.
Alternative Fuels	**Transportation fuels** including biodiesel, ethanol, hydrogen, and algae-based.
Fueling Infrastructure	**Technology enabling vehicle fueling and storage of alternative fuels,** including electric vehicle charging, and hydrogen, natural gas, ethanol and biodiesel fueling.
Alternative Transportation Energy Storage	**Power and energy storage technology for alternative motor vehicles,** including advanced batteries (advanced lead-acid, lithium-ion, nickel-metal hydride and ultracapacitors), proton exchange membrane (PEM) fuel cells, and hybrid hydrogen storage systems.
Logistics	**Products and services to enhance efficiency in transportation** including fleet tracking and traffic monitoring.

Analysis: Collaborative Economics

Employment levels represent core employment in companies directly related to alternative fuels and vehicles in the region. This dataset includes companies that devote a majority of their business efforts to advanced transportation technologies and services, but does not include companies that have some activity but not an explicit focus on the industry. For example, a vehicle repair shop with employees that service some electric vehicles, but work primarily with conventional vehicles are not included in this analysis. Similarly, a farmer or processing facility supplying a cellulosic ethanol pilot plant with leftover biomass and large automakers like General Motors and Honda are not included. Companies that are shifting into advanced transportation activities from the "adaptive" sector and are important for overall market growth, but this section will focus on core alternative fuel and vehicle companies that are leading change in the industry.

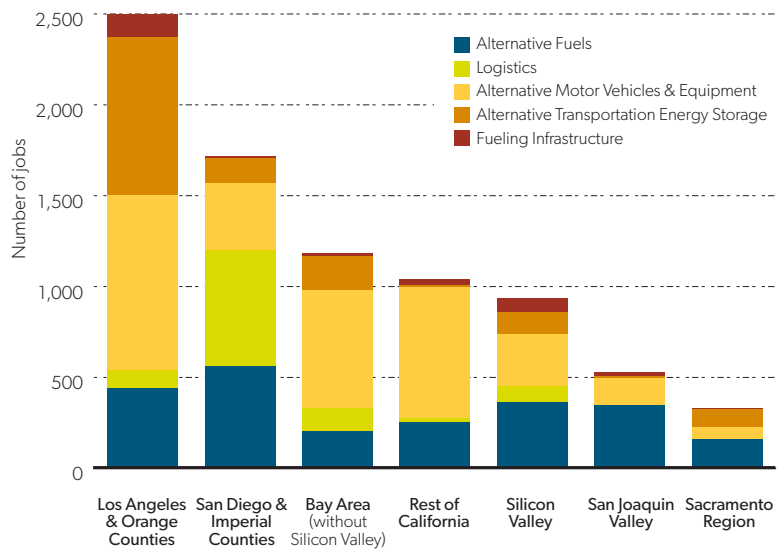
Core Employment by Segment

Orange and Los Angeles Counties, 2001-2011



Core Employment by Region

2011



Data Source: National Establishments Time Series Database, Green Establishments Database
Analysis: Collaborative Economics

Orange & Los Angeles Counties have the highest regional core employment in ARFV in California with about 2,500 jobs as of January 2011. The region has the highest concentration of jobs in the Energy Storage and Alternative Motor Vehicles & Equipment segments in California, with about 870 and 970 jobs respectively.

• • •

Alternative Motor Vehicles & Equipment jobs are distributed across the region, with about two-thirds in Orange County and the remainder in Los Angeles County. Note that Los Angeles County's "adaptive" sector jobs in this area are likely much higher, with major automotive design centers located in the region, such as those for Honda and Toyota, not included in these core employment numbers. Energy Storage jobs are concentrated primarily in Los Angeles County.

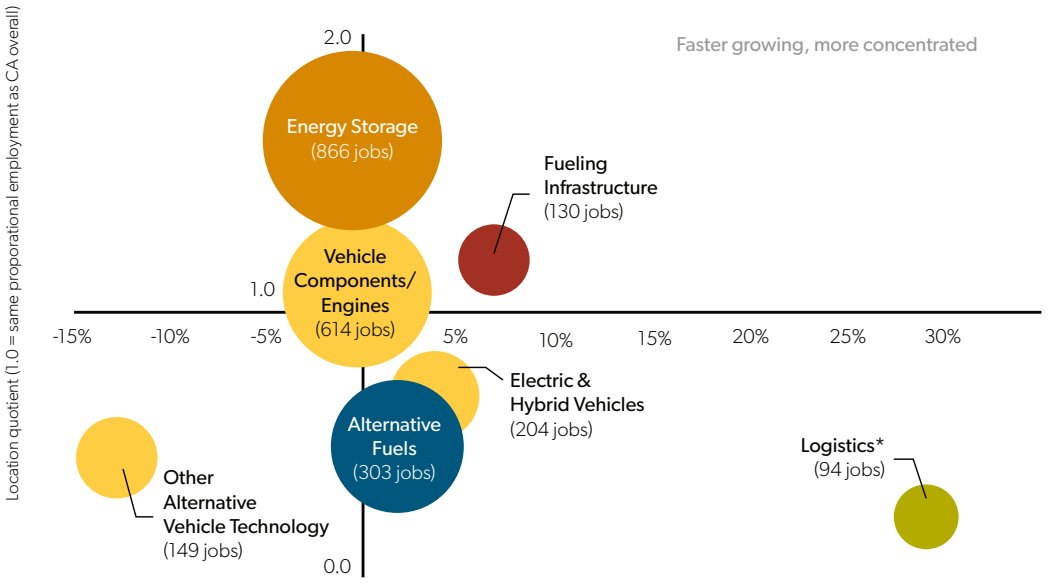
• • •

Alternative Fuels is the next largest sector, with about 440 jobs in the region, three quarters of which are in Los Angeles County. The region is focused on producing biodiesel fuels, though it does have other alternative fuel projects identified sections below. Five of the six active biofuel projects are in Los Angeles County.

The bubble chart provides perspective on three dimensions: the size, growth, and employment concentration in a cluster. Cluster bubbles arranged together in a chart help to communicate the overall regional picture. It tells what industries make up the region, their size, growth, and relative employment concentration. The size of the bubble shows the employment size for the industry cluster. The horizontal x-axis displays the annual average growth rate between 2006 and 2011. The vertical y-axis displays the employment concentration of each industry which is a sign for potential regional specialization and competitive advantage. A concentration greater than one indicates that the region's employment in that cluster represents a larger percentage of the region's total employment than is the case for the state as a whole. In other words, a concentration greater than one suggests that the region is relatively specialized in the cluster when compared with the state.

Core Employment

Employment Level, Concentration Compared to California and Growth Rate
Orange and Los Angeles Counties, 2006-2011

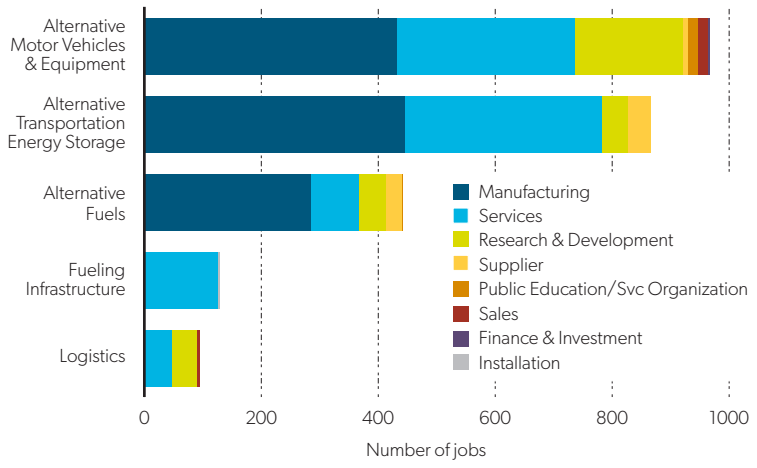


*Reflects average annual growth rates higher than 30%
Data Source: National Establishments Time Series Database, Green Establishments Database-
Analysis: Collaborative Economics

The following regional employment charts provide a closer look at what types of jobs are in each segment, including the establishment's primary function or daily activity along the production value chain.

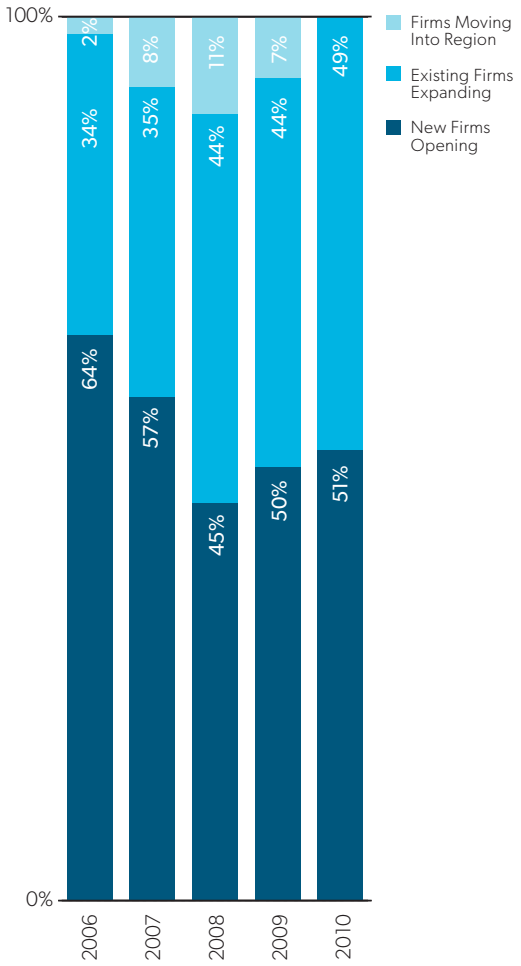
Core Employment by Value Chain Activity

Orange and Los Angeles Counties, 2011



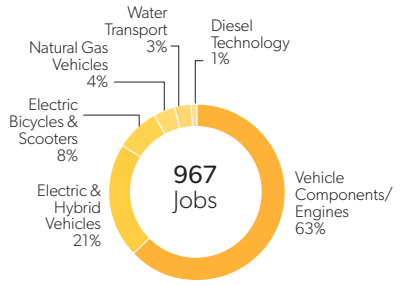
Core Employment Growth by Source

Orange and Los Angeles Counties, 2006-2010



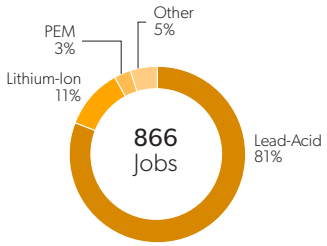
Alternative Motor Vehicles & Equipment Employment

Orange and Los Angeles Counties, 2011



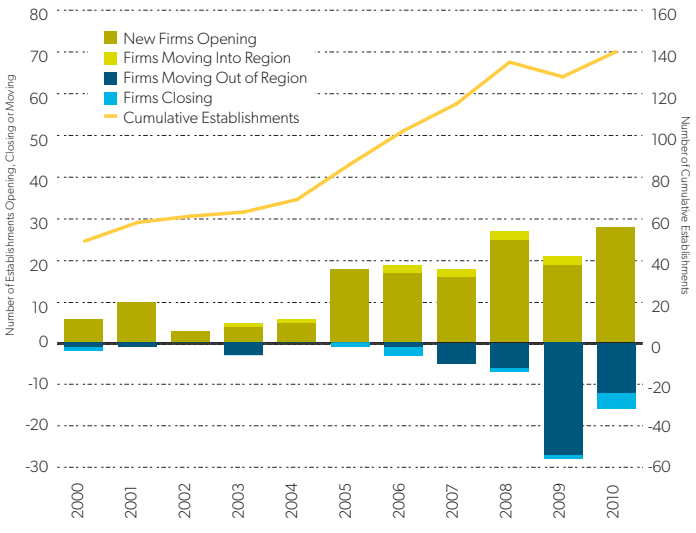
Alternative Transportation Energy Storage Employment

Orange and Los Angeles Counties, 2011



Core Establishments Churn

Orange and Los Angeles Counties, 2000-2010



Data Source: National Establishments Time Series Database, Green Establishments Database
Analysis: Collaborative Economics

Occupations In Advanced Transportation

The ARFV industry includes workers in a wide variety of occupations throughout the supply chain, ranging from research and development, to manufacturing and sales. The Bureau of Labor Statistics (BLS) used green survey results and interviews with industry experts to identify common occupations in the electric vehicle and biofuel industries. BLS identified a total of 42 occupations using the Standard Occupational Classification system, which allows for cross referencing with employment and wage data. While the list of occupations is not exhaustive for the ARFV industry, it does provide the most comprehensive list available of the most common occupations in ARFV businesses. Some occupational skills may transfer directly from a different industry into an ARFV business, though other occupations or skills may require additional training for an ARFV specific skill set. This list can be a starting point for regions to target certain occupations for training and emerging growth opportunities.

Common occupations for biofuel and electric vehicle industries are listed in the following tables. The number of employees, average annual wage, typical entry education levels, green outlook, and employment projections for each identified occupation are detailed below. Occupation titles are standardized across industries, so the results below are for all industries and not ARFV specific, though this does provide a snapshot of the potential workforce pool for the ARFV industry. The Green Outlook (see table below) is the result of research by the Occupational Information Network's (O*NET) National Center for Development, which analyzed occupations in the green economy to identify how worker requirements and demand is expected to change.

Green Outlook Descriptions

Enhanced Skills Occupations	**Green economy activities and technologies are likely to cause significant change to the work and worker requirements.** New tasks, skills, knowledge, credentials may be needed. Employment demand remains the same, but there is potential for an increase.
New and Emerging Occupations	**The impact of green economy activities and technologies is sufficient to create the need for unique work and worker requirements,** which results in the generation of new occupations.
Increased Demand	**Green economy activities and technologies are likely to increase the employment demand,** but will not lead to significant changes in the work and worker requirements.

Data Source: O*Net

The electric vehicles industry has 23 common occupations identified by BLS in areas such as scientific research, design and development, manufacturing, electric vehicle maintenance, infrastructure development, and sales and support.

The biofuel industry has 23 occupations identified by BLS in areas such as scientific research, engineering, construction, agriculture, plant operations, and sales.

Electric Vehicle Industry-Related Common Occupations

Orange and Los Angeles Counties

Occupation Title	Regional Average Annual Wage (Q1 2013)	Regional Employment (May 2012)	General Education Category	Green Outlook
Chemical engineers	$104,855	850	Bachelor's Degree or Higher	Increased Demand
Electrical engineers	$104,725	7,610	Bachelor's Degree or Higher	Enhanced Skills Occupations
Electronics engineers, except computer	$103,596	9,650	Bachelor's Degree or Higher	Enhanced Skills Occupations
Industrial production managers	$102,780	7,080	Bachelor's Degree or Higher	New and Emerging Opportunities
Software developers, applications	$98,613	23,750	Bachelor's Degree or Higher	Not available
Materials engineers	$97,875	1,600	Bachelor's Degree or Higher	Not available
Industrial engineers	$95,947	7,860	Bachelor's Degree or Higher	Increased Demand
Materials scientists	$93,556	347	Bachelor's Degree or Higher	Increased Demand
Electrical power-line installers and repairers	$89,083*	*	Post-High School Training to Associate's Degree	Increased Demand
Urban and regional planners	$78,643	2,690	Bachelor's Degree or Higher	Enhanced Skills Occupations
Chemists	$70,730	3,000	Bachelor's Degree or Higher	Increased Demand
Commercial and industrial designers	$66,741	1,640	Bachelor's Degree or Higher	Increased Demand
Electricians	$62,938	14,210	Post-High School Training to Associate's Degree	Increased Demand
Mechanical engineering technicians	$57,418	1,510	Post-High School Training to Associate's Degree	New and Emerging Opportunities
Mechanical drafters	$56,292	1,680	Post-High School Training to Associate's Degree	Not available
Automotive Service Technicians and Mechanics	$45,247	18,160	Post-High School Training to Associate's Degree	Enhanced Skills Occupations
Machinists	$40,071	14,540	Post-High School Training to Associate's Degree	Enhanced Skills Occupations
Customer service representatives	$39,073	83,130	High School Diploma or Less	Increased Demand
Computer-controlled machine tool operators, metal and plastic	$37,842	5,160	Post-High School Training to Associate's Degree	Increased Demand
Engine and other machine assemblers	$34,088*	*	High School Diploma or Less	Increased Demand
Electromechanical equipment assemblers	$29,458	2,030	High School Diploma or Less	Not available
Electrical and electronic equipment assemblers	$28,164	9,160	High School Diploma or Less	Increased Demand
Team assemblers	$27,460	34,810	Post-High School Training to Associate's Degree	Increased Demand
Retail Salespersons	$27,057	164,730	High School Diploma or Less	Not available

Average Wage Levels
- $80,000 and up
- $40,000 - $79,999
- Below $39,999

General Education Category
- Bachelor's Degree or Higher
- Post-High School Training to Associate's Degree
- High School Diploma or Less

Green Outlook
- Enhanced Skills Occupations
- New and Emerging Opportunities
- Increased Demand

*Regional data unavailable, state average annual wage provided.

Note: Regional data is for Metropolitan Statistical Areas within the region.

Data Source: California Employment Development Department, U.S. Bureau of Labor Statistics, and O*NET Online

Analysis: Collaborative Economics

Biofuel Industry-Related Common Occupations

Orange and Los Angeles Counties

Occupation Title	Regional Average Annual Wage (Q1 2013)	Regional Employment (May 2012)	General Education Category	Green Outlook
Construction managers	$106,782	7,010		+
Chemical engineers	$104,855	850		↑
Electrical engineers	$104,725	7,610		+
Industrial production managers	$102,780	7,080		✸
Environmental engineers	$98,101	1,660		✸
Industrial engineers	$95,947	7,860		↑
Civil engineers	$95,849	10,390		✸
Biochemists and biophysicists	$94,226	1,220		Not available
Mechanical engineers	$93,724	8,660		✸
Farmers, ranchers, and other agricultural managers	$90,388*	*		+
Wholesale and manufacturing sales representatives, techical and scientific products	$83,944	16,890		✸
Microbiologists	$83,185	720		Not available
Agricultural engineers	$77,259*	*		Not available
Soil and plant scientists	$73,346*	*		+
Chemists	$70,730	3,000		↑
Operating engineers and other construction equipment operators	$69,942	6,120		↑
Buyers and purchasing agents, farm products	$68,436	217		↑
Industrial machinery mechanics	$56,638	6,960		↑
Chemical equipment operators and tenders	$47,729	750		↑
Chemical technicians	$44,456	1,840		↑
Construction laborers	$41,994	27,520		+
Agricultural equipment operators	$23,904*	*		Not available
Farmworkers and laborers, crop, nursery, and greenhouse	$19,679	2,560		Not available

Average Wage Levels
- $80,000 and up
- $40,000 - $79,999
- Below $39,999

General Education Category
- Bachelor's Degree or Higher
- Post-High School Training to Associate's Degree
- High School Diploma or Less

Green Outlook
- + Enhanced Skills Occupations
- ✸ New and Emerging Opportunities
- ↑ Increased Demand

*Regional data unavailable, state average annual wage provided.

Note: Regional data is for Metropolitan Statistical Areas within the region.

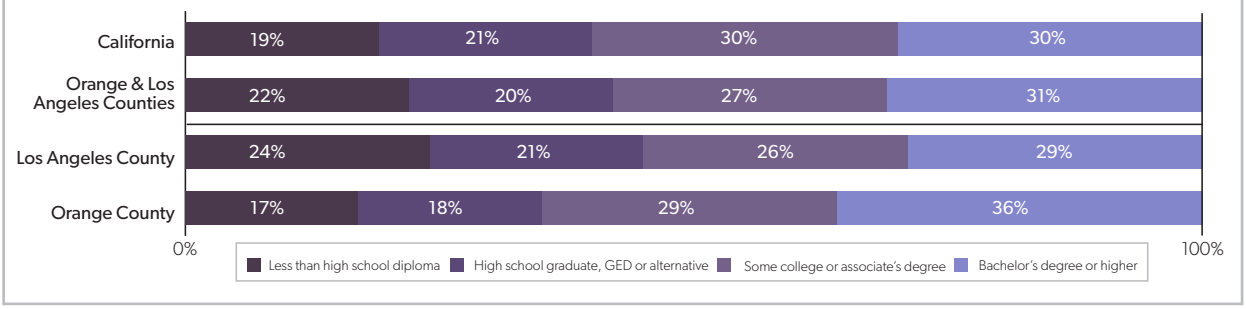
Data Source: California Employment Development Department, U.S. Bureau of Labor Statistics, and O*NET Online

Analysis: Collaborative Economics

Educational Attainment in the Region

Educational Attainment

Orange and Los Angeles Counties, 2011



Data Source: U.S. Census Bureau, American Community Survey Analysis: Collaborative Economics

Workforce Opportunities Questions for Discussion

1. **What are your region's most important segments for employment?** Consider employment size and growth as well as degree of specialization. How have these changed over time?

2. **What other companies in the adaptive advanced transportation economy are part of the supply chain in your region?** (e.g. original equipment manufacturers, auto repair shops)

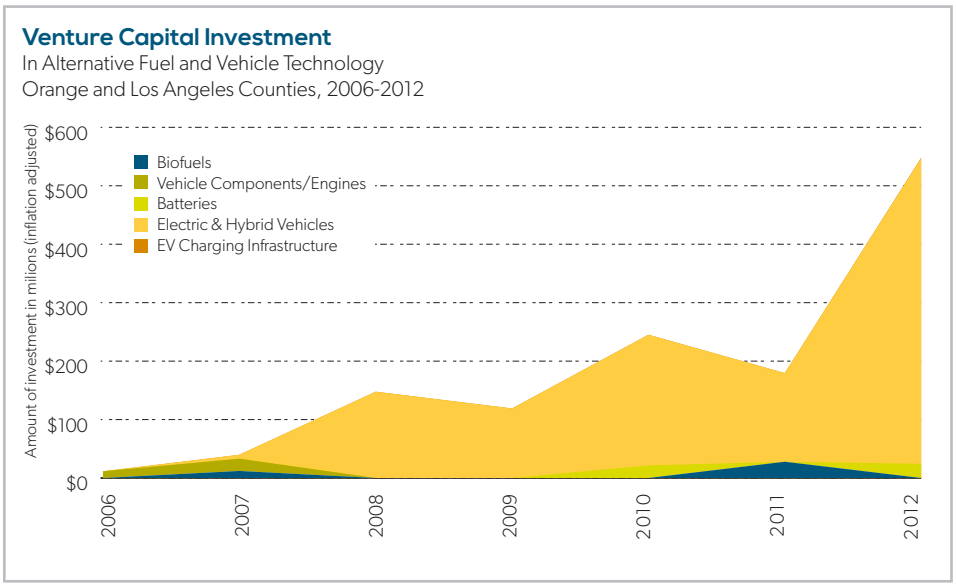
3. **Considering employment, specialization, wages, and education levels, which occupations are likely to be critical to future cluster growth?**

4. **Given the employment and occupation patterns identified, what are the implications for engaging regional partners and employers?**

INNOVATION IN ADVANCED TRANSPORTATION

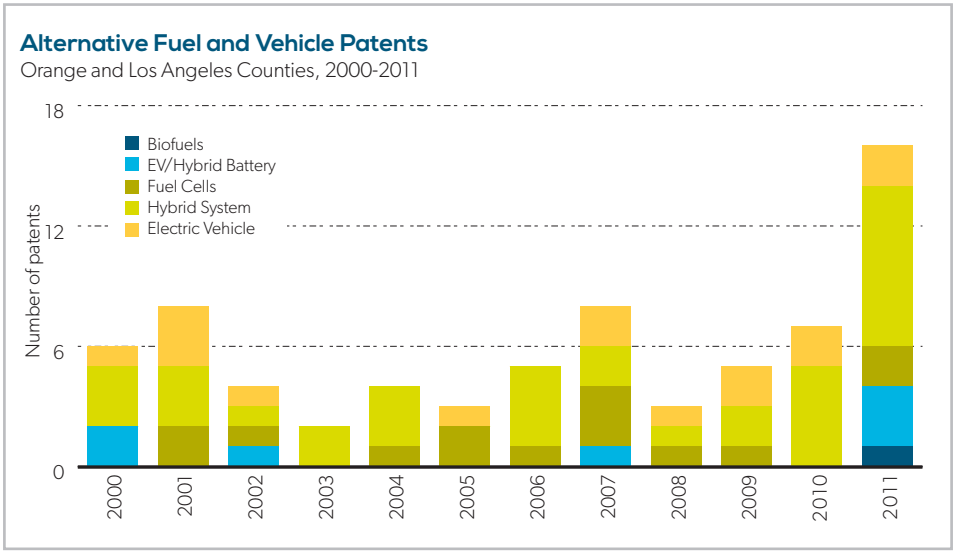
Transportation technologies have evolved dramatically in the last 100 years, but new innovations are still necessary for California to achieve its greenhouse gas reduction goals. California businesses and inventors are striving to make the shift from a carbon-based to a cleaner and more efficient economy. Financial investments in alternative fuel and vehicle technology companies help to commercialize and scale new products and services. Similarly, patent registrations reflect private and public research and development investments and industry growth potential.

Investment in Regional Advanced Transportation Companies



Data Source: CB Insights
Analysis: Collaborative Economics

Patents in Advanced Transportation Technologies



Source: US Patent Trade Office, 1790 Analytics
Analysis: Collaborative Economics

Innovation Questions For Discussion

1. Which new and innovative technologies are being developed and scaled in your region?

2. Are there any existing academic or sector partnerships to leverage to expand regional innovation capabilities?

3. Are there other industries or research institutions in the region that could be leveraged to expand regional innovation capabilities?

4. Given innovation activity in the region, what are the implications for engaging partners and employers?

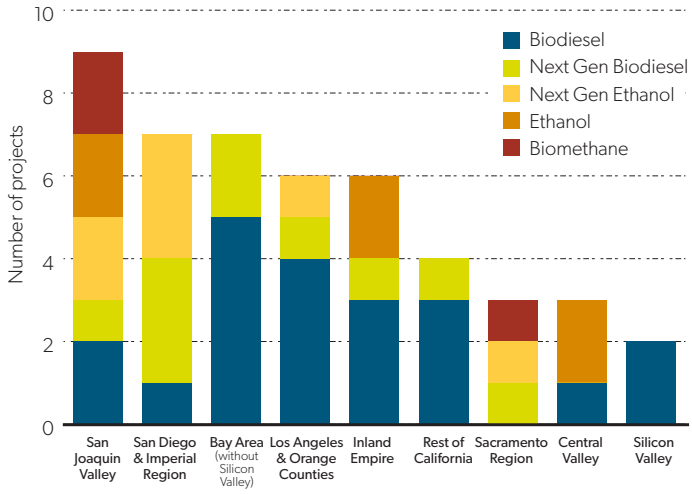
ADVANCED TRANSPORTATION TECHNOLOGY IMPLEMENTATION AND GROWTH

The following charts show how the region has been adopting new alternative vehicle technologies, deploying supportive alternative vehicle infrastructure, and deploying transportation biofuel production projects. This section can show where market demand in your region is focused and therefore where opportunities are to leverage the market and advance the industry.

Biofuel Production Projects in the Region

Commercialization and production of biofuels can result from capitalizing on growing research and investment and leveraging policies such as California's Low Carbon Fuel Standard. Biofuels include first generation biofuels such as ethanol and biodiesel, as well as a growing number of next generation advanced biofuels, such as cellulosic ethanol or algae-based biodiesel. Many of the next generation biofuel projects noted in this section are demonstration-scale facilities, as companies seek to refine their process and increase cost competitiveness. This section focuses on biofuel for transportation and excludes biomass or waste-to-energy processes that exclusively generate electricity or are used for pipeline gas.

Transportation Biofuels Projects by Region*
As of July 2013

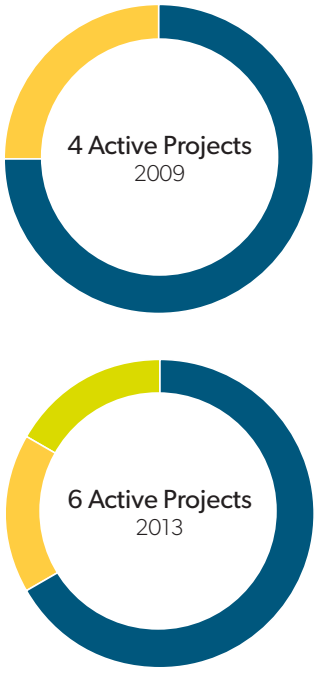


* Active Projects include announced, commissioned, under-construction and permitted projects, and exclude abandoned or suspended ones.

Data Sources: Bloomberg New Energy Finance, E2 Environmental Entreprenuers, Renewable Fuels Association, Biodiesel Magazine, and National Biodiesel Board

Analysis: Collaborative Economics

Active Biofuels Projects*
Orange and Los Angeles Counties, 2009 and 2013



Alternative Vehicle Registrations in the Region

Alternative Vehicle Registrations
Orange and Los Angeles Counties, 2011

	Los Angeles County Total	Orange County Total	Proportion of Regional Registrations by Vehicle Fuel Type
All Fuels	6,794,495	2,287,410	
Flex Ethanol	129,133	42,658	1.9%
Natural Gas	12,120	3,682	0.2%
Electric	4,597	1,849	0.1%
Propane	848	169	0.0%
Plug In Hybrid	331	124	0.0%
Hydrogen	85	9	0.0%

Data Source: California Energy Commission
Analysis: Collaborative Economics

Alternative vehicles include zero emission vehicles such as electric and hydrogen fuel cell and low-emission/low carbon fuel vehicles using fuels such as natural gas, ethanol, and propane.

Clean Vehicle Rebates Issued in the Region

Clean Vehicle Rebates Issued
Orange and Los Angeles Counties, 2010-2013*

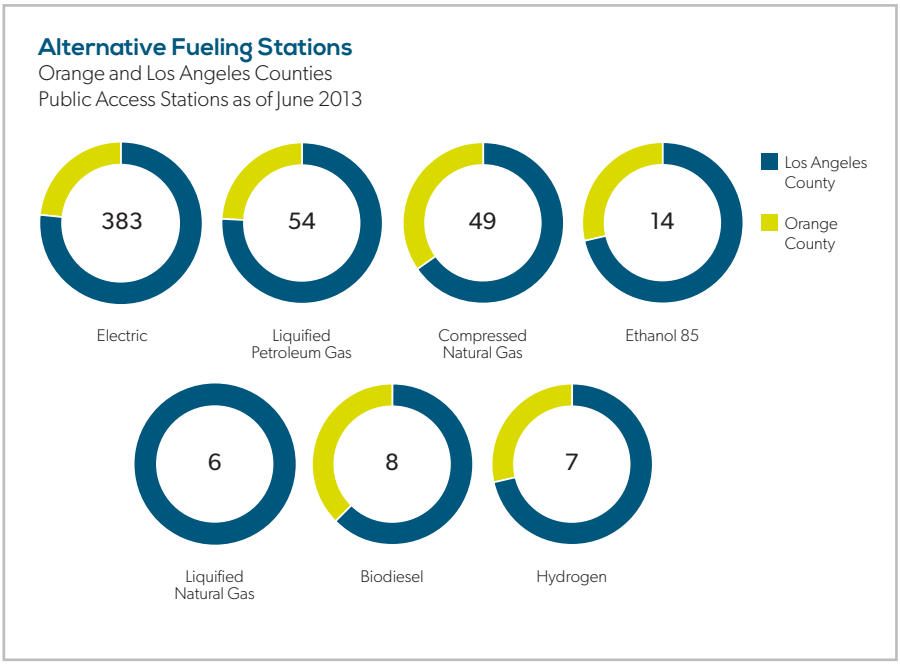
	2010	2011	2012	2013*	Grand Total
LOS ANGELES COUNTY					
Plug-in Hybrid Electric Vehicles			2310	1540	3850
Zero Emission Vehicle	22	905	765	1347	3039
ORANGE COUNTY					
Plug-in Hybrid Electric Vehicles			1263	648	1911
Zero Emission Vehicle	7	280	320	575	1182
REGIONAL SHARE OF TOTAL CALIFORNIA REBATES					
Plug-in Hybrid Electric Vehicles			48%	45%	47%
Zero Emission Vehicle	39%	27%	29%	34%	31%

*Note: 2013 data is as of June 17, 2013
Data Source: Center for Sustainable Energy California, Clean Vehicle Rebate Project
Analysis: Collaborative Economics

In addition to supporting alternative vehicles that use a range of lower emission fuel types, California has taken specific actions to stimulate demand for zero emission vehicles. Since alternative vehicle registration data is only available through 2011, clean vehicle rebates are used as a proxy for the number of alternative vehicles purchased in the last two years. Clean vehicle rebates apply to plug-in hybrid electric and zero emission vehicles (fuel cell or all electric), not other alternative vehicle types such as natural gas or flex ethanol.

Alternative Fueling Infrastructure Available in the Region

Widely-available alternative fueling infrastructure is a critical requirement of widespread adoption of new alternative vehicles. Range anxiety is a common concern among electric vehicle owners as the batteries are generally not able to provide enough charge for long distance trips. Private fueling stations are important to support individual businesses, fleets, or individual use, but public access stations are essential for wider adoption of alternative vehicles.



Data Source: U.S. Department of Energy, Alternative Fuels Data Center
Analysis: Collaborative Economics

Technology Growth and Implementation Questions for Discussion

1. **How is the adoption rate for alternative vehicles changing in your region?** What are the implications?

2. **How are the alternative fueling infrastructure needs in your region changing based on regional demand for alternative vehicles and supply of biofuels?** Are there opportunities to better align demand for vehicles and access to fueling infrastructure?

3. **What policies or partnerships (e.g. business or economic development organizations) are currently in place to support the industry?**

4. **Based on these technology deployment patterns, what are the implications for engaging regional partners and employers?**

EMPLOYER ENGAGEMENT

The Los Angeles and Orange County area has a number of automotive design, research, and/or manufacturing centers, vehicle component and battery makers that are helping advance the alternative transportation cluster in the state and region. The following list of companies are identified as high-potential employers because they have high levels of employment, high growth rates, received venture capital investments, registered patents, and/or were identified by a regional organization as a leader.

Potential Companies to Engage for RICO

Orange and Los Angeles Counties

Company Name	Segment	Large Employer (20+) in Core ARFV Industry (2011)	Fast Growing Employer (2006-2011)	Registered Patents (2009-2011)	Received Investment (2010-2013)	County
Trojan Battery Company	Advanced Transportation Energy Storage - Advanced Pb-Acid	✦				Los Angeles
Enevate	Advanced Transportation Energy Storage - Li-Ion				✦	Orange
Quallion	Advanced Transportation Energy Storage - Li-Ion	✦				Los Angeles
Baker Commodities	Alternative Fuels - Biodiesel	✦	✦			Los Angeles
BlueFire Renewables	Alternative Fuels - Ethanol				✦	Orange
Clean Energy Fuels	Alternative Fuels - Natural Gas	✦				Orange
General Motors (Research & Development)	Alternative Motor Vehicles & Equipment			✦		Los Angeles
Honda (Research & Development)	Alternative Motor Vehicles & Equipment			✦		Los Angeles
Toyota (Research & Development)	Alternative Motor Vehicles & Equipment			✦		Los Angeles
Balqon Corporation	Alternative Motor Vehicles & Equipment - Electric & Hybrid Vehicles		✦			Los Angeles
IMPCO Technologies	Alternative Motor Vehicles & Equipment - Vehicle Component/Engines	✦				Orange
US Hybrid Company	Alternative Motor Vehicles & Equipment - Vehicle Component/Engines	✦				Los Angeles
Greenkraft, Inc.	Alternative Motor Vehicles & Equipment - Vehicle Component/Engines, CNG	✦	✦			Orange
Quantum Technologies	Alternative Motor Vehicles & Equipment - Vehicle Component/Engines, CNG	✦				Orange
Aerovironment	Fueling Infrastructure - EV Charging	✦	✦			Los Angeles
EV Connect	Fueling Infrastructure - EV Charging				✦	Los Angeles
Gridtest Systems	Fueling Infrastructure - EV Charging				✦	Los Angeles
Telogis	Logistics - Fleet Management	✦	✦			Orange

Note: Employment data includes only companies in the core ARFV industry
Data Source: Employment data from National Establishments Time Series Database; Patent data from US Patent Trade Office, 1790 Analytics; Investment data from CB Insights
Analysis: Collaborative Economics

Employer Engagement Questions for Discussion

1. What do you know about the employers on the list above?

2. In addition to the list above, what other employers need to be engaged?

3. **What is your current employer engagement strategy?** How can it be expanded for the advanced transportation cluster?

AB 118 Regional Industry Clusters of Opportunity

ADVANCED TRANSPORTATION DIAGNOSTIC PACKAGE

Sacramento Region

September 2013

CONTENTS

INTRODUCTION

Transportation is a vital part of the California economy, connecting businesses and communities across the state with highways, railways, shipping, and aviation routes. This vast transportation network also takes a tremendous amount of energy to run, most of which comes from petroleum. Burning this fuel creates air pollution such as particulates, air toxics and smog, contributing to air quality problems in many California regions.

Given the impact of the transportation sector, California state and local policymakers have implemented a number of laws and programs for more efficient, renewable, and innovative transportation fuels and vehicles. The California Alternative and Renewable Fuel, Vehicle Technology, Clean Air, and Carbon Reduction Act of 2007 (Assembly Bill (AB) 118) is an important part of California's transportation strategy. AB 118 created the Alternative and Renewable Fuel and Vehicle Technology Program in California Energy Commission (The Commission) to fund projects to develop and deploy innovative technologies that transform the state's fuel and vehicle types to help attain the California's climate goals.

The California Workforce Investment Board and the Commission, working in coordination with the California Labor and Workforce Development Agency, is funding this AB 118 Regional Industry Clusters of Opportunity (RICO) grant program to develop and implement strategies to advance regional economies and workforce in targeted alternative fuel and vehicle clusters.

Transportation fuels are the leading source of greenhouse emissions in California, accounting for 38 percent California's total greenhouse gas emissions.

RICO OVERVIEW

This Diagnostic Package is a part of the first of four stages in the RICO process. Below is an overview of the entire RICO process for your reference. These dates offer a general guide to the timing, but are flexible. The stages listed are excerpts from the RFP; please consult the original RFP for details.

STAGE 1
Clusters of Opportunity Diagnosis
July-September 2013

Collaborative Economics and the regional team work together to develop a regional diagnostic package of relevant research and analyses, to increase understanding of the region's economic and workforce opportunities in the alternative fuels and vehicles cluster

Action Clinic #1 in Sacramento - September 2013

STAGE 2
Collaborative Priority-Setting
October 2013-March 2014

Regional teams design and implement a collaborative cluster engagement process, in which they identify, invite, and host employers in cluster meetings to develop the Industry Sector Partnership. Meetings are designed to elicit (1) priority opportunities for cluster growth, (2) priority requirements to capitalize on those opportunities (both workforce and economic development related), and (3) employer "champions" who will work with community partners to design and implement a cluster investment strategy and sustainability plan.

Action Clinic #2 in Sacramento - January 2014
Site Visits by Technical Assistance team - #1 November 2013 and #2 March 2014 (or as needed)

STAGE 3
Clusters of Opportunity Investment Strategy
April-July 2014

The Industry Sector Partnership will identify and connect specific investments and commitments of local, state, and federal government partners, as well as private firms, industry associations, non-profit partners, private foundation partners, and others to advance the competitive position of regionally targeted clusters of opportunity. This activity should produce a cluster investment strategy with specific organizational commitments and champions organized around shared cluster priorities, which should be aligned with regional resources to form career pathways in alternative fuel and vehicle technology industries.

Action Clinic #3 in Sacramento - May 2014
Site Visits #3 by Technical Assistance team if needed

STAGE 4
Sustainable Implementation
August-December 2014

The Industry Sector Partnership will develop the support for long-term sustainability and growth, which should produce a set of broader organizational and policy changes to sustain and expand regional cluster of opportunity strategies, as well as a lasting mechanism to support ongoing collaboration among all the partners. Regional teams will produce an action plan, including a cluster investment strategy and sustainability plan, to be approved by the State Board. Regions are expected to begin implementation before the grant period ends on December 31, 2014.

Showcase Event in Sacramento - September 2014

HOW TO USE THE DIAGNOSTIC PACKAGE

The goal of the RICO process is to develop and implement alternative and renewable fuel and vehicle (ARFV) regional clusters of opportunity strategies, mobilizing employers and regional partners to advance the competitive position of targeted clusters. This RICO initiative is a structured process that supports Regional Economic and Workforce Development Networks. These Networks consist of economic and workforce development practitioners and industry, forming Industry Sector Partnerships and developing action plans to support and advance targeted industry clusters. Regions are focusing on one or more established and/or emerging clusters of opportunity in the alternative fuel and vehicle transportation sector.

This Diagnostic Package is designed to provide data to illustrate regional progress, strengths, and emerging opportunities in a range of AB 118 areas. The data, along with your personal knowledge and experience of activities and priorities in the region, and other resources from your region if available, can allow you to make data-based decisions when determining or reviewing your RICO area of focus.

Each section of the Diagnostic Package ends with questions to help focus the conversation on identifying clusters of opportunity to prioritize in the RICO process.

Advanced Transportation in the Sacramento Region

The six county Sacramento region (including El Dorado, Placer, Sacramento, Sutter, Yolo, and Yuba Counties) has seen steady growth in the advanced transportation industry. Leveraging regional assets including strong research and development capabilities at UC Davis as well as successful regional economic collaborations, the region has the potential to accelerate growth in the advanced transportation industry.

Identifying Clusters of Opportunity

This diagnostic package presents a variety of data specific to your region that can help identify regional "clusters of opportunity" in advanced transportation. A cluster of opportunity is a combination of related sectors that are growing in terms of jobs, companies, investment, and/or innovation. Typically, a cluster of opportunity is comprised of sectors that are export-oriented, population driven, and offer occupations with career potential, creating workforce opportunities for regions in the state. The data provided in this package is focused around workforce, technology adoption, and innovation in the industry. We suggest using the following four kinds of information to help identify advanced transportation areas of opportunity in your region:

1. **Growth in employment** (e.g. jobs by segment and occupation opportunities)
2. **Growth in companies** (e.g. new establishment formation or existing business growth)
3. **Growth in technology adoption** (e.g. biofuel production projects, alternative vehicles, clean vehicle rebates, and fueling infrastructure)
4. **Growth in innovation** (e.g. investments and patents)

WORKFORCE OPPORTUNITIES

The advanced transportation industry has created jobs across the state, many of which require new training programs to prepare the workforce. This section provides an overview of employment and common occupations in the industry, as well as the educational profile for the region.

Core Employment in Regional Advanced Transportation Segments

This section examines a snapshot of the region's employment as of January 2011 (most recent year available) to profile the sector's core employment and diversity of activities. Employment data used in this analysis is built from the National Establishments Time Series database, which contains employment at the establishment level throughout the state of California. Using industry organization membership lists, private and public financing reports, local government programs and industry codes to identify specific companies active in the sector, companies were identified that are developing, producing, supplying and servicing products in the advanced transportation industry. The table below details the types of technologies included within each industry segment.

Segments of the ARFV Industry

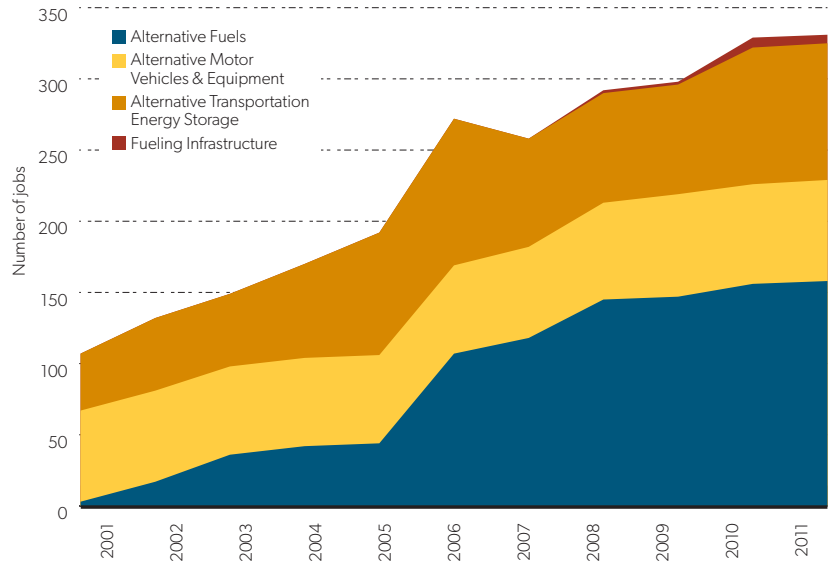
Alternative Motor Vehicles & Equipment	**Motorized vehicle and equipment technology** including, electric, hybrid and natural gas vehicles, as well as diesel technology, and efficiency-enhancing vehicle/engine components.
Alternative Fuels	**Transportation fuels** including biodiesel, ethanol, hydrogen, and algae-based.
Fueling Infrastructure	**Technology enabling vehicle fueling and storage of alternative fuels,** including electric vehicle charging, and hydrogen, natural gas, ethanol and biodiesel fueling.
Alternative Transportation Energy Storage	**Power and energy storage technology for alternative motor vehicles,** including advanced batteries (advanced lead-acid, lithium-ion, nickel-metal hydride and ultracapacitors), proton exchange membrane (PEM) fuel cells, and hybrid hydrogen storage systems.
Logistics	**Products and services to enhance efficiency in transportation** including fleet tracking and traffic monitoring.

Analysis: Collaborative Economics

Employment levels represent core employment in companies directly related to alternative fuels and vehicles in the region. This dataset includes companies that devote a majority of their business efforts to advanced transportation technologies and services, but does not include companies that have some activity but not an explicit focus on the industry. For example, a vehicle repair shop with employees that service some electric vehicles, but work primarily with conventional vehicles are not included in this analysis. Similarly, a farmer or processing facility supplying a cellulosic ethanol pilot plant with leftover biomass and large automakers like General Motors and Honda are not included. Companies that are shifting into advanced transportation activities from the "adaptive" sector and are important for overall market growth, but this section will focus on core alternative fuel and vehicle companies that are leading change in the industry.

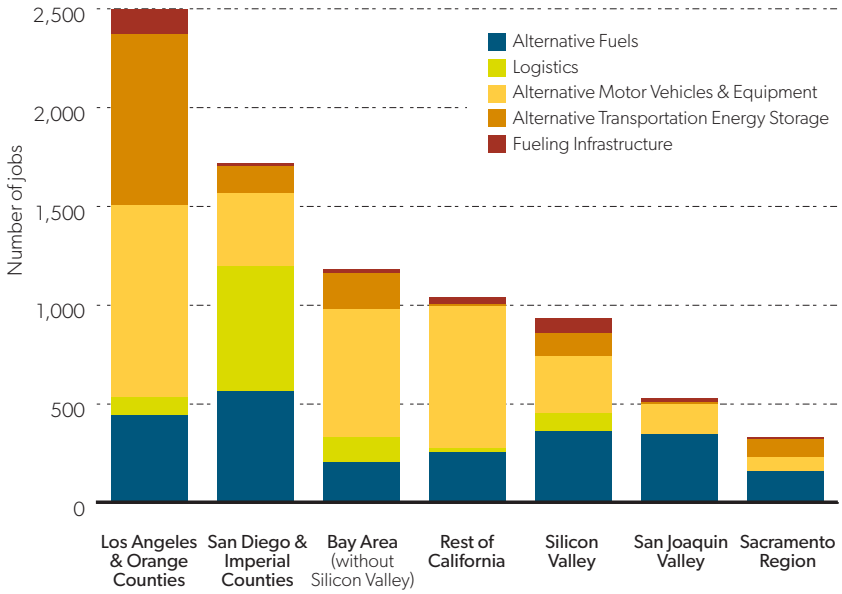
Core Employment by Segment

Sacramento Region, 2001-2011



Core Employment by Region

California, 2011



Data Source: National Establishments Time Series Database, Green Establishments Database
Analysis: Collaborative Economics

Alternative Fuels segment was the greatest employer in the ARFV industry as of January 2011, and has grown by 48 percent between 2006 and 2011.

• • •

Alternative Motor Vehicles & Equipment employment has grown by 15 percent between 2006 and 2011.

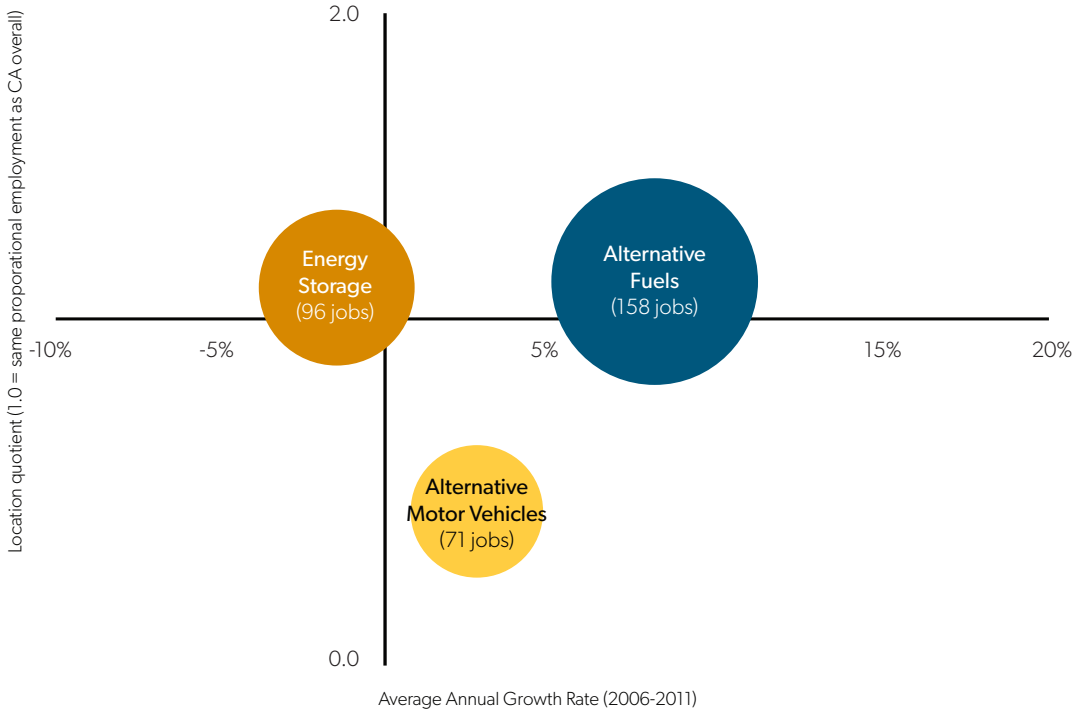
• • •

Advanced Transportation Energy Storage declined in employment between 2006 and 2011 but the Sacramento region has a relatively high concentration of activity in the segment relative to the state.

The bubble chart provides perspective on three dimensions: the size, growth, and employment concentration in a cluster. Cluster bubbles arranged together in a chart help to communicate the overall regional picture. It tells what industries make up the region, their size, growth, and relative employment concentration. The size of the bubble shows the employment size for the industry cluster. The horizontal x-axis displays the annual average growth rate between 2006 and 2011. The vertical y-axis displays the employment concentration of each industry which is a sign for potential regional specialization and competitive advantage. A concentration greater than one indicates that the region's employment in that cluster represents a larger percentage of the region's total employment than is the case for the state as a whole. In other words, a concentration greater than one suggests that the region is relatively specialized in the cluster when compared with the state.

Core Employment

Employment Level, Concentration Compared to California and Growth Rate
Sacramento Region, 2006-2011

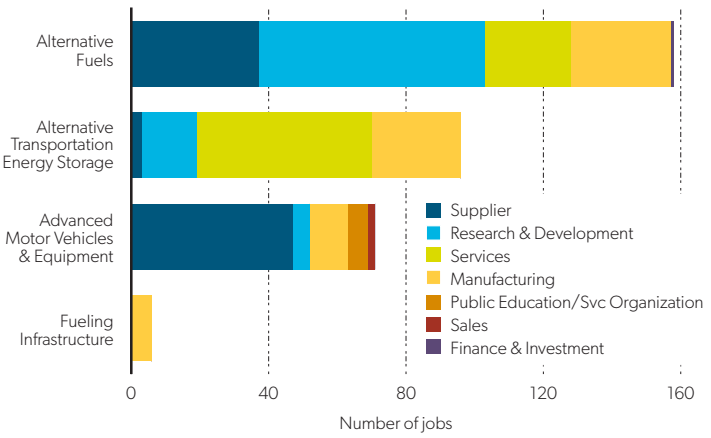


Data Source: National Establishments Time Series Database, Green Establishments Database
Analysis: Collaborative Economics

The following regional employment charts provide a closer look at what types of jobs are in each segment, including the establishment's primary function or daily activity along the production value chain.

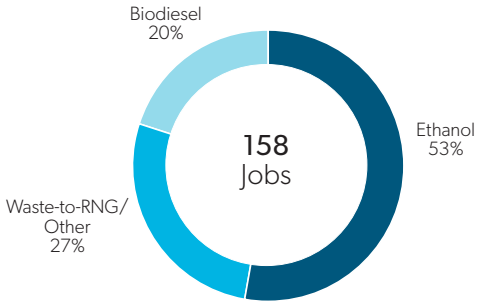
Core Employment by Value Chain Activity

Sacramento Region, 2011



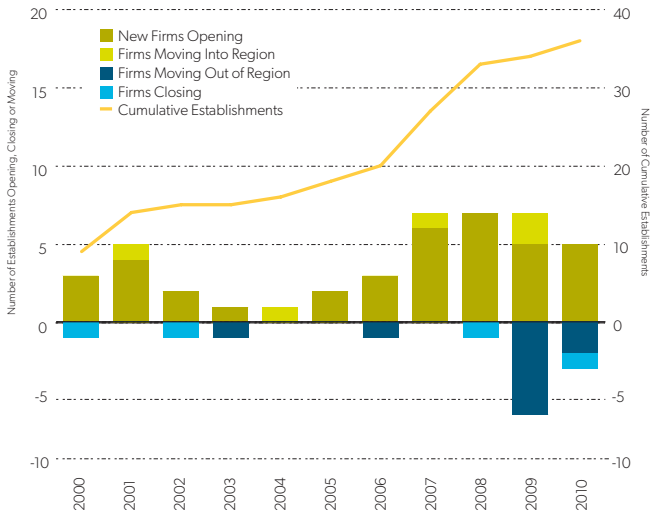
Alternative Fuels Employment

Sacramento Region, 2011



Core Establishments Churn

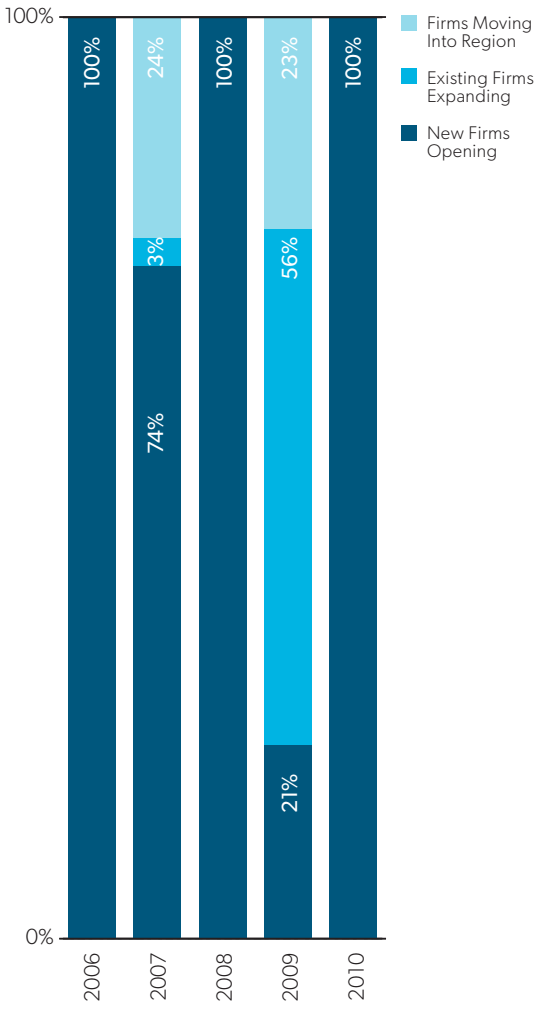
Sacramento Region, 2000-2010



Data Source: National Establishments Time Series Database, Green Establishments Database
Analysis: Collaborative Economics

Core Employment Growth by Source

Sacramento Region, 2006-2010



Occupations in Advanced Transportation

The ARFV industry includes workers in a wide variety of occupations throughout the supply chain, ranging from research and development, to manufacturing and sales. The Bureau of Labor Statistics (BLS) used green survey results and interviews with industry experts to identify common occupations in the electric vehicle and biofuel industries. BLS identified a total of 42 occupations using the Standard Occupational Classification system, which allows for cross referencing with employment and wage data. While the list of occupations is not exhaustive for the ARFV industry, it does provide the most comprehensive list available of the most common occupations in ARFV businesses. Some occupational skills may transfer directly from a different industry into an ARFV business, though other occupations or skills may require additional training for an ARFV specific skill set. This list can be a starting point for regions to target certain occupations for training and emerging growth opportunities.

Common occupations for biofuel and electric vehicle industries are listed in the following tables. The number of employees, average annual wage, typical entry education levels, green outlook, and employment projections for each identified occupation are detailed below. Occupation titles are standardized across industries, so the results below are for all industries and not ARFV specific, though this does provide a snapshot of the potential workforce pool for the ARFV industry. The Green Outlook (see table below) is the result of research by the Occupational Information Network's (O*NET) National Center for Development, which analyzed occupations in the green economy to identify how worker requirements and demand is expected to change.

Green Outlook Descriptions

Enhanced Skills Occupations	**Green economy activities and technologies are likely to cause significant change to the work and worker requirements.** New tasks, skills, knowledge, credentials may be needed. Employment demand remains the same, but there is potential for an increase.
New and Emerging Occupations	**The impact of green economy activities and technologies is sufficient to create the need for unique work and worker requirements,** which results in the generation of new occupations.
Increased Demand	**Green economy activities and technologies are likely to increase the employment demand,** but will not lead to significant changes in the work and worker requirements.

Data Source: O*Net

The electric vehicles industry has 23 common occupations identified by BLS in areas such as scientific research, design and development, manufacturing, electric vehicle maintenance, infrastructure development, and sales and support.

The biofuel industry has 23 occupations identified by BLS in areas such as scientific research, engineering, construction, agriculture, plant operations, and sales.

Electric Vehicles Industry-Related Common Occupations

Sacramento Region

Occupation Title	Regional Average Annual Wage (Q1 2013)	Regional Employment (May 2012)	General Education Category	Green Outlook
Electrical engineers	$116,003	1,160	3	+
Software developers, applications	$104,935	4,070	3	Not available
Electronics engineers, except computer	$96,362	1,290	3	+
Chemical engineers	$92,268	30	3	↑
Materials engineers	$91,665	70	3	Not available
Industrial production managers	$90,871	530	3	✸
Electrical power-line installers and repairers	$88,247	300	2	↑
Materials scientists	$83,082	*	3	↑
Industrial engineers	$79,957	420	3	↑
Chemists	$79,557	540	3	↑
Urban and regional planners	$76,525	840	3	+
Commercial and industrial designers	$63,279	40	3	↑
Mechanical engineering technicians	$62,922	250	2	✸
Electricians	$58,407	2,450	2	↑
Mechanical drafters	$55,167	160	2	Not available
Automotive Service Technicians and Mechanics	$48,748	3,520	2	+
Machinists	$41,184	990	2	+
Computer-controlled machine tool operators, metal and plastic	$37,462	180	2	↑
Customer service representatives	$36,529	12,930	1	↑
Electromechanical equipment assemblers	$32,332*	*	1	Not available
Electrical and electronic equipment assemblers	$31,268	950	1	↑
Team assemblers	$27,247	2,090	2	↑
Engine and other machine assemblers	$25,311	*	1	↑
Retail Salespersons	$25,086	27,170	1	Not available

Average Wage Levels
- $80,000 and up
- $40,000 - $79,999
- Below $39,999

General Education Category
- 3 Bachelor's Degree or Higher
- 2 Post-High School Training to Associate's Degree
- 1 High School Diploma or Less

Green Outlook
- \+ Enhanced Skills Occupations
- ✸ New and Emerging Opportunities
- ↑ Increased Demand

*Regional data unavailable, state average annual wage provided.
Note: Regional data is for Metropolitan Statistical Areas within the region.
Data Source: California Employment Development Department, U.S. Bureau of Labor Statistics, and O*NET Online
Analysis: Collaborative Economics

Biofuel Industry-Related Common Occupations

Sacramento Region

Occupation Title	Regional Average Annual Wage (Q1 2013)	Regional Employment (May 2012)	General Education Category	Green Outlook
Electrical engineers	$116,003	1,160	Bachelor's Degree or Higher	Enhanced Skills Occupations
Construction managers	$105,667	1,660	Post-High School Training to Associate's Degree	Enhanced Skills Occupations
Civil engineers	$99,072	4,100	Bachelor's Degree or Higher	New and Emerging Opportunities
Chemical engineers	$92,268	30	Bachelor's Degree or Higher	Increased Demand
Industrial production managers	$90,871	530	Bachelor's Degree or Higher	New and Emerging Opportunities
Environmental engineers	$85,537	500	Bachelor's Degree or Higher	New and Emerging Opportunities
Biochemists and biophysicists	$84,263	*	Bachelor's Degree or Higher	Not available
Mechanical engineers	$80,371	750	Bachelor's Degree or Higher	New and Emerging Opportunities
Industrial engineers	$79,957	420	Bachelor's Degree or Higher	Increased Demand
Wholesale and manufacturing sales representatives, techical and scientific products	$79,680	1,490	Bachelor's Degree or Higher	New and Emerging Opportunities
Chemists	$79,557	540	Bachelor's Degree or Higher	Increased Demand
Agricultural engineers	$77,259*	*	Bachelor's Degree or Higher	Not available
Microbiologists	$74,518	310	Bachelor's Degree or Higher	Not available
Buyers and purchasing agents, farm products	$71,233	*	Post-High School Training to Associate's Degree	Increased Demand
Soil and plant scientists	$71,071	160	Bachelor's Degree or Higher	Enhanced Skills Occupations
Operating engineers and other construction equipment operators	$67,216	1,820	Post-High School Training to Associate's Degree	Increased Demand
Chemical technicians	$59,890	290	Post-High School Training to Associate's Degree	Increased Demand
Farmers, ranchers, and other agricultural managers	$56,676	*	High School Diploma or Less	Enhanced Skills Occupations
Chemical equipment operators and tenders	$56,419	30	Post-High School Training to Associate's Degree	Increased Demand
Industrial machinery mechanics	$50,812	900	Post-High School Training to Associate's Degree	Increased Demand
Construction laborers	$44,364	5,090	High School Diploma or Less	Enhanced Skills Occupations
Agricultural equipment operators	$23,904*	*	High School Diploma or Less	Not available
Farmworkers and laborers, crop, nursery, and greenhouse	$20,018	3,370	High School Diploma or Less	Not available

Average Wage Levels
- $80,000 and up
- $40,000 - $79,999
- Below $39,999

General Education Category
- Bachelor's Degree or Higher
- Post-High School Training to Associate's Degree
- High School Diploma or Less

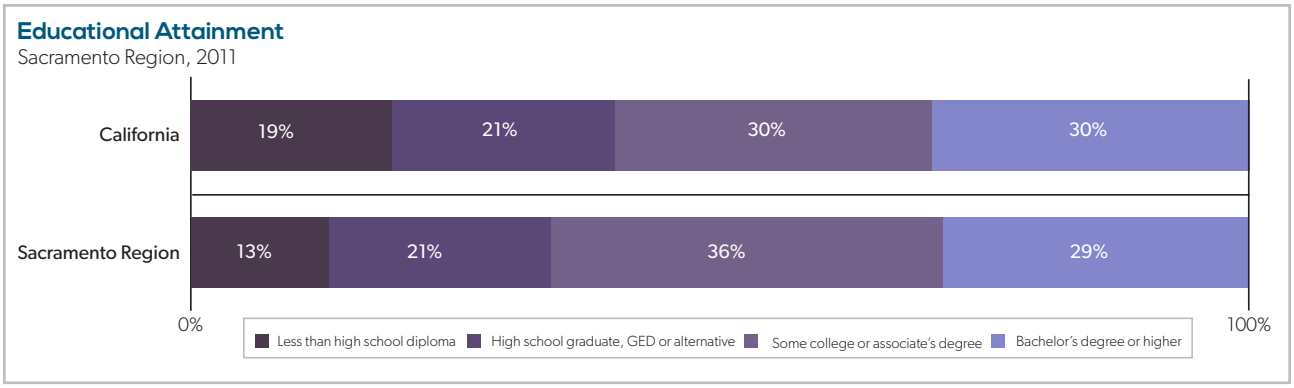
Green Outlook
- Enhanced Skills Occupations
- New and Emerging Opportunities
- Increased Demand

*Regional data unavailable, state average annual wage provided.
Note: Regional data is for Metropolitan Statistical Areas within the region.
Data Source: California Employment Development Department, U.S. Bureau of Labor Statistics, and O*NET Online
Analysis: Collaborative Economics

Educational Attainment in the Region

Educational Attainment

Sacramento Region, 2011



Data Source: U.S. Census Bureau, American Community Survey
Analysis: Collaborative Economics

Workforce Opportunities Questions for Discussion

1. **What are your region's most important segments for employment?** Consider employment size and growth as well as degree of specialization. How have these changed over time?

2. **What other companies in the adaptive advanced transportation economy are part of the supply chain in your region?** (e.g. original equipment manufacturers, auto repair shops)

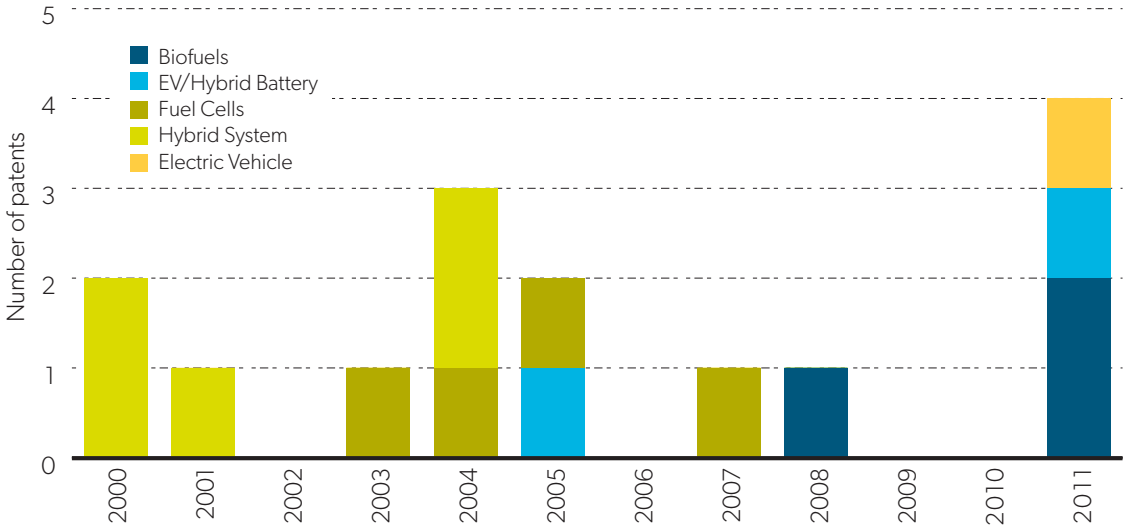
3. **Considering employment, specialization, wages, and education levels, which occupations are likely to be critical to future cluster growth?**

4. **Given the employment and occupation patterns identified, what are the implications for engaging regional partners and employers?**

INNOVATION IN ADVANCED TRANSPORTATION

Transportation technologies have evolved dramatically in the last 100 years, but new innovations are still necessary for California to achieve its greenhouse gas reduction goals. California businesses and inventors are striving to make the shift from a carbon-based to a cleaner and more efficient economy. Patent registrations in alternative fuel and vehicle technology companies reflect private and public research and development investments and industry growth potential.

Alternative Fuel and Vehicle Patents
Sacramento Region, 2000-2011



Source: US Patent Trade Office, 1790 Analytics
Analysis: Collaborative Economics

Regional Innovation Assets

The UC Davis Institute of Transportation Studies serves as a strong research asset in the region, leading the state in research and policy analysis. This research capability, as well as a growing concentration of biofuel companies in the region, is helping to advance the Alternative Fuels segment in Sacramento.

As of 2011, a majority of Alternative Fuel and Vehicle jobs in Sacramento were in biofuel research and development. Davis-based Novozymes, the research and development arm of the Danish biotech company, is the largest employer in the segment, employing 65 people in 2011. The company has been responsible for two ethanol patents since 2008, both with applications in transportation. Novozymes maintains a close partnership with UC Davis as a source of talent and as a collaborative scientific partner.

Innovation Questions For Discussion

1. Which new and innovative technologies are being developed and scaled in your region?

2. Are there any existing academic or sector partnerships to leverage to expand regional innovation capabilities?

3. Are there other industries or research institutions in the region that could be leveraged to expand regional innovation capabilities?

4. Given innovation activity in the region, what are the implications for engaging partners and employers?

ADVANCED TRANSPORTATION TECHNOLOGY IMPLEMENTATION AND GROWTH

The following charts show how the region has been adopting new alternative vehicle technologies, deploying supportive alternative vehicle infrastructure, and deploying transportation biofuel production projects. This section can show where market demand in your region is focused and therefore where opportunities are to leverage the market and advance the industry.

Biofuel Production Projects in the Region

Commercialization and production of biofuels can result from capitalizing on growing research and investment and leveraging policies such as California's Low Carbon Fuel Standard. Biofuels include first generation biofuels such as ethanol and biodiesel, as well as a growing number of next generation advanced biofuels, such as cellulosic ethanol or algae-based biodiesel.

Transportation Biofuels Projects

Sacramento Region

	Location	Fuel Type	Project Initiated
West Biofuels Next Generation Bioethanol Pilot Plant	Yolo	Next Gen Ethanol	2008
Sierra Energy Renewable Energy Testing Center	Sacramento	Next Gen Biodiesel	2012
Clean World Partners Waste-to-Energy Digester	Sacramento	Biomethane (RNG)	2012

Data Sources: Bloomberg New Energy Finance, E2 Environmental Entreprenuers, Renewable Fuels Association, Biodiesel Magazine, and National Biodiesel Board
Analysis: Collaborative Economics

The Sacramento Region Transportation Biofuels Projects table shows that the area has three projects currently producing biofuel, each making a different fuel type. While the Sacramento region is home to only one biomethane project producing transportation fuel (Clean World Waste-to-Energy Digester), this fuel type is an emerging area of interest in the region.

The Sacramento region has several other biogas projects in the Sacramento region that use the fuel for non-transportation uses (see Biogas Energy Projects table below). Biogas is produced when bacteria break down organic waste, in landfills, wastewater treatment plans, or farms. Biogas can be burned to generate electricity or can be processed into renewable natural gas and transportation fuels. While federal tax incentives and state renewable energy programs encourage biogas use for electricity over transportation , biogas projects have the potential to produce renewable natural gas for transportation instead of or in addition to their current use. If the biogas segment is targeted as a cluster of opportunity for the region, more could be done to determine what skills are required for jobs at biogas projects that specifically produce transportation fuels.

Biogas Energy Projects
Sacramento Region

Project Name	Fuel Type	Use	Facility Type	Developer/Operator
CAL-Denier Dairy	Lagoon Gas	Electricity	Dairy	RCM International, LLC
Tollenaar Holsteins Dairy	Lagoon Gas	Electricity	Dairy	RCM International, LLC
Landfill Energy Systems Sloughhouse Landfill Gas Plant	Landfill Gas	Electricity	Landfill	Landfill Energy Systems and DTE Biomass Energy
Ostrom Road Landfill	Landfill Gas	Electricity	Landfill	G2 Energy, LLC
Union Mine Disposal Site	Landfill Gas	Electricity	Landfill	El Dorado County, CA
Western Regional LF	Landfill Gas	Electricity	Landfill	Energy 2001, Inc., Shaw Environmental, Inc.
Yolo County Central LF	Landfill Gas	Electricity	Landfill	Fortistar Methane Group
DAVIS WWTP	Wastewater Gas	Electricity	Wastewater treatement plant	City of Davis
El Dorado Hills Reclamation Plant	Wastewater Gas	Other	Wastewater treatement plant	El Dorado Irrigation District
Sacramento City LF	Landfill Gas	Pipeline	Landfill	Fortistar Methane Group
Sacramento Regional County Sanitation District (SRCSD)	Wastewater Gas	Pipeline/Electricity	Wastewater treatement plant	Sacramento Regional Sanitation District

Source: U.S. Environmental Protection Agency Landfill Methane Outreach Program, AgStar, and Biogasdata.org
Analysis: Collaborative Economics

Alternative Vehicle Registrations in the Region

Alternative vehicles include zero emission vehicles such as electric and hydrogen fuel cell and low-emission/low carbon fuel vehicles using fuels such as natural gas, ethanol, and propane.

Alternative Vehicle Registrations
Sacramento Region, 2011

	Sacramento Region Total	Proportion of Regional Registrations by Vehicle Fuel Type
All Fuels	1,754,108	
Flex Ethanol	37,850	2.2%
Natural Gas	2,545	0.1%
Electric	1,812	0.1%
Propane	236	0.0%
Plug In Hybrid	69	0.0%
Hydrogen	-	0.0%

Data Source: California Energy Commission
Analysis: Collaborative Economics

CLEAN VEHICLE REBATES ISSUED IN THE REGION

Clean Vehicle Rebates Issued

Sacramento Region, 2010-2013*

	2011	2012	2013*	Grand Total
El Dorado County				
Plug-in Hybrid Electric Vehicles		39	23	62
Zero Emission Vehicle	16	18	20	54
Placer County				
Plug-in Hybrid Electric Vehicles		59	40	99
Zero Emission Vehicle	27	33	41	101
Sacramento County				
Plug-in Hybrid Electric Vehicles		128	64	192
Zero Emission Vehicle	65	124	123	312
Sutter County				
Plug-in Hybrid Electric Vehicles		4		4
Zero Emission Vehicle			1	1
Yolo County				
Plug-in Hybrid Electric Vehicles		24	25	49
Zero Emission Vehicle	28	22	27	77
Yuba County				
Plug-in Hybrid Electric Vehicles		1	1	2
Zero Emission Vehicle	1	3	2	6
Regional Share of Total Califonia Rebates				
Plug-in Hybrid Electric Vehicles		3%	3%	3%
Zero Emission Vehicle	3%	5%	4%	4%

In addition to supporting alternative vehicles that use a range of lower emission fuel types, California has taken specific actions to stimulate demand for zero emission vehicles. Since alternative vehicle registration data is only available through 2011, clean vehicle rebates are used as a proxy for the number of alternative vehicles purchased in the last two years. Clean vehicle rebates apply to plug-in hybrid electric and zero emission vehicles (fuel cell or all electric), not other alternative vehicle types such as natural gas or flex ethanol.

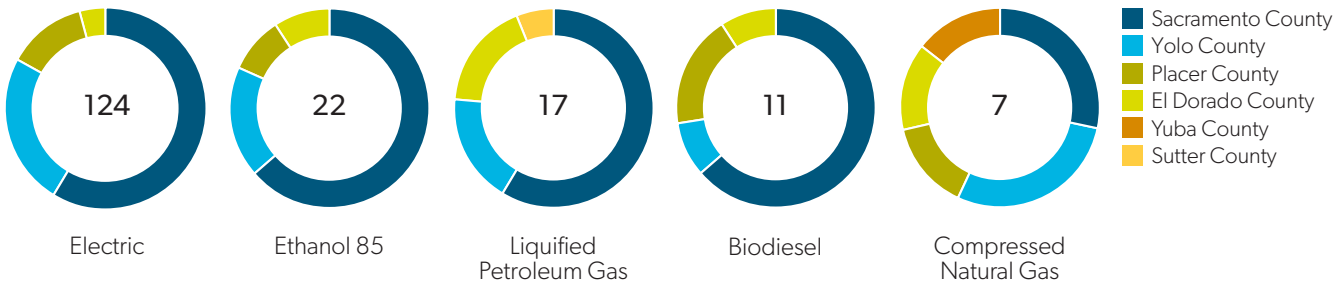
*Note: 2013 data is as of June 17, 2013
Data Source: Center for Sustainable Energy California, Clean Vehicle Rebate Project
Analysis: Collaborative Economics

ALTERNATIVE FUELING INFRASTRUCTURE AVAILABLE IN THE REGION

Widely-available alternative fueling infrastructure is a critical requirement of widespread adoption of new alternative vehicles. Range anxiety is a common concern among electric vehicle owners as the batteries are generally not able to provide enough charge for long distance trips. Private fueling stations are important to support individual businesses, fleets, or individual use, but public access stations are essential for wider adoption of alternative vehicles.

Alternative Fueling Stations

Sacramento Region
Public Access Stations as of June 2013



Data Source: U.S. Department of Energy, Alternative Fuels Data Center
Analysis: Collaborative Economics

Technology Growth and Implementation Questions for Discussion

1. **How is the adoption rate for alternative vehicles changing in your region?** What are the implications?

2. **How are the alternative fueling infrastructure needs in your region changing based on regional demand for alternative vehicles and supply of biofuels?** Are there opportunities to better align demand for vehicles and access to fueling infrastructure?

3. **What policies or partnerships (e.g. business or economic development organizations) are currently in place to support the industry?**

4. **Based on these technology deployment patterns, what are the implications for engaging regional partners and employers?**

EMPLOYER ENGAGEMENT

The following list of companies are identified as high-potential employers because they have high levels of employment, high growth rates, received venture capital investments, registered patents, and/or were identified by a regional organization as a leader.

Potential Companies to Engage for RICO

Sacramento Region

Company Name	Segment	10+ Employees in Core ARFV Industry (2011)	Fast Growing Employer (2006-2011)	Registered Patents (2008-2012)	Investments Received (2006-2012)	Identified by SARTA CleanStart (2013)
Altergy Systems	Advanced Transportation Energy Storage	✦	✦			✦
Exide Technologies	Advanced Transportation Energy Storage	✦				
Jadoo Power Systems, Inc.	Advanced Transportation Energy Storage	✦				✦
Springboard Biodiesel LLC	Alternative Fuels - Biodiesel					✦
Novozymes	Alternative Fuels - Ethanol	✦		✦		
Pacific Ethanol, Inc.	Alternative Fuels - Ethanol				✦	✦
Carbon Sequestration LLC	Alternative Fuels - Waste-to-energy biogas					✦
Clean World	Alternative Fuels - Waste-to-energy biogas				✦	✦
Onsite Power Systems, Inc.	Alternative Fuels - Waste-to-energy biogas					✦
Organic Energy Corporation	Alternative Fuels - Waste-to-energy biogas					✦
Sierra Energy	Alternative Fuels - Waste-to-energy biogas					✦
Synterra Energy	Alternative Fuels - Waste-to-energy biogas					✦
Battery M.D., Inc.	Alternative Motor Vehicles & Equipment					✦
Efficient Drivetrains	Alternative Motor Vehicles & Equipment					✦
Clipper Creek	Fueling Infrastructure					✦

Note: Employment data includes only companies in the core ARFV industry
Data Source: Employment data from National Establishments Time Series Database; Patent data from US Patent Trade Office, 1790 Analytics; Investment data from CB Insights
Analysis: Collaborative Economics

Employer Engagement Questions for Discussion

1. What do you know about the employers on the list above?

2. In addition to the list above, what other employers need to be engaged?

3. **What is your current employer engagement strategy?** How can it be expanded for the advanced transportation cluster?

AB 118 Regional Industry Clusters of Opportunity

ADVANCED TRANSPORTATION DIAGNOSTIC PACKAGE

San Diego Region

September 2013

CONTENTS

INTRODUCTION

Transportation is a vital part of the California economy, connecting businesses and communities across the state with highways, railways, shipping, and aviation routes. This vast transportation network also takes a tremendous amount of energy to run, most of which comes from petroleum. Burning this fuel creates air pollution such as particulates, air toxics and smog, contributing to air quality problems in many California regions.

Given the impact of the transportation sector, California state and local policymakers have implemented a number of laws and programs for more efficient, renewable, and innovative transportation fuels and vehicles. The California Alternative and Renewable Fuel, Vehicle Technology, Clean Air, and Carbon Reduction Act of 2007 (Assembly Bill (AB) 118) is an important part of California's transportation strategy. AB 118 created the Alternative and Renewable Fuel and Vehicle Technology Program in California Energy Commission (The Commission) to fund projects to develop and deploy innovative technologies that transform the state's fuel and vehicle types to help attain the California's climate goals.

The California Workforce Investment Board and the Commission, working in coordination with the California Labor and Workforce Development Agency, is funding this AB 118 Regional Industry Clusters of Opportunity (RICO) grant program to develop and implement strategies to advance regional economies and workforce in targeted alternative fuel and vehicle clusters.

Transportation fuels are the leading source of greenhouse emissions in California, accounting for 38 percent California's total greenhouse gas emissions.

RICO OVERVIEW

This Diagnostic Package is a part of the first of four stages in the RICO process. Below is an overview of the entire RICO process for your reference. These dates offer a general guide to the timing, but are flexible. The stages listed are excerpts from the RFP; please consult the original RFP for details.

STAGE 1
Clusters of Opportunity Diagnosis
July-September 2013

Collaborative Economics and the regional team work together to develop a regional diagnostic package of relevant research and analyses, to increase understanding of the region's economic and workforce opportunities in the alternative fuels and vehicles cluster

Action Clinic #1 in Sacramento - September 2013

STAGE 2
Collaborative Priority-Setting
October 2013-March 2014

Regional teams design and implement a collaborative cluster engagement process, in which they identify, invite, and host employers in cluster meetings to develop the Industry Sector Partnership. Meetings are designed to elicit (1) priority opportunities for cluster growth, (2) priority requirements to capitalize on those opportunities (both workforce and economic development related), and (3) employer "champions" who will work with community partners to design and implement a cluster investment strategy and sustainability plan.

Action Clinic #2 in Sacramento - January 2014
Site Visits by Technical Assistance team - #1 November 2013 and #2 March 2014 (or as needed)

STAGE 3
Clusters of Opportunity Investment Strategy
April-July 2014

The Industry Sector Partnership will identify and connect specific investments and commitments of local, state, and federal government partners, as well as private firms, industry associations, non-profit partners, private foundation partners, and others to advance the competitive position of regionally targeted clusters of opportunity. This activity should produce a cluster investment strategy with specific organizational commitments and champions organized around shared cluster priorities, which should be aligned with regional resources to form career pathways in alternative fuel and vehicle technology industries.

Action Clinic #3 in Sacramento - May 2014
Site Visits #3 by Technical Assistance team if needed

STAGE 4
Sustainable Implementation
August-December 2014

The Industry Sector Partnership will develop the support for long-term sustainability and growth, which should produce a set of broader organizational and policy changes to sustain and expand regional cluster of opportunity strategies, as well as a lasting mechanism to support ongoing collaboration among all the partners. Regional teams will produce an action plan, including a cluster investment strategy and sustainability plan, to be approved by the State Board. Regions are expected to begin implementation before the grant period ends on December 31, 2014.

Showcase Event in Sacramento - September 2014

HOW TO USE THE DIAGNOSTIC PACKAGE

The goal of the RICO process is to develop and implement alternative and renewable fuel and vehicle (ARFV) clusters of opportunity strategies, mobilizing employers and regional partners to advance the competitive position of targeted clusters. This RICO initiative is a structured process that supports Regional Economic and Workforce Development Networks. These Networks consist of economic and workforce development practitioners and industry, forming Industry Sector Partnerships and developing action plans to support and advance targeted industry clusters. Regions are focusing on one or more established and/or emerging clusters of opportunity in the alternative fuel and vehicle transportation sector.

This Diagnostic Package is designed to provide data to illustrate regional progress, strengths, and emerging opportunities in a range of AB 118 areas. The data, along with your personal knowledge and experience of activities and priorities in the region, and other resources from your region if available, can allow you to make data-based decisions when determining or reviewing your RICO area of focus.

Each section of the Diagnostic Package ends with questions to help focus the conversation on identifying clusters of opportunity to prioritize in the RICO process.

San Diego and Imperial counties are working together to increase the attractiveness of the region for commercializing and producing biofuels. The San Diego metro area has long been a hub of biofuels and biotechnology research and development, and several leading algae and next generation biofuel companies already have headquarters and research facilities in the area. Imperial County's location advantages (e.g. proximity, real estate and climate) and workforce assets offer a natural value proposition for companies seeking to produce biofuels. The current RICO process will focus on reducing barriers to siting biofuels facilities and enhancing workforce training to better tailor local skills to the needs of the sector.

Identifying Clusters of Opportunity

This diagnostic package presents a variety of data specific to your region that can help identify regional "clusters of opportunity" in advanced transportation. A cluster of opportunity is a combination of related sectors that are growing in terms of jobs, companies, investment, and/or innovation. Typically, a cluster of opportunity is comprised of sectors that are export-oriented, population driven, and offer occupations with career potential, creating workforce opportunities for regions in the state. The data provided in this package is focused around workforce, technology adoption, and innovation in the industry. We suggest using the following four kinds of information to help identify advanced transportation areas of opportunity in your region:

1. **Growth in employment** (e.g. jobs by segment and occupation opportunities)
2. **Growth in companies** (e.g. new establishment formation or existing business growth)
3. **Growth in technology adoption** (e.g. biofuel production projects, alternative vehicles, clean vehicle rebates, and fueling infrastructure)
4. **Growth in innovation** (e.g. investments and patents)

WORKFORCE OPPORTUNITIES

The advanced transportation industry has created jobs across the state, many of which require new training programs to prepare the workforce. This section provides an overview of employment and common occupations in the industry, as well as the educational profile for the region.

Core Employment in Regional Advanced Transportation Segments

This section examines a snapshot of the region's employment as of January 2011 (most recent year available) to profile the sector's core employment and diversity of activities. Employment data used in this analysis is built from the National Establishments Time Series database, which contains employment at the establishment level throughout the state of California. Using industry organization membership lists, private and public financing reports, local government programs and industry codes to identify specific companies active in the sector, companies were identified that are developing, producing, supplying and servicing products in the advanced transportation industry. The table below details the types of technologies included within each industry segment.

Segments of the ARFV Industry

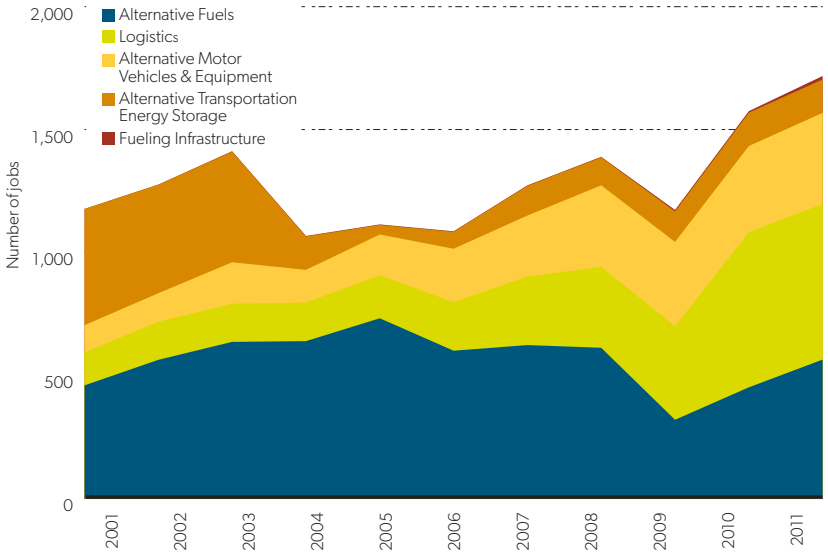
Alternative Motor Vehicles & Equipment	**Motorized vehicle and equipment technology** including, electric, hybrid and natural gas vehicles, as well as diesel technology, and efficiency-enhancing vehicle/engine components.
Alternative Fuels	**Transportation fuels** including biodiesel, ethanol, hydrogen, and algae-based.
Fueling Infrastructure	**Technology enabling vehicle fueling and storage of alternative fuels,** including electric vehicle charging, and hydrogen, natural gas, ethanol and biodiesel fueling.
Alternative Transportation Energy Storage	**Power and energy storage technology for alternative motor vehicles,** including advanced batteries (advanced lead-acid, lithium-ion, nickel-metal hydride and ultracapacitors), proton exchange membrane (PEM) fuel cells, and hybrid hydrogen storage systems.
Logistics	**Products and services to enhance efficiency in transportation** including fleet tracking and traffic monitoring.

Analysis: Collaborative Economics

Employment levels represent core employment in companies directly related to alternative fuels and vehicles in the region. This dataset includes companies that devote a majority of their business efforts to advanced transportation technologies and services, but does not include companies that have some activity but not an explicit focus on the industry. For example, a vehicle repair shop with employees that service some electric vehicles, but work primarily with conventional vehicles are not included in this analysis. Similarly, a farmer or processing facility supplying a cellulosic ethanol pilot plant with leftover biomass and large automakers like General Motors and Honda are not included. Companies that are shifting into advanced transportation activities from the "adaptive" sector and are important for overall market growth, but this section will focus on core alternative fuel and vehicle companies that are leading change in the industry.

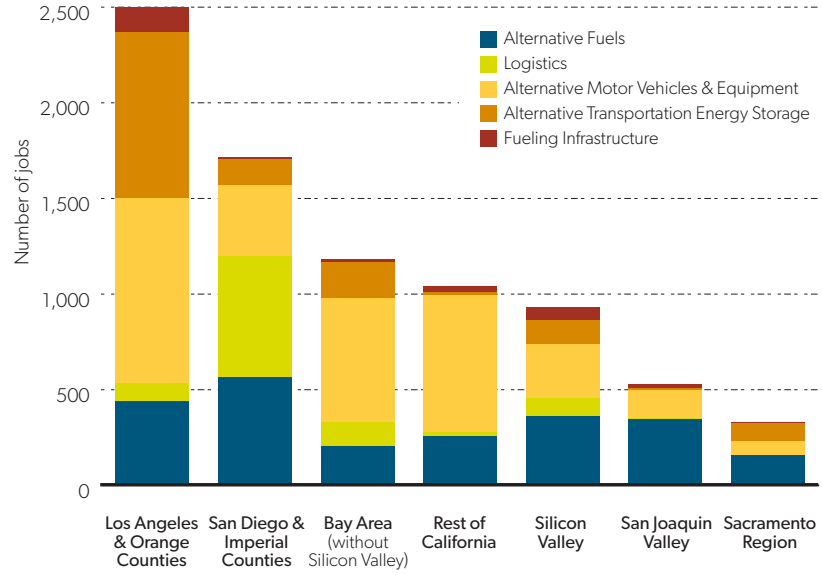
Core Employment by Segment

San Diego and Imperial Counties, 2001-2011



Core Employment by Region

2011



Data Source: National Establishments Time Series Database, Green Establishments Database
Analysis: Collaborative Economics

Alternative Fuels is one of the region's most prominent segments, accounting for more than 550 jobs in the region in 2011, and increased 77 percent since 2009.

• • •

There were **2.5 times** as many alternative fuels jobs in proportion to the total economy as California overall in 2011.

• • •

More than 35 biofuels companies were active in the region in 2011, with roughly a third focused primarily on research and development.

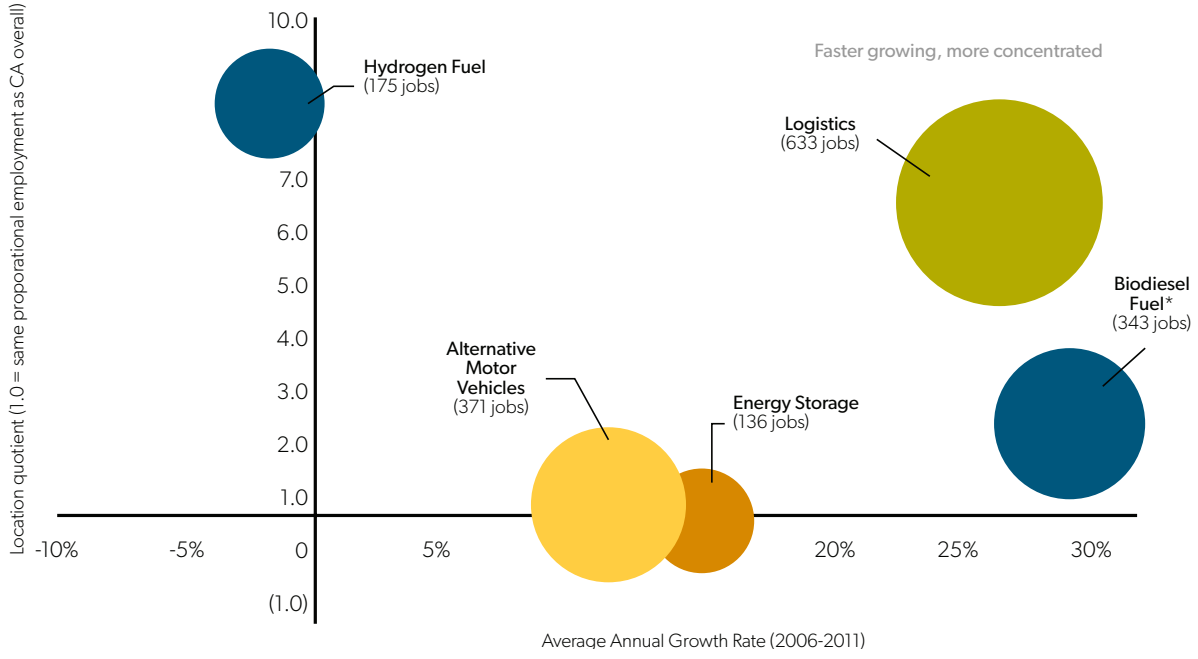
• • •

Transportation logistics provided the highest number of ARFV sector jobs in the region in 2011 (roughly 600), though involved only a handful of larger companies including Smart Drive Systems and DriveCam Inc.

The bubble chart provides perspective on three dimensions: the size, growth, and employment concentration in a cluster. Cluster bubbles arranged together in a chart help to communicate the overall regional picture. It tells what industries make up the region, their size, growth, and relative employment concentration. The size of the bubble shows the employment size for the industry cluster. The horizontal x-axis displays the annual average growth rate between 2006 and 2011. The vertical y-axis displays the employment concentration of each industry which is a sign for potential regional specialization and competitive advantage. A concentration greater than one indicates that the region's employment in that cluster represents a larger percentage of the region's total employment than is the case for the state as a whole. In other words, a concentration greater than one suggests that the region is relatively specialized in the cluster when compared with the state.

Core Employment

Employment Level, Concentration Compared to California and Growth Rate
San Diego and Imperial Counties, 2006-2011

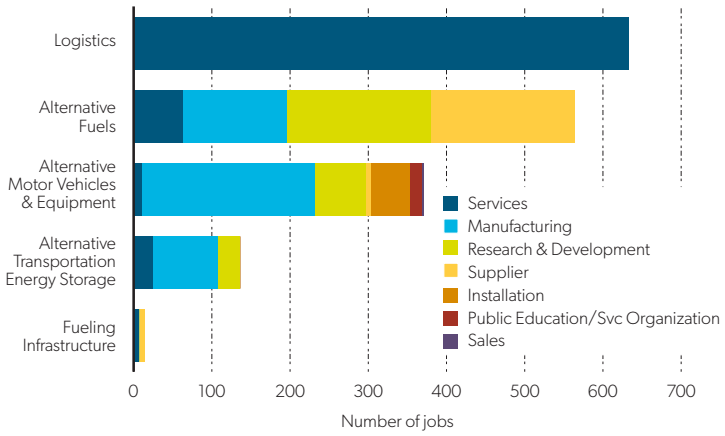


*Reflects average annual growth rates higher than 30%, includes advanced biodiesel feedstock production.
Data Source: Green Establishments Database, National Establishments Time Series Database
Analysis: Collaborative Economics

The following regional employment charts provide a closer look at what types of jobs are in each segment, including the establishment's primary function or daily activity along the production value chain.

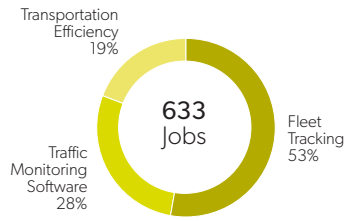
Core Employment by Value Chain Activity

San Diego and Imperial Counties, 2011



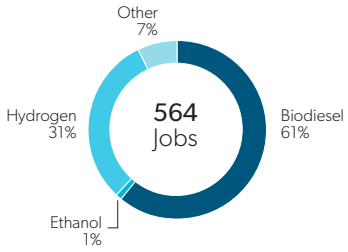
Transportation Logistics Employment

San Diego and Imperial Counties, 2011



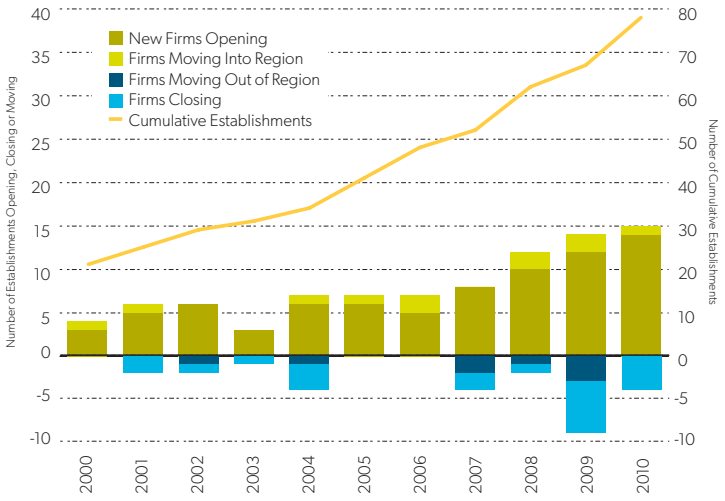
Alternative Fuels Employment

San Diego and Imperial Counties, 2011



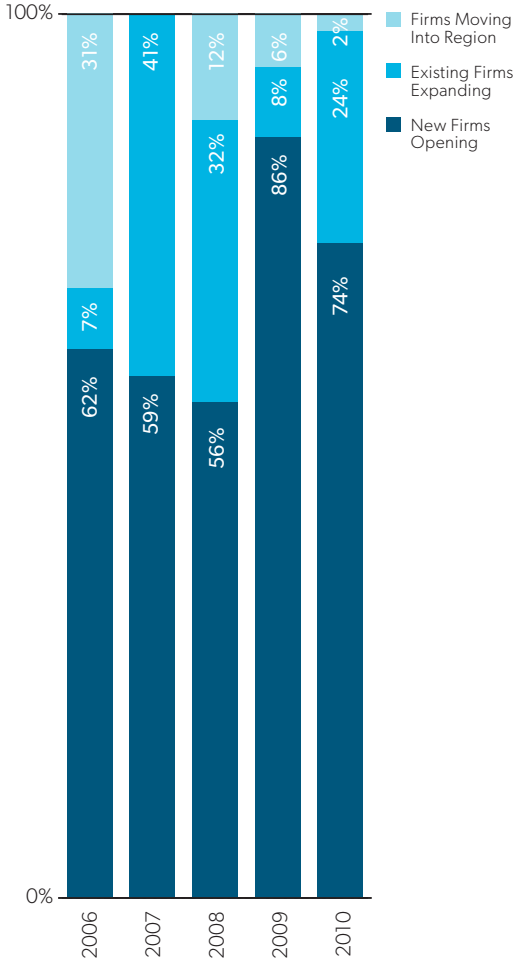
Core Establishments Churn

San Diego and Imperial Counties, 2000-2010



Core Employment Growth by Source

San Diego and Imperial Counties, 2006-2010



Data Source: National Establishment Time Series Database, Green Establishments Database
Analysis: Collaborative Economics

Occupations in Advanced Transportation

The ARFV industry includes workers in a wide variety of occupations throughout the supply chain, ranging from research and development, to manufacturing and sales. The Bureau of Labor Statistics (BLS) used green survey results and interviews with industry experts to identify common occupations in the biofuels sector. BLS identified a total of 23 occupations using the Standard Occupational Classification system, which allows for cross referencing with employment and wage data. While the list of occupations is not exhaustive for the ARFV industry, it does provide the most comprehensive list available of the most common occupations in ARFV businesses. Some occupational skills may transfer directly from a different industry into an ARFV business, though other occupations or skills may require additional training for an ARFV specific skill set. This list can be a starting point for regions to target certain occupations for training and emerging growth opportunities.

Common occupations for the biofuels sector are listed in the following tables. The number of employees, average annual wage, typical entry education levels, green outlook, and employment projections for each identified occupation are detailed below. Occupation titles are standardized across industries, so the results below are for all industries and not ARFV specific, though this does provide a snapshot of the potential workforce pool for the ARFV industry. The Green Outlook (see table below) is the result of research by the Occupational Information Network's (O*NET) National Center for Development, which analyzed occupations in the green economy to identify how worker requirements and demand is expected to change.

Green Outlook Descriptions

Enhanced Skills Occupations	**Green economy activities and technologies are likely to cause significant change to the work and worker requirements.** New tasks, skills, knowledge, credentials may be needed. Employment demand remains the same, but there is potential for an increase.
New and Emerging Occupations	**The impact of green economy activities and technologies is sufficient to create the need for unique work and worker requirements,** which results in the generation of new occupations.
Increased Demand	**Green economy activities and technologies are likely to increase the employment demand,** but will not lead to significant changes in the work and worker requirements.

Data Source: O*Net

The biofuels sector has 23 occupations identified by BLS in areas such as scientific research, engineering, construction, agriculture, plant operations, and sales.

Biofuel Industry-Related Common Occupations

San Diego and Imperial Counties

Occupation Title	Regional Average Annual Wage (Q1 2013)	Regional Employment (May 2012)	General Education Category	Green Outlook
Biochemists and biophysicists	$105,146	1,560	3	Not available
Construction managers	$99,068	2,270	2	+
Industrial production managers	$98,342	1,370	3	✸
Electrical engineers	$97,807	2,390	3	+
Chemists	$90,597	1,890	3	⬆
Farmers, ranchers, and other agricultural managers	$90,388*	*	1	+
Industrial engineers	$87,592	2,010	3	⬆
Civil engineers	$87,557	3,780	3	✸
Mechanical engineers	$86,954	3,480	3	✸
Environmental engineers	$81,788	840	3	✸
Chemical engineers	$78,317	240	3	⬆
Agricultural engineers	$77,259*	*	3	Not available
Soil and plant scientists	$73,669	40	3	+
Wholesale and manufacturing sales representatives, techical and scientific products	$71,970	3,930	3	✸
Microbiologists	$67,841	600	3	Not available
Operating engineers and other construction equipment operators	$57,193	1,580	2	⬆
Buyers and purchasing agents, farm products	$49,592	50	2	⬆
Industrial machinery mechanics	$49,119	1,260	2	⬆
Chemical equipment operators and tenders	$46,288	310	2	⬆
Chemical technicians	$44,686	510	2	⬆
Construction laborers	$38,965	7,150	1	+
Agricultural equipment operators	$22,078	160	1	Not available
Farmworkers and laborers, crop, nursery, and greenhouse	$19,844	7,860	1	Not available

Average Wage Levels
- $80,000 and up
- $40,000 - $79,999
- Below $39,999

General Education Category
- 3 Bachelor's Degree or Higher
- 2 Post-High School Training to Associate's Degree
- 1 High School Diploma or Less

Green Outlook
- + Enhanced Skills Occupations
- ✸ New and Emerging Opportunities
- ⬆ Increased Demand

*Regional data unavailable, state average annual wage provided.

Note: Regional data is for Metropolitan Statistical Areas within the region.

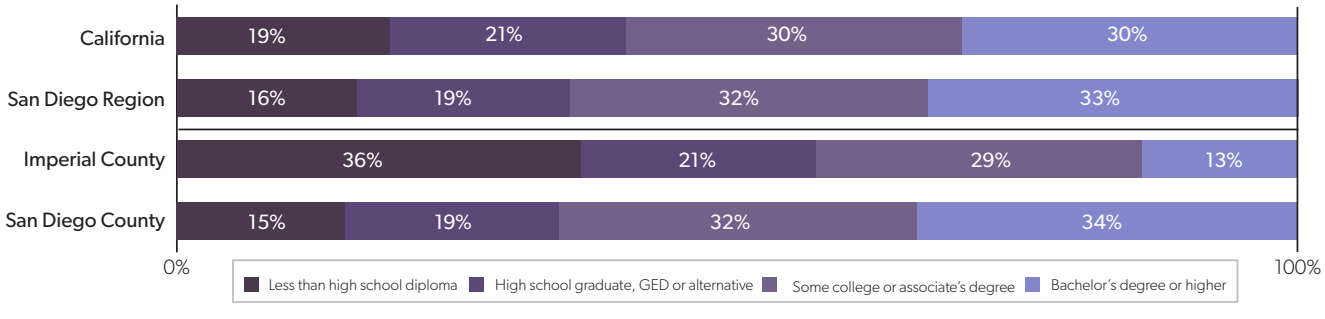
Data Source: California Employment Development Department, U.S. Bureau of Labor Statistics, and O*NET Online

Analysis: Collaborative Economics

Educational Attainment in the Region

Educational Attainment

San Diego and Imperial Counties, 2011



Data Source: U.S. Census Bureau, American Community Survey Analysis: Collaborative Economics

Workforce Opportunities Questions for Discussion

1. **What are your region's most important segments for employment?** Consider employment size and growth as well as degree of specialization. How have these changed over time?

2. **What other companies in the adaptive advanced transportation economy are part of the supply chain in your region?** (e.g. original equipment manufacturers, auto repair shops)

3. **Considering employment, specialization, wages, and education levels, which occupations are likely to be critical to future cluster growth?**

4. **Given the employment and occupation patterns identified, what are the implications for engaging regional partners and employers?**

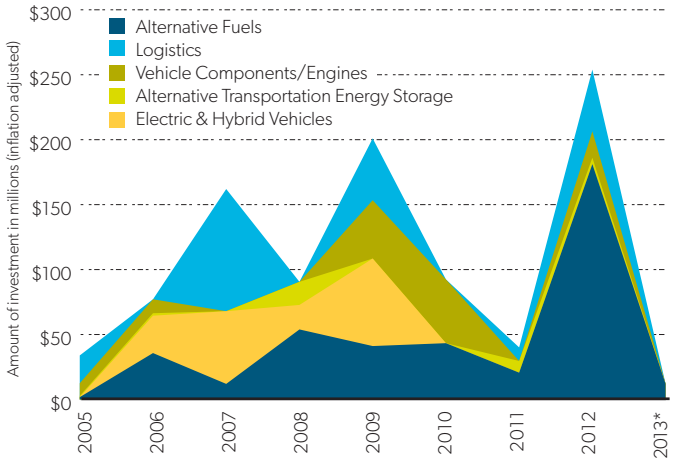
INNOVATION IN ADVANCED TRANSPORTATION

Transportation technologies have evolved dramatically in the last 100 years, but new innovations are still necessary for California to achieve its greenhouse gas reduction goals. California businesses and inventors are striving to make the shift from a carbon-based to a cleaner and more efficient economy. Financial investments in alternative fuel and vehicle technology companies help to commercialize and scale new products and services. Similarly, patent registrations reflect private and public research and development investments and industry growth potential.

Investment in Regional Advanced Transportation Companies

Venture Capital Investment

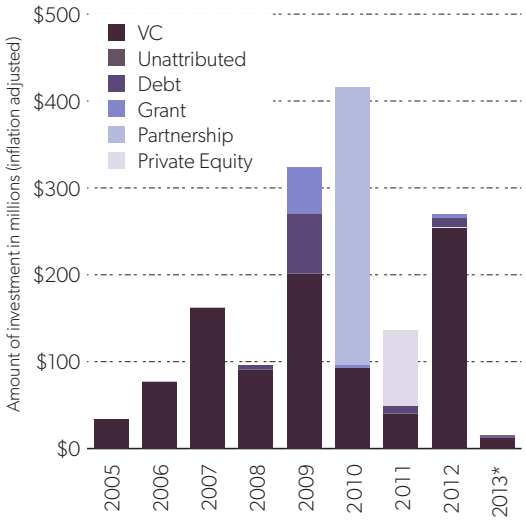
In Alternative Fuel and Vehicle Technology
San Diego and Imperial Counties, 2005-2013*



*2013 data as of July 1, 2013

Types of Investments

San Diego and Imperial Counties, 2005-2013*

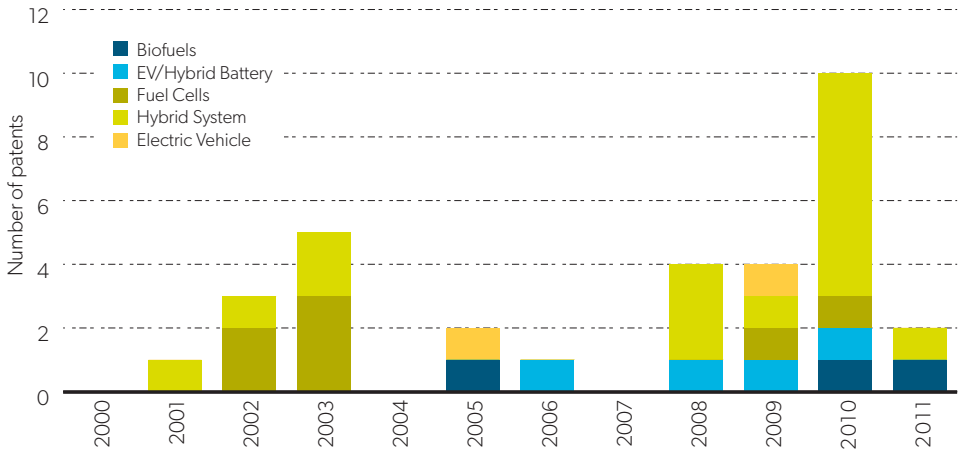


Data Source: CB Insights
Analysis: Collaborative Economics

Patents in Regional Advanced Transportation Technologies

Alternative Fuel and Vehicle Patents

San Diego and Imperial Counties, 2000-2011



Source: US Patent Trade Office, 1790 Analytics
Analysis: Collaborative Economics

Innovation Questions For Discussion

1. Which new and innovative technologies are being developed and scaled is your region?

2. Are there any existing academic or sector partnerships to leverage to expand regional innovation capabilities?

3. Are there other industries or research institutions in the region that could be leveraged to expand regional innovation capabilities?

4. Given innovation activity in the region, what are the implications for engaging partners and employers?

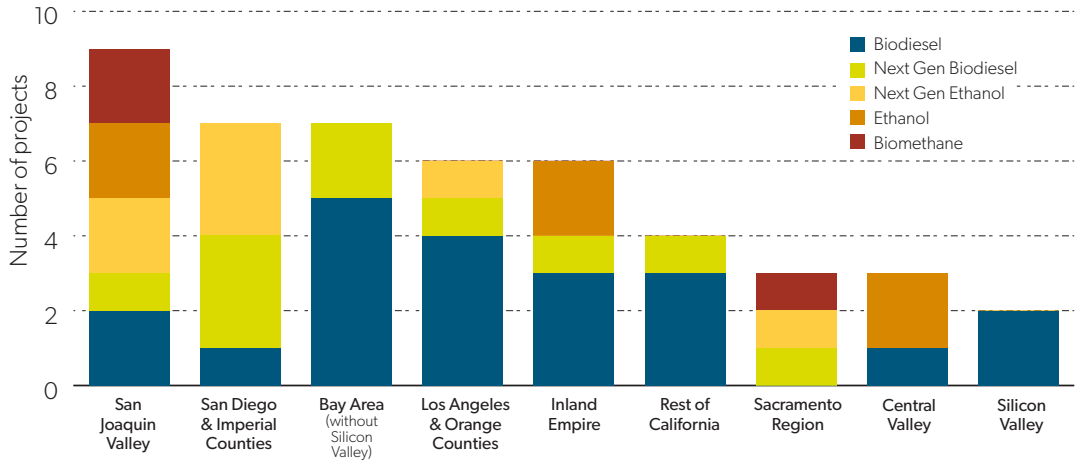
ADVANCED TRANSPORTATION TECHNOLOGY IMPLEMENTATION AND GROWTH

The following charts show how the region has been adopting new alternative vehicle technologies, deploying supportive alternative vehicle infrastructure, and deploying transportation biofuel production projects. This section can show where market demand in your region is focused and therefore where opportunities are to leverage the market and advance the industry.

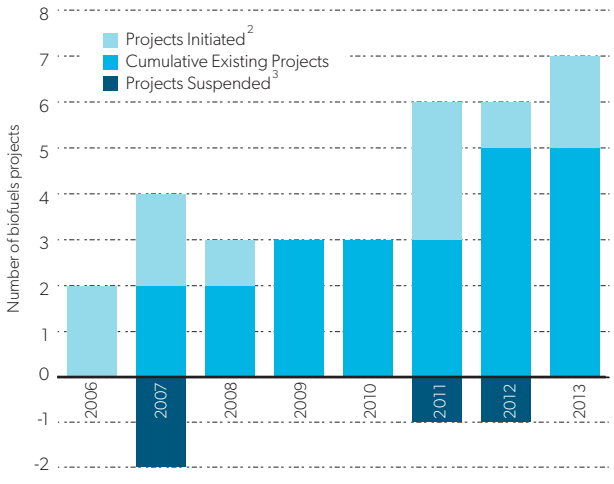
Biofuel Production Projects in the Region

Commercialization and production of biofuels can result from capitalizing on growing research and investment and leveraging policies such as California's Low Carbon Fuel Standard. Biofuels include first generation biofuels such as ethanol and biodiesel, as well as a growing number of next generation advanced biofuels, such as cellulosic ethanol or algae-based biodiesel. Many of the next generation biofuel projects noted in this section are demonstration-scale facilities, as companies seek to refine their process and increase cost competitiveness. This section focuses on biofuel for transportation and excludes biomass or waste-to-energy processes that exclusively generate electricity or are used for pipeline gas.

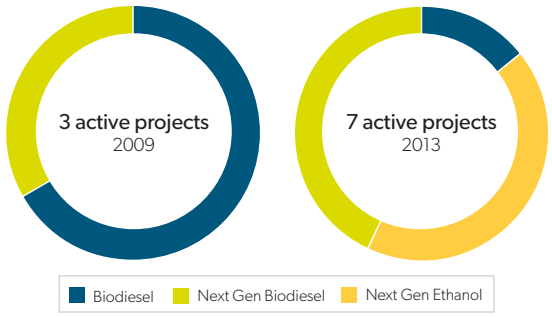
Transportation Biofuels Projects by Region[1]
As of July 2013



Cumulative Transportation Biofuels Projects
San Diego and Imperial Counties, 2006-2013



Active Biofuels Projects[4]
San Diego and Imperial Counties, 2009 and 2013



1. Projects include announced, commissioned, under-construction and permitted projects, and exclude abandoned or suspended ones.

2. Project initiation dates are based on reported announced, permitted, financed or comissioned dates, based on available data.

3. Project suspension dates include reported suspended or abandoned dates.

4. Active Projects include announced, commissioned, under-construction and permitted projects, and exclude abandoned or suspended ones.

Data Sources: Bloomberg New Energy Finance, E2 Environmental Entreprenuers, Renewable Fuels Association, Biodiesel Magazine, and National Biodiesel Board

Analysis: Collaborative Economics

Alternative Vehicle Registrations in the Region

Alternative Vehicle Registrations

San Diego and Imperial Counties, 2011

	Imperial County Total	San Diego County Total	Proportion of Regional Registrations by Vehicle Fuel Type
All Fuels	134,120	2,341,033	
Flex Ethanol	4,244	44,291	2.0%
Natural Gas	154	2,471	0.1%
Electric	69	2,196	0.1%
Propane	10	119	0.0%
Plug In Hybrid	1	126	0.0%
Hydrogen	-	-	0.0%

Alternative vehicles include zero emission vehicles such as electric and hydrogen fuel cell and low-emission/low carbon fuel vehicles using fuels such as natural gas, ethanol, and propane.

Data Source: California Energy Commission
Analysis: Collaborative Economics

Clean Vehicle Rebates Issued in the Region

Clean Vehicle Rebates Issued

San Diego and Imperial Counties, 2010-2013*

	2010	2011	2012	2013*	Grand Total
IMPERIAL COUNTY					
Plug-in Hybrid Electric Vehicles			3	2	5
Zero Emission Vehicle				1	1
SAN DIEGO COUNTY					
Plug-in Hybrid Electric Vehicles			449	342	791
Zero Emission Vehicle	6	966	359	498	1829
REGIONAL SHARE OF TOTAL CALIFORNIA REBATES					
Plug-in Hybrid Electric Vehicles			6%	7%	7%
Zero Emission Vehicle	8%	22%	10%	9%	13%

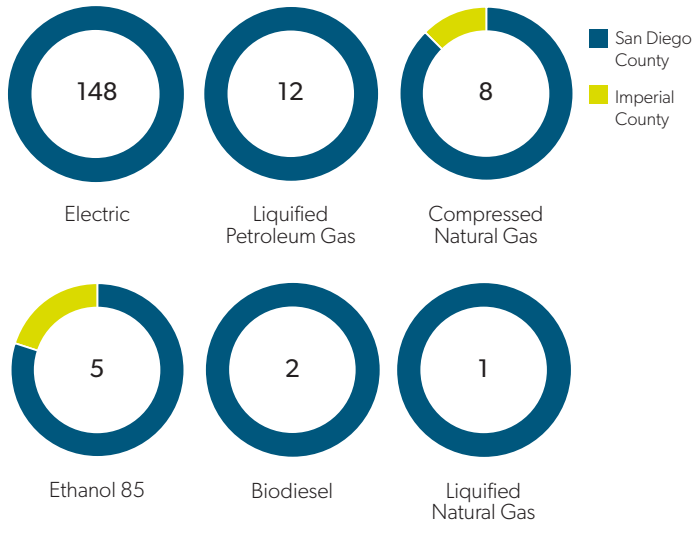
*Note: 2013 data is as of June 17, 2013
Data Source: Center for Sustainable Energy California, Clean Vehicle Rebate Project
Analysis: Collaborative Economics

In addition to supporting alternative vehicles that use a range of lower emission fuel types, California has taken specific actions to stimulate demand for zero emission vehicles. Since alternative vehicle registration data is only available through 2011, clean vehicle rebates are used as a proxy for the number of alternative vehicles purchased in the last two years. Clean vehicle rebates apply to plug-in hybrid electric and zero emission vehicles (fuel cell or all electric), not other alternative vehicle types such as natural gas or flex ethanol.

Alternative Fueling Infrastructure Available in the Region

Alternative Fueling Stations

San Diego and Imperial Counties, Public Access Stations as of June 2013



Widely-available alternative fueling infrastructure is a critical requirement of widespread adoption of new alternative vehicles. Range anxiety is a common concern among electric vehicle owners as the batteries are generally not able to provide enough charge for long distance trips. Private fueling stations are important to support individual businesses, fleets, or individual use, but public access stations are essential for wider adoption of alternative vehicles.

Data Source: U.S. Department of Energy, Alternative Fuels Data Center
Analysis: Collaborative Economics

Technology Growth and Implementation Questions for Discussion

1. **How is the adoption rate for alternative vehicles changing in your region?** What are the implications?

2. **How are the alternative fueling infrastructure needs in your region changing based on regional demand for alternative vehicles and supply of biofuels?** Are there opportunities to better align demand for vehicles and access to fueling infrastructure?

3. **What policies or partnerships (e.g. business or economic development organizations) are currently in place to support the industry?**

4. **Based on these technology deployment patterns, what are the implications for engaging regional partners and employers?**

EMPLOYER ENGAGEMENT

The following list of companies are identified as high-potential employers because they have high levels of employment, high growth rates, received venture capital investments, registered patents, and/or were identified by a regional organization as a leader.

Potential Companies to Engage for RICO

San Diego and Imperial Counties

Company Name	Alternative Fuel Segment	20+ Employees in Core ARVF Industry (2011)	Expanding Employment (2006-2011)	Received Investment (2010-2013)	R&D Operations in the Region	Production/ Demonstration Operations in the Region (Announced or Operating)	Identified by CleanTECH San Diego
Algenetix	Feedstocks - Algae			✦	✦		
Cellana (formerly HR Biopetroleum)	Feedstocks - Algae		✦	✦		●	✦
Kent Bioenergy Corporation	Feedstocks - Algae		✦		✦	●	✦
Sapphire Energy	Feedstocks/Fuel - Algae	✦	✦	✦	✦	●	✦
Synthetic Genomics, Inc.	Feedstocks - Algae	✦	✦	✦	✦	✦	✦
Verdezyne, Inc.	Feedstocks - Bio Processes	✦	✦	✦		✦	✦
Genomatica, Inc.	Feedstocks - Bio Processes				✦		
Agradis	Feedstocks - Plant Science			✦	✦	●	
iDiverse	Feedstocks - Plant Science				✦		✦
SG Biofuels	Feedstocks - Plant Science		✦	✦	✦		✦
ZeaKal, Inc.	Feedstocks - Plant Science			✦	✦		
Community Fuels (American Biodiesel, Inc.)	First Gen Biodiesel					●	✦
New Leaf Biofuels	First Gen Biodiesel		✦			✦	✦
California Ethanol & Power	First Gen Ethanol					✦	
Menon & Associates	Next Gen Biodiesel		✦	✦	✦		✦
Sustainable Green Tech, Inc.	Next Gen Biodiesel		✦		✦		✦
Oberon Fuels	Next Gen Biogas-to-Fuel		✦			✦	
Canergy	Next Gen Ethanol					✦	

✦ Category applies ● Company has active production/demonstration facilities not located in San Diego and Imperial Counties

Strategic Adaptive Companies with Ties to Alternative Fuels Segment

San Diego and Imperial Counties

Company Name	Activity in Sector
General Atomics	Strategic Corporate
Life Technologies Corporation	Strategic Corporate
BP Alternative Energy (Biofuels Global Technology Center)	Strategic Corporate/Research Center
Anaergia (Services Division, Formerly UTS Bioenergy)	Strategic Corporate
CMAE Capital	Venture Capital (ties to SD-CAB)
Finistere Ventures, LLC	Venture Capital
Kapyon Ventures, LLC	Venture Capital/Incubator

Note: Employment data includes only companies in the core ARFV industry

Data Source: Employment data from National Establishments Time Series Database; Patent data from US Patent Trade Office, 1790 Analytics; Investment data from CB Insights

Analysis: Collaborative Economics

Employer Engagement Questions for Discussion

1. What do you know about the employers on the list above?

2. In addition to the list above, what other employers need to be engaged?

3. **What is your current employer engagement strategy?** How can it be expanded for the advanced transportation cluster?

SITING BIOFUELS PRODUCTION FACTILITIES

Six biofuels projects launched in San Diego and Imperial counties between 2011 and 2013, dramatically increasing the number of bio-based fuel production and demonstration projects in the region. In 2010, there were only 3 biofuel facilities total across the two counties. Many of the new projects involved next generation feedstocks and processes, building on the region's biotechnology and research strengths. Despite its recent gains, the region lags behind the San Joaquin Valley in the number biofuels projects, and has not yet secured a fuel-producing algae facility, according to Bloomberg New Energy Finance.

San Diego County is a leader in biofuel research and development activities in California. However, some companies that have research facilities in the area are choosing to locate larger scale sites outside of the state, though Imperial County offers many benefits for production facilities. Therefore, Collaborative Economics Technical Assistance team interviewed business leaders from Oberon Fuels, Sapphire Energy, Synthetic Genomics and Cellana to learn about the opportunities and challenges around siting production facilities in the region. Summary points from their comments are below.

Key motivations for deciding to produce in the region include the following:

- Proximity to company headquarters or R&D facilities
- Suitable climate and local resources to grow algae or procure agricultural waste feedstocks
- Space to expand
- Reputation of Imperial County as a better place to permit facilities than some other parts of California

Key challenges for producing bio-based fuels in the region include the following:

- High cost and time to permit facilities
- Perception of environmental permitting risk in California
- Low availability of workers with scientific technical skills (e.g. laboratory)
- Difficult economics of producing algae-based fuel as a primary business (this is industry-wide and applies to any prospective site)

Commercial Algal Biofuel Production Demonstration Facilities
United States, 2013

State	Number of Facilities	Companies/Organizations
New Mexico	2	Sapphire Energy; New Mexico State University-CEHMM
Pennsylvania	1	Bard Holding, Inc.
Texas	1	PetroSun BioFuels, Inc.
Rhode Island	1	Tomorrow BioFuels, LLC
Missouri	1	Green Star Products, Inc.
Hawaii	1	Cellana, LLC
Colorado	1	Solix BioSystems

Includes announced, permitted, financed and commissioned projects.
Data Source: Bloomberg New Energy Finance

Opportunities in Algae for Imperial Valley
Cellana, LLC. - Martin Sabarsky, Chief Executive Officer

Cellana is developing algae technology in Hawaii to produce three products: high-value omega-3 fatty acids, diesel fuel and agricultural supplements. The company currently has an administrative office in San Diego, and has announced the intention to develop a larger commercial-scale facility.

According to Cellana's CEO, the three most significant considerations for siting the next facility are place, people and electricity costs. Within the "place" category are natural attributes such as climate, non-agricultural real estate and access to salt water (for which Imperial County is well suited), as well as the perception of risks among the investor community about the location. California is perceived as a higher risk location because of the time, cost and potential litigation around permitting. "People" includes labor costs; the majority of jobs required for the new facility will require a high school education.

With assistance and guidance, Cellana may be open to navigating the permitting process in Imperial County.

Opting to Produce Fuel in Imperial Valley

Oberon Fuels - Dr. Rebecca Bourdreaux, President; Amy Stapp, Engineer

As of late August 2013, Oberon Fuels will be producing dimethyl ether (DME) fuel at its production facility in Brawley, California, the first fuel grade DME plant in North America.

Dr. Bourdreaux cited several main considerations in selecting Imperial County for their first production site, including proximity to the firm's headquarters in La Jolla, access to DME feedstocks (manure, agricultural waste) and the comparatively receptive economic, environmental, and procedural conditions in the county versus other regions in California. Within this third category she specifically noted that the responsiveness from the Imperial Valley Economic Development Corporation, high unemployment in the region, and Imperial's reputation for fairly efficient regulatory processing affected the decision to locate in Brawley.

Oberon spent about seven months and roughly $100,000 on the permitting process. Their facility did not trigger an Environmental Impact Review (EIR), which would have incurred additional costs, though Stapp mentioned that future expansion may involve an EIR. As the company looks ahead, it plans to add 5 more production units, 2 of which may be in Imperial County.

Bourdreaux had suggestions for improving the attractiveness of siting in the region. First, she recommended designating a single contact to help shepherd through the permitting paperwork, in order to speed up the process and increase accountability across the nine agencies involved in approving permits. In addition, because identifying good partners and building trust within the community was important to the success of the project, there is room for additional help in building those relationships and educating residents.

Opting to Produce Algae in Imperial Valley

Synthetic Genomics, Inc- Joe Mahler, CFO; Charlie Witherspoon, Principal Engineer; Dave Hanselman, Director of Regulatory Affairs

Synthetic Genomics, Inc. (SGI) launched demonstration scale algae production in Imperial County in November 2012, complementing its headquarters and pilot-scale facilities in La Jolla. Although the company originally intended to use the site to produce algae-based fuel, SGI has since shifted focus to higher value oleochemicals for food and cosmetics. SGI selected the Imperial site (an existing facility out of use for 10 years) because of the proximity to its other facilities, the potential to expand its space, the local climate, and access to natural resources such as water and carbon dioxide.

Launching the production facility involved challenges in permitting and finding an adequately skilled workforce. The permitting process required 6-8 months of all-hands-on-deck effort, and for the state compliance portion, cost more than $200,000. Witherspoon noted, "for a start-up company, six months is a significant period of time." Regarding workforce, SGI struggled to find local workers with laboratory and science technician skills, despite communicating with multiple workforce organizations. The recruiting process took months, though they were able to eventually find qualified workers from the area.

Mahler offered suggestions for improving the attractiveness of the area. First, additional development of shared infrastructure for algae producers, such as municipal waste water treatment facilities and transport roads could help reduce costs to individual companies of locating in the valley. Second, improving public relations around the Salton Sea could lower roadblocks to development of algae in the area.

Choosing Elsewhere to Produce Algae-based Fuel

Sapphire Energy - Tim Zenk, VP of Corporate Affairs

Sapphire Energy is one of the highest profile algal fuel companies in the United States, and has secured four rounds of venture funding, involved Monsanto as a corporate partner and paid off its federal loan guarantees. Sapphire's headquarters is located in San Diego, though its research and development and 100 acre production facilities are housed in New Mexico.

Zenk pointed to the risks with permitting and producing green crude in California as the chief reason for not locating in the state. In California, even after completing the permitting process and receiving approval on the site design and specifications, private entities can sue. This adds risk and potential cost to the process of locating a facility; litigation is expensive, unpredictable and has uncertain outcomes. In contrast, in New Mexico, once the permitting process is complete and as long as the company remains in compliance, there is little opportunity for private litigation. Companies can generally move forward with certainty.

The monetary and time cost of compliance with California regulation also influenced the decision. In New Mexico, Sapphire permitted the 100 acre production facility in one year, for roughly $2 million. In California, their internal research suggested it would take five years, with substantial additional costs to account for the risks of litigation and time.

AB 118 Regional Industry Clusters of Opportunity

ADVANCED TRANSPORTATION DIAGNOSTIC PACKAGE

San Joaquin Valley

September 2013

CONTENTS

INTRODUCTION

Transportation is a vital part of the California economy, connecting businesses and communities across the state with highways, railways, shipping, and aviation routes. This vast transportation network also takes a tremendous amount of energy to run, most of which comes from petroleum. Burning this fuel creates air pollution such as particulates, air toxics and smog, contributing to air quality problems in many California regions.

Given the impact of the transportation sector, California state and local policymakers have implemented a number of laws and programs for more efficient, renewable, and innovative transportation fuels and vehicles. The California Alternative and Renewable Fuel, Vehicle Technology, Clean Air, and Carbon Reduction Act of 2007 (Assembly Bill (AB) 118) is an important part of California's transportation strategy. AB 118 created the Alternative and Renewable Fuel and Vehicle Technology Program in California Energy Commission (The Commission) to fund projects to develop and deploy innovative technologies that transform the state's fuel and vehicle types to help attain the California's climate goals.

The California Workforce Investment Board and the Commission, working in coordination with the California Labor and Workforce Development Agency, is funding this AB 118 Regional Industry Clusters of Opportunity (RICO) grant program to develop and implement strategies to advance regional economies and workforce in targeted alternative fuel and vehicle clusters.

Transportation fuels are the leading source of greenhouse emissions in California, accounting for 38 percent California's total greenhouse gas emissions.

RICO OVERVIEW

This Diagnostic Package is a part of the first of four stages in the RICO process. Below is an overview of the entire RICO process for your reference. These dates offer a general guide to the timing, but are flexible. The stages listed are excerpts from the RFP; please consult the original RFP for details.

STAGE 1
Clusters of Opportunity Diagnosis
July-September 2013

Collaborative Economics and the regional team work together to develop a regional diagnostic package of relevant research and analyses, to increase understanding of the region's economic and workforce opportunities in the alternative fuels and vehicles cluster

Action Clinic #1 in Sacramento - September 2013

STAGE 2
Collaborative Priority-Setting
October 2013-March 2014

Regional teams design and implement a collaborative cluster engagement process, in which they identify, invite, and host employers in cluster meetings to develop the Industry Sector Partnership. Meetings are designed to elicit (1) priority opportunities for cluster growth, (2) priority requirements to capitalize on those opportunities (both workforce and economic development related), and (3) employer "champions" who will work with community partners to design and implement a cluster investment strategy and sustainability plan.

Action Clinic #2 in Sacramento - January 2014
Site Visits by Technical Assistance team - #1 November 2013 and #2 March 2014 (or as needed)

STAGE 3
Clusters of Opportunity Investment Strategy
April-July 2014

The Industry Sector Partnership will identify and connect specific investments and commitments of local, state, and federal government partners, as well as private firms, industry associations, non-profit partners, private foundation partners, and others to advance the competitive position of regionally targeted clusters of opportunity. This activity should produce a cluster investment strategy with specific organizational commitments and champions organized around shared cluster priorities, which should be aligned with regional resources to form career pathways in alternative fuel and vehicle technology industries.

Action Clinic #3 in Sacramento - May 2014
Site Visits #3 by Technical Assistance team if needed

STAGE 4
Sustainable Implementation
August-December 2014

The Industry Sector Partnership will develop the support for long-term sustainability and growth, which should produce a set of broader organizational and policy changes to sustain and expand regional cluster of opportunity strategies, as well as a lasting mechanism to support ongoing collaboration among all the partners. Regional teams will produce an action plan, including a cluster investment strategy and sustainability plan, to be approved by the State Board. Regions are expected to begin implementation before the grant period ends on December 31, 2014.

Showcase Event in Sacramento - September 2014

HOW TO USE THE DIAGNOSTIC PACKAGE

The goal of the RICO process is to develop and implement alternative and renewable fuel and vehicle (ARFV) regional clusters of opportunity strategies, mobilizing employers and regional partners to advance the competitive position of targeted clusters. This RICO initiative is a structured process that supports Regional Economic and Workforce Development Networks. These Networks consist of economic and workforce development practitioners and industry, forming Industry Sector Partnerships and developing action plans to support and advance targeted industry clusters. Regions are focusing on one or more established and/or emerging clusters of opportunity in the alternative fuel and vehicle transportation sector.

This Diagnostic Package is designed to provide data to illustrate regional progress, strengths, and emerging opportunities in a range of AB 118 areas. The data, along with your personal knowledge and experience of activities and priorities in the region, and other resources from your region if available, can allow you to make data-based decisions when determining or reviewing your RICO area of focus.

Each section of the Diagnostic Package ends with questions to help focus the conversation on identifying clusters of opportunity to prioritize in the RICO process.

For this RICO process, San Joaquin Valley will focus on advancing alternative fuel and vehicle industry partnerships and further developing career pathways for the sector within the region's three sub-regions. The Northern sub-region includes San Joaquin, Stanislaus and Merced counties. The Central San Joaquin sub-region includes Fresno and Madera counties. Included in the South sub-region are Kern, Kings and Tulare counties.

Identifying Clusters of Opportunity

This diagnostic package presents a variety of data specific to your region that can help identify regional "clusters of opportunity" in advanced transportation. A cluster of opportunity is a combination of related sectors that are growing in terms of jobs, companies, investment, and/or innovation. Typically, a cluster of opportunity is comprised of sectors that are export-oriented, population driven, and offer occupations with career potential, creating workforce opportunities for regions in the state. The data provided in this package is focused around workforce, technology adoption, and innovation in the industry. We suggest using the following four kinds of information to help identify advanced transportation areas of opportunity in your region:

1. **Growth in employment** (e.g. jobs by segment and occupation opportunities)
2. **Growth in companies** (e.g. new establishment formation or existing business growth)
3. **Growth in technology adoption** (e.g. biofuel production projects, alternative vehicles, clean vehicle rebates, and fueling infrastructure)
4. **Growth in innovation** (e.g. investments and patents)

WORKFORCE OPPORTUNITIES

The advanced transportation industry has created jobs across the state, many of which require new training programs to prepare the workforce. This section provides an overview of employment and common occupations in the industry, as well as the educational profile for the region.

Employment in Regional Advanced Transportation Segments

This section examines a snapshot of the region's employment as of January 2011 (most recent year available) to profile the sector's core employment and diversity of activities. Employment data used in this analysis is built from the National Establishments Time Series database, which contains employment at the establishment level throughout the state of California. Using industry organization membership lists, private and public financing reports, local government programs and industry codes to identify specific companies active in the sector, companies were identified that are developing, producing, supplying and servicing products in the advanced transportation industry. The table below details the types of technologies included within each industry segment.

Segments of the ARFV Industry

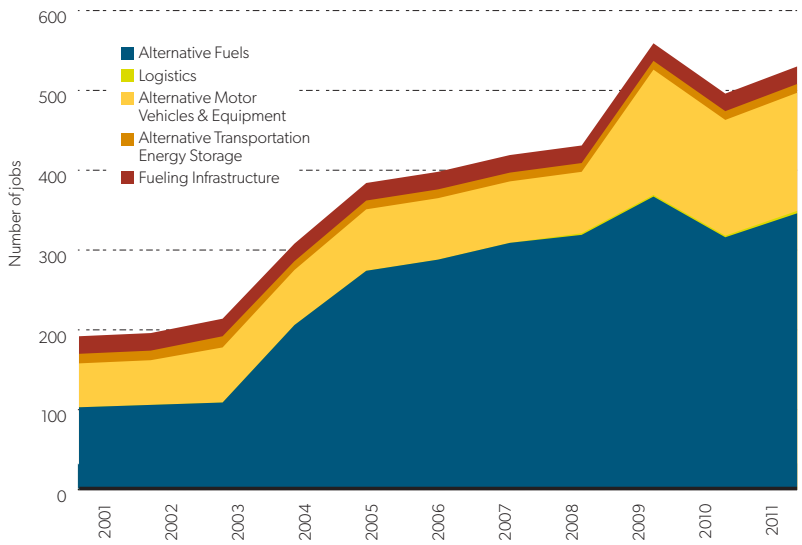
Alternative Motor Vehicles & Equipment	**Motorized vehicle and equipment technology** including, electric, hybrid and natural gas vehicles, as well as diesel technology, and efficiency-enhancing vehicle/engine components.
Alternative Fuels	**Transportation fuels** including biodiesel, ethanol, hydrogen, and algae-based.
Fueling Infrastructure	**Technology enabling vehicle fueling and storage of alternative fuels,** including electric vehicle charging, and hydrogen, natural gas, ethanol and biodiesel fueling.
Alternative Transportation Energy Storage	**Power and energy storage technology for alternative motor vehicles,** including advanced batteries (advanced lead-acid, lithium-ion, nickel-metal hydride and ultracapacitors), proton exchange membrane (PEM) fuel cells, and hybrid hydrogen storage systems.
Logistics	**Products and services to enhance efficiency in transportation** including fleet tracking and traffic monitoring.

Analysis: Collaborative Economics

Employment levels represent core employment in companies directly related to alternative fuels and vehicles in the region. This dataset includes companies that devote a majority of their business efforts to advanced transportation technologies and services, but does not include companies that have some activity but not an explicit focus on the industry. For example, a vehicle repair shop with employees that service some electric vehicles, but work primarily with conventional vehicles are not included in this analysis. Similarly, a farmer or processing facility supplying a cellulosic ethanol pilot plant with leftover biomass and large automakers like General Motors and Honda are not included. Companies that are shifting into advanced transportation activities from the "adaptive" sector and are important for overall market growth, but this section will focus on core alternative fuel and vehicle companies that are leading change in the industry.

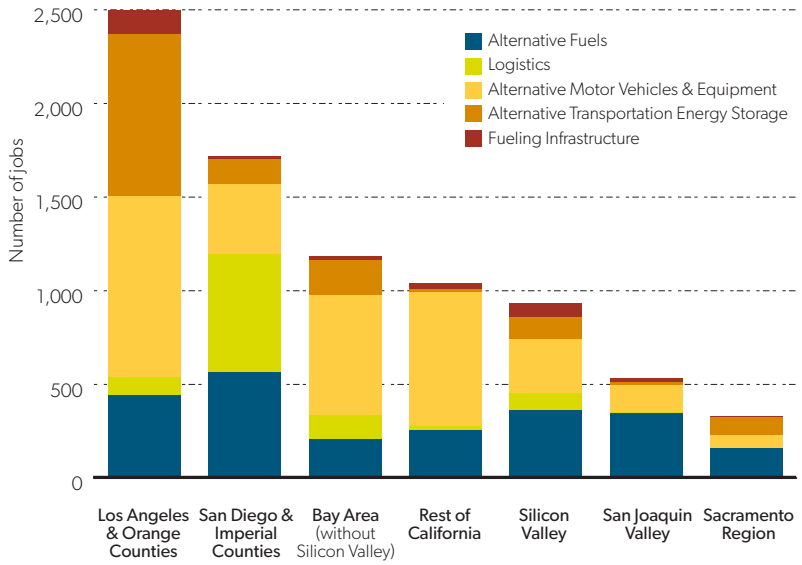
Core Employment by Segment

San Joaquin Valley, 2001-2011



Core Employment by Region

By Region, 2011



Data Source: National Establishments Time Series Database, Green Establishments Database
Analysis: Collaborative Economics

ARFV employment in the San Joaquin Valley nearly tripled between 2001 and 2011, and was comparatively more specialized in Alternative Fuels than the state overall.

• • •

In the Northern sub-region there were roughly 100 core ARFV jobs in 2011, with the majority in Alternative Fuels and Fueling Infrastructure.

• • •

Central San Joaquin Valley had roughly 150 jobs in 2011 spread over 11 companies, many of them also related to Alternative Fuels (production, supply and sales).

• • •

Southern San Joaquin Valley had the highest number of ARFV companies (15), including several biofuels industry leaders such as Edeniq, Calgren Renewables and an Aemetis production facility (formerly Cilion).

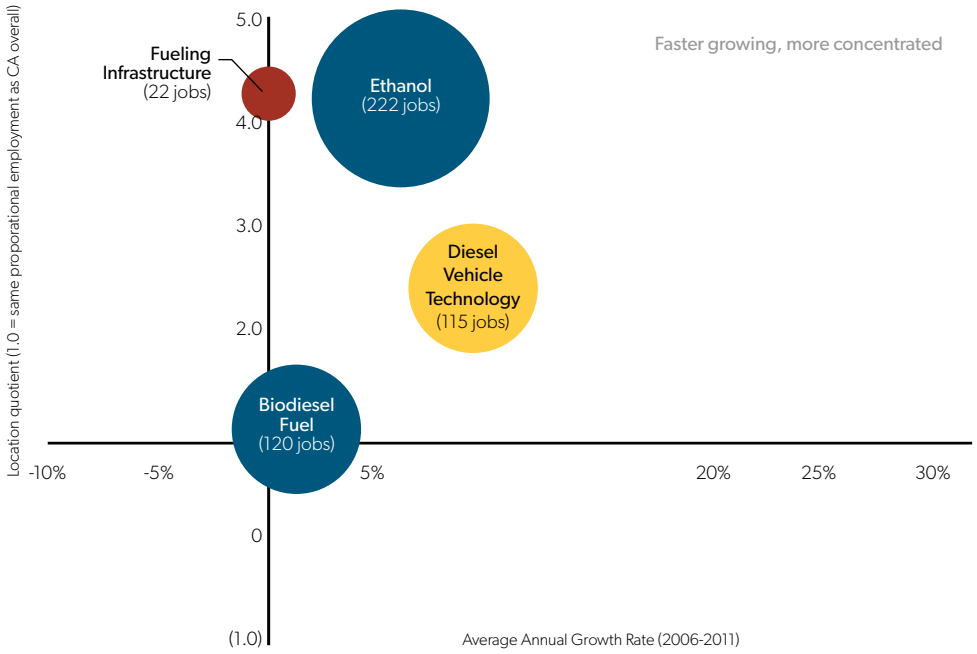
• • •

Alternative Motor Vehicles & Equipment accounted for the second highest share of jobs in the ARFV industry across the valley, though involved only a few establishments, largely related to medium and heavy-duty vehicles.

The bubble chart provides perspective on three dimensions: the size, growth, and employment concentration in a cluster. Cluster bubbles arranged together in a chart help to communicate the overall regional picture. It tells what industries make up the region, their size, growth, and relative employment concentration. The size of the bubble shows the employment size for the industry cluster. The horizontal x-axis displays the annual average growth rate between 2006 and 2011. The vertical y-axis displays the employment concentration of each industry which is a sign for potential regional specialization and competitive advantage. A concentration greater than one indicates that the region's employment in that cluster represents a larger percentage of the region's total employment than is the case for the state as a whole. In other words, a concentration greater than one suggests that the region is relatively specialized in the cluster when compared with the state.

Core Employment

Employment Level, Concentration Compared to California and Growth Rate
San Joaquin Valley, 2006-2011

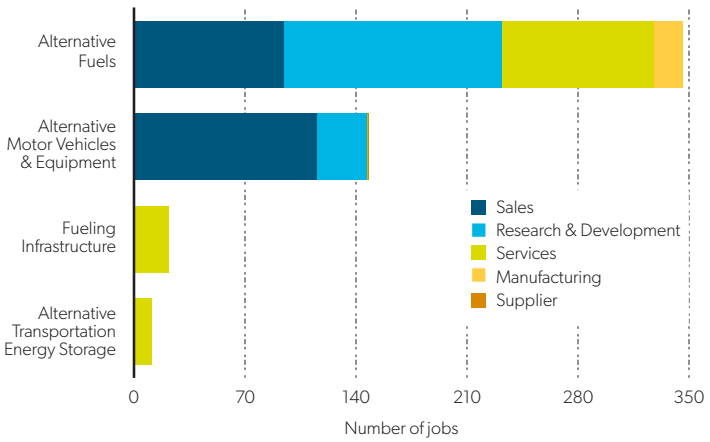


*Reflects average annual growth rates higher than 30%
Data Source: Green Establishments Database, National Establishments Time Series Database
Analysis: Collaborative Economics

The following regional employment charts provide a closer look at what types of jobs are in each segment, including the establishment's primary function or daily activity along the production value chain.

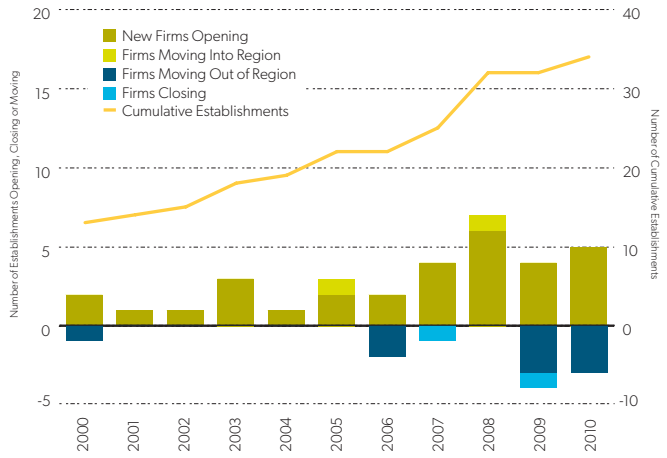
Core Employment by Value Chain Activity

San Joaquin Valley, 2011



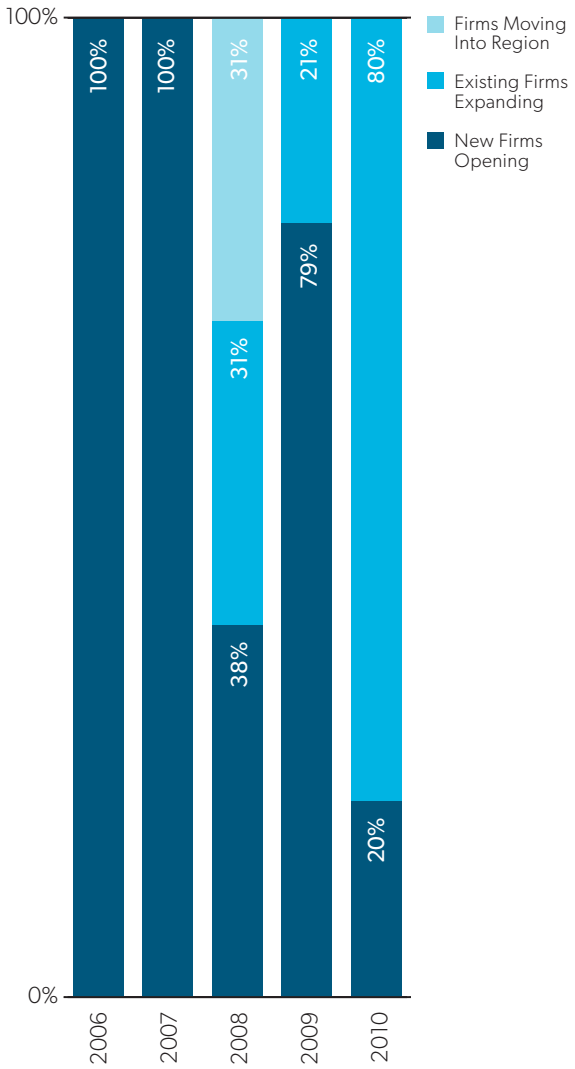
Core Establishments Churn

San Joaquin Valley, 2000-2010



Core Employment Growth by Source

San Joaquin Valley, 2006-2010



Data Source: National Establishments Time Series Database, Green Establishments Database
Analysis: Collaborative Economics

Occupations In Advanced Transportation

The ARFV industry includes workers in a wide variety of occupations throughout the supply chain, ranging from research and development, to manufacturing and sales. The Bureau of Labor Statistics (BLS) used green survey results and interviews with industry experts to identify common occupations in the electric vehicle and biofuel industries. BLS identified a total of 42 occupations using the Standard Occupational Classification system, which allows for cross referencing with employment and wage data. While the list of occupations is not exhaustive for the ARFV industry, it does provide the most comprehensive list available of the most common occupations in ARFV businesses. Some occupational skills may transfer directly from a different industry into an ARFV business, though other occupations or skills may require additional training for an ARFV specific skill set. This list can be a starting point for regions to target certain occupations for training and emerging growth opportunities.

Common occupations for biofuel and electric vehicle industries are listed in the following tables. The number of employees, average annual wage, typical entry education levels, green outlook, and employment projections for each identified occupation are detailed below. Occupation titles are standardized across industries, so the results below are for all industries and not ARFV specific, though this does provide a snapshot of the potential workforce pool for the ARFV industry. The Green Outlook (see table below) is the result of research by the Occupational Information Network's (O*NET) National Center for Development, which analyzed occupations in the green economy to identify how worker requirements and demand is expected to change.

Green Outlook Descriptions

Enhanced Skills Occupations	**Green economy activities and technologies are likely to cause significant change to the work and worker requirements.** New tasks, skills, knowledge, credentials may be needed. Employment demand remains the same, but there is potential for an increase.
New and Emerging Occupations	**The impact of green economy activities and technologies is sufficient to create the need for unique work and worker requirements,** which results in the generation of new occupations.
Increased Demand	**Green economy activities and technologies are likely to increase the employment demand,** but will not lead to significant changes in the work and worker requirements.

Data Source: O*Net

The electric vehicles industry has 23 common occupations identified by BLS in areas such as scientific research, design and development, manufacturing, electric vehicle maintenance, infrastructure development, and sales and support.
The biofuel industry has 23 occupations identified by BLS in areas such as scientific research, engineering, construction, agriculture, plant operations, and sales.

Biofuel Industry-Related Common Occupations

San Joaquin Valley

Occupation Title	Regional Average Annual Wage (Q1 2013)	Regional Employment (May 2012)	General Education Category	Green Outlook
Chemical engineers	$98,721	100		
Biochemists and biophysicists	$96,078*	*		Not available
Electrical engineers	$95,894	450		
Environmental engineers	$94,896	170		
Construction managers	$92,698	1,510		
Industrial production managers	$90,363	1,430		
Farmers, ranchers, and other agricultural managers	$89,087	150		
Industrial engineers	$88,517	770		
Civil engineers	$88,200	2,070		
Microbiologists	$86,594*	*		Not available
Mechanical engineers	$80,546	1,030		
Wholesale and manufacturing sales representatives, techical and scientific products	$77,845	1,180		
Agricultural engineers	$77,259*	*		Not available
Chemists	$74,360	380		
Buyers and purchasing agents, farm products	$69,875	60		
Soil and plant scientists	$67,288	160		
Operating engineers and other construction equipment operators	$53,722	3,200		
Industrial machinery mechanics	$50,820	4,050		
Chemical equipment operators and tenders	$49,156*	*		
Chemical technicians	$42,391	430		
Construction laborers	$36,807	6,610		
Agricultural equipment operators	$23,096	1,180		Not available
Farmworkers and laborers, crop, nursery, and greenhouse	$18,737	93,980		Not available

Average Wage Levels

- $80,000 and up
- $40,000 - $79,999
- Below $39,999

General Education Category

- Bachelor's Degree or Higher
- Post-High School Training to Associate's Degree
- High School Diploma or Less

Green Outlook

- Enhanced Skills Occupations
- New and Emerging Opportunities
- Increased Demand

*Regional data unavailable, state average annual wage provided.

Note: Regional data is for Metropolitan Statistical Areas within the region.

Data Source: California Employment Development Department, U.S. Bureau of Labor Statistics, and O*NET Online

Analysis: Collaborative Economics

Electric Vehicle Industry-Related Common Occupations

San Joaquin Valley

Occupation Title	Regional Average Annual Wage (Q1 2013)	Regional Employment (May 2012)	General Education Category	Green Outlook
Chemical engineers	$98,721	100	3	↑
Electrical engineers	$95,894	450	3	+
Materials scientists	$95,282*	*	3	↑
Software developers, applications	$92,767	950	3	Not available
Industrial production managers	$90,363	1,430	3	✸
Electrical power-line installers and repairers	$89,083*	*	2	↑
Industrial engineers	$88,517	770	3	↑
Electronics engineers, except computer	$87,313	1,130	3	+
Materials engineers	$78,828	30	3	Not available
Urban and regional planners	$74,414	430	3	+
Chemists	$74,360	380	3	↑
Commercial and industrial designers	$60,881	30	3	↑
Mechanical engineering technicians	$56,911	160	2	✸
Electricians	$56,236	3,970	2	↑
Mechanical drafters	$49,950	340	2	Not available
Machinists	$40,017	1,400	2	+
Automotive Service Technicians and Mechanics	$37,430	5,240	2	+
Computer-controlled machine tool operators, metal and plastic	$37,267	160	2	↑
Customer service representatives	$34,922	11,880	1	↑
Engine and other machine assemblers	$34,088*	*	1	↑
Electromechanical equipment assemblers	$32,332*	*	1	Not available
Electrical and electronic equipment assemblers	$31,698	150	1	↑
Team assemblers	$28,529	3,280	2	↑
Retail Salespersons	$24,319	33,110	1	Not available

Average Wage Levels
- $80,000 and up
- $40,000 - $79,999
- Below $39,999

General Education Category
- 3 Bachelor's Degree or Higher
- 2 Post-High School Training to Associate's Degree
- 1 High School Diploma or Less

Green Outlook
- \+ Enhanced Skills Occupations
- ✸ New and Emerging Opportunities
- ↑ Increased Demand

*Regional data unavailable, state average annual wage provided.

Note: Regional data is for Metropolitan Statistical Areas within the region.

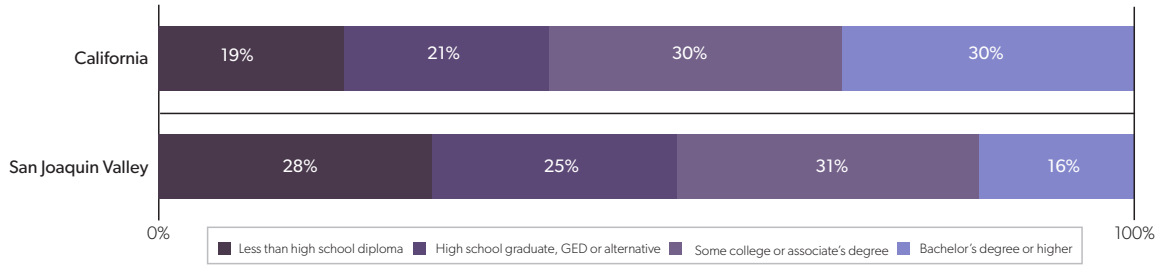
Data Source: California Employment Development Department, U.S. Bureau of Labor Statistics, and O*NET Online

Analysis: Collaborative Economics

Educational Attainment in the Region

Educational Attainment

San Joaquin Valley, 2011



Data Source: U.S. Census Bureau, American Community Survey Analysis: Collaborative Economics

Workforce Opportunities Questions for Discussion

1. **What are your region's most important segments for employment?** Consider employment size and growth as well as degree of specialization. How have these changed over time?

2. **What other companies in the adaptive advanced transportation economy are part of the supply chain in your region?** (e.g. original equipment manufacturers, auto repair shops)

3. **Considering employment, specialization, wages, and education levels, which occupations are likely to be critical to future cluster growth?**

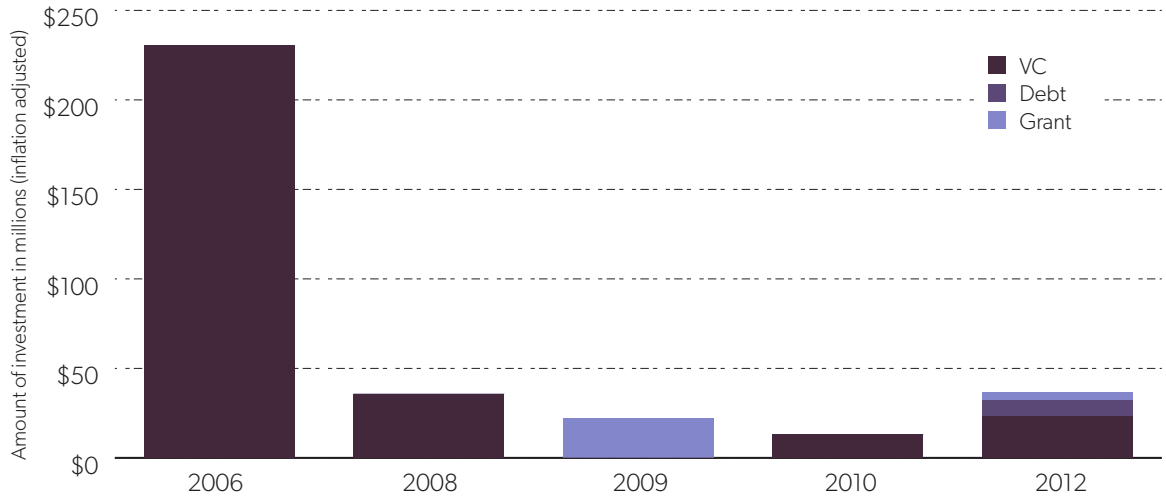
4. **Given the employment and occupation patterns identified, what are the implications for engaging regional partners and employers?**

INNOVATION IN ADVANCED TRANSPORTATION

Transportation technologies have evolved dramatically in the last 100 years, but new innovations are still necessary for California to achieve its greenhouse gas reduction goals. California businesses and inventors are striving to make the shift from a carbon-based to a cleaner and more efficient economy. Financial investments in alternative fuel and vehicle technology companies help to commercialize and scale new products and services.

Investment in Regional Biofuels Companies

Types of Investments
San Joaquin Valley, 2006-2012



Note: All investment in San Joaquin Valley ARFV companies since 2006 occurred in the biofuels segment.
Data Source: CB Insights
Analysis: Collaborative Economics

Innovation Questions For Discussion

1. Which new and innovative technologies are being developed and scaled is your region?

2. Are there any existing academic or sector partnerships to leverage to expand regional innovation capabilities?

3. Are there other industries or research institutions in the region that could be leveraged to expand regional innovation capabilities?

4. Given innovation activity in the region, what are the implications for engaging partners and employers?

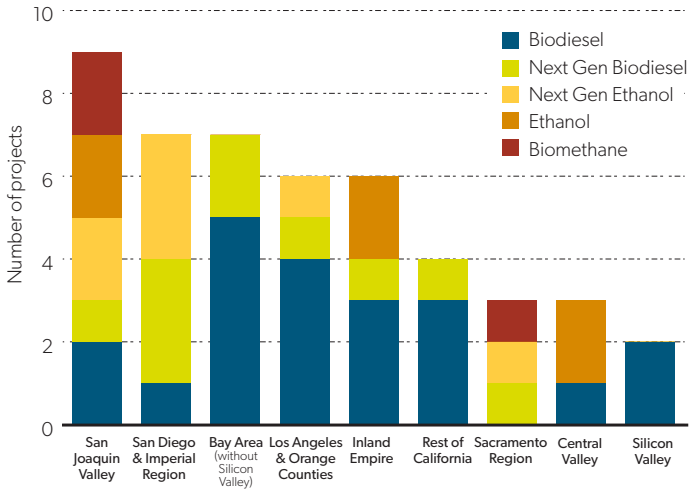
ADVANCED TRANSPORTATION TECHNOLOGY IMPLEMENTATION AND GROWTH

The following charts show how the region has been adopting new alternative vehicle technologies, deploying supportive alternative vehicle infrastructure, and deploying transportation biofuel production projects. This section can show where market demand in your region is focused and therefore where opportunities are to leverage the market and advance the industry.

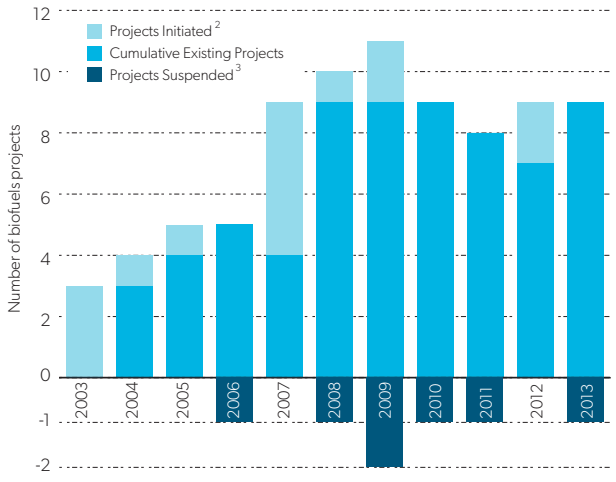
Biofuel Production Projects in the Region

Commercialization and production of biofuels can result from capitalizing on growing research and investment and leveraging policies such as California's Low Carbon Fuel Standard. Biofuels include first generation biofuels such as ethanol and biodiesel, as well as a growing number of next generation advanced biofuels, such as cellulosic ethanol or algae-based biodiesel. Many of the next generation biofuel projects noted in this section are demonstration-scale facilities, as companies seek to refine their process and increase cost competitiveness. This section focuses on biofuel for transportation and excludes biomass or waste-to-energy processes that exclusively generate electricity or are used for pipeline gas.

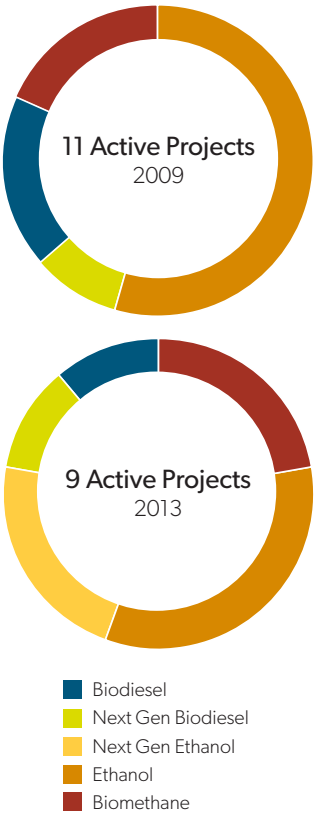
Transportation Biofuels Projects by Region[1]
As of July 2013



Cumulative Transportation Biofuels Projects
San Joaquin Valley, 2006-2013



Biofuels Production Projects[4]
San Joaquin Valley, 2009 and 2013



1. Projects include announced, commissioned, under-construction and permitted projects, and exclude abandoned or suspended ones.

2. Project initiation dates are based on reported announced, permitted, financed or comissioned dates, based on available data.

3. Project suspension dates include reported suspended or abandoned dates.

4. Active Projects include announced, commissioned, under-construction and permitted projects, and exclude abandoned or suspended ones.

Data Sources: Bloomberg New Energy Finance, E2 Environmental Entreprenuers, Renewable Fuels Association, Biodiesel Magazine, and National Biodiesel Board

Analysis: Collaborative Economics

Alternative Vehicle Registrations in the Region

Alternative Vehicle Registrations

San Joaquin Valley, 2011

	San Joaquin Valley Total	Proportion of Regional Registrations by Vehicle Fuel Type
All Fuels	2,650,925	
Flex Ethanol	69,647	2.6%
Natural Gas	3,128	0.1%
Electric	966	0.0%
Propane	365	0.0%
Plug In Hybrid	63	0.0%
Hydrogen	-	0.0%

Alternative vehicles include zero emission vehicles such as electric and hydrogen fuel cell and low-emission/low carbon fuel vehicles using fuels such as natural gas, ethanol, and propane.

Data Source: California Energy Commission

Analysis: Collaborative Economics

Clean Vehicle Rebates Issued in the Region

Clean Vehicle Rebates Issued

San Joaquin Valley, 2010-2013*

	2010	2011	2012	2013*	Grand Total
FRESNO COUNTY					
Plug-in Hybrid Electric Vehicles			25	17	42
Zero Emission Vehicle		15	15	36	66
KERN COUNTY					
Plug-in Hybrid Electric Vehicles			21	14	35
Zero Emission Vehicle		10	26	28	64
KINGS COUNTY					
Plug-in Hybrid Electric Vehicles			2		2
Zero Emission Vehicle			1		1
MADERA COUNTY					
Plug-in Hybrid Electric Vehicles			3	2	5
Zero Emission Vehicle		5	3	1	9
MERCED COUNTY					
Plug-in Hybrid Electric Vehicles			3	4	7
Zero Emission Vehicle		1	4	2	7
SAN JOAQUIN COUNTY					
Plug-in Hybrid Electric Vehicles			26	13	39
Zero Emission Vehicle		14	20	25	59
STANISLAUS COUNTY					
Plug-in Hybrid Electric Vehicles			10	12	22
Zero Emission Vehicle	1	6	6	5	18
TULARE COUNTY					
Plug-in Hybrid Electric Vehicles			5	4	9
Zero Emission Vehicle		7	9	6	22
REGIONAL SHARE OF TOTAL CALIFORNIA REBATES					
Plug-in Hybrid Electric Vehicles			1%	1%	1%
Zero Emission Vehicle	1%	1%	2%	2%	2%

In addition to supporting alternative vehicles that use a range of lower emission fuel types, California has taken specific actions to stimulate demand for zero emission vehicles. Since alternative vehicle registration data is only available through 2011, clean vehicle rebates are used as a proxy for the number of alternative vehicles purchased in the last two years. Clean vehicle rebates apply to plug-in hybrid electric and zero emission vehicles (fuel cell or all electric), not other alternative vehicle types such as natural gas or flex ethanol.

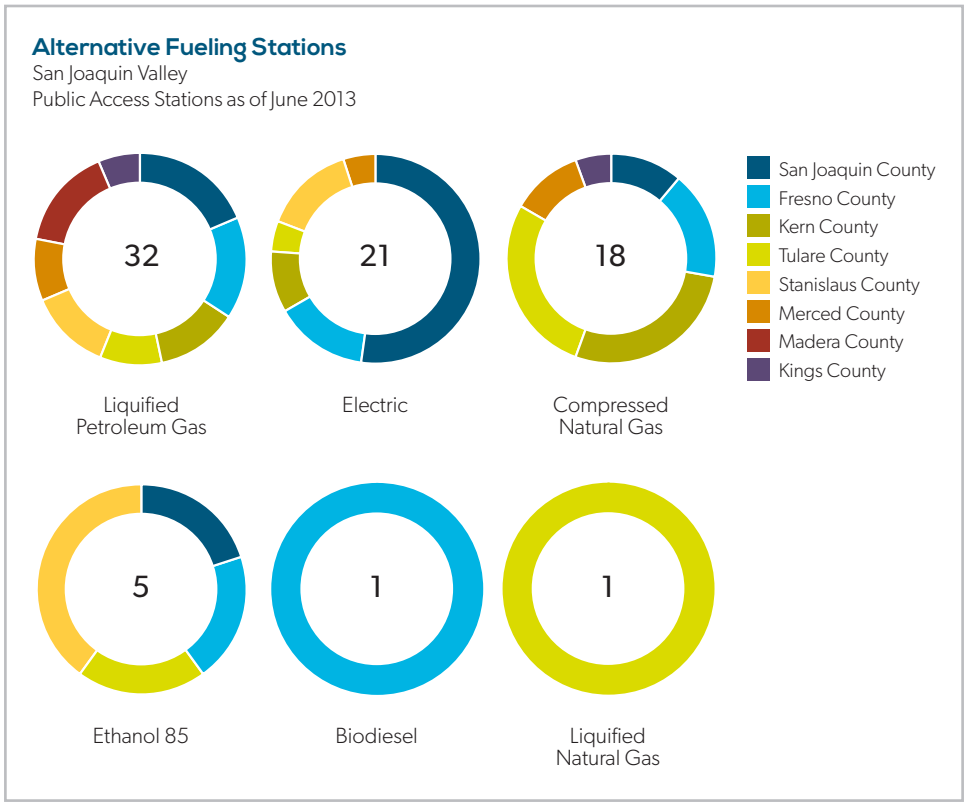
*Note: 2013 data is as of June 17, 2013

Data Source: Center for Sustainable Energy California, Clean Vehicle Rebate Project

Analysis: Collaborative Economics

Alternative Fueling Infrastructure Available in the Region

Widely-available alternative fueling infrastructure is a critical requirement of widespread adoption of new alternative vehicles. Range anxiety is a common concern among electric vehicle owners as the batteries are generally not able to provide enough charge for long distance trips. Private fueling stations are important to support individual businesses, fleets, or individual use, but public access stations are essential for wider adoption of alternative vehicles. For an interactive map of alternative fueling stations, visit maps.nrel.gov/transatlas.



Data Source: U.S. Department of Energy, Alternative Fuels Data Center
Analysis: Collaborative Economics

Technology Growth and Implementation Questions for Discussion

1. **How is the adoption rate for alternative vehicles changing in your region?** What are the implications?

2. **How are the alternative fueling infrastructure needs in your region changing based on regional demand for alternative vehicles and supply of biofuels?** Are there opportunities to better align demand for vehicles and access to fueling infrastructure?

3. **What policies or partnerships (e.g. business or economic development organizations) are currently in place to support the industry?**

4. **Based on these technology deployment patterns, what are the implications for engaging regional partners and employers?**

EMPLOYER ENGAGEMENT

The following list of companies are identified as high-potential employers because they have high levels of employment, high growth rates, received venture capital investments, registered patents, and/or were identified by a regional organization as a leader.

Potential Companies to Engage for RICO

San Joaquin Valley

San Joaquin Sub-Region	Company Name	Sector	Segment	15+ Employees in Core ARVF Industry (2011)	Expanded Employment (2006-2011)	Received Investment (2010-2013)	Biofuels Production in the Region (Announced or Operating)
North	American Biodiesel, Inc. (Community Fuels)	Alternative Fuels	Biodiesel	✦			✦
North	Kinergy Fuels Marketing (Subsidiary of Pacific Ethanol)	Alternative Fuels	Ethanol				
North	Pacific Ethanol, Inc.	Alternative Fuels	Ethanol	✦	✦		
North	Electric Vehicles Intl., LLC	Alternative Motor Vehicles	Hybrid Trucks	✦			
North	Flyers Energy, LLC (Retail Facility)	Fueling Infrastructure	Biofuels				
Central	Eslinger Biodiesel	Alternative Fuels	Biodiesel				✦
Central	Imperial Western Products -Biotane (Retail Facility)	Alternative Fuels	Biodiesel	✦			
Central	Mendota Advanced Bioenergy Beet Cooperative	Alternative Fuels	Ethanol				✦
Central	Propel Fuels (Retail Facility)	Fueling Infrastructure	Biofuels				
South	Crimson Renewable Energy, LP	Alternative Fuels	Biodiesel				✦
South	Aemetis, formerly Cilion (Production Facility)	Alternative Fuels	Ethanol			✦	✦
South	Calgren Renewable Fuels, LLC	Alternative Fuels	Ethanol	✦	✦		✦
South	Edeniq, Inc.	Alternative Fuels	Ethanol	✦	✦	✦	✦
South	Logos Technologies (Production Facility, co-ownership)	Alternative Fuels	Ethanol				✦

Strategic Adaptive Companies with Ties to Alternative Fuels Segment

San Joaquin Valley

Company	San Joaquin Sub-Region	Activity in Sector
Baker Commodities, Inc.	All	Feedstock Supplier (Rendering)
AL Gilbert Co	North	Feedstock Supplier (Grains)
JD Heiskell Holdings, LLC	South	Feedstock Supplier (Grains)
Western Milling, LLC	South	Feedstock Supplier (Grains)
Hilarides Dairy	South	Renewable Natural Gas Producer
WM Lyles Co	Central	Facility Construction

Note: Employment data includes only companies in the core ARFV industry

Data Source: Employment data from National Establishments Time Series Database; Patent data from US Patent Trade Office, 1790 Analytics; Investment data from CB Insights

Analysis: Collaborative Economics

Employer Engagement Questions for Discussion

1. What do you know about the employers on the list above?

2. In addition to the list above, what other employers need to be engaged?

3. **What is your current employer engagement strategy?** How can it be expanded for the advanced transportation cluster?

AB 118 Regional Industry Clusters of Opportunity

ADVANCED TRANSPORTATION DIAGNOSTIC PACKAGE

Silicon Valley

September 2013

CONTENTS

INTRODUCTION

Transportation is a vital part of the California economy, connecting businesses and communities across the state with highways, railways, shipping, and aviation routes. This vast transportation network also takes a tremendous amount of energy to run, most of which comes from petroleum. Burning this fuel creates air pollution such as particulates, air toxics and smog, contributing to air quality problems in many California regions.

Given the impact of the transportation sector, California state and local policymakers have implemented a number of laws and programs for more efficient, renewable, and innovative transportation fuels and vehicles. The California Alternative and Renewable Fuel, Vehicle Technology, Clean Air, and Carbon Reduction Act of 2007 (Assembly Bill (AB) 118) is an important part of California's transportation strategy. AB 118 created the Alternative and Renewable Fuel and Vehicle Technology Program in the California Energy Commission (The Commission) to fund projects to develop and deploy innovative technologies that transform the state's fuel and vehicle types to help attain the California's climate goals.

The California Workforce Investment Board and the Commission, working in coordination with the California Labor and Workforce Development Agency, is funding this AB 118 Regional Industry Clusters of Opportunity (RICO) grant program to develop and implement strategies to advance regional economies and workforce in targeted alternative fuel and vehicle clusters.

Transportation fuels are the leading source of greenhouse emissions in California, accounting for 38 percent California's total greenhouse gas emissions.

RICO OVERVIEW

This Diagnostic Package is a part of the first of four stages in the RICO process. Below is an overview of the entire RICO process for your reference. These dates offer a general guide to the timing, but are flexible. The stages listed are excerpts from the RFP; please consult the original RFP for details.

STAGE 1
Clusters of Opportunity Diagnosis
July-September 2013

Collaborative Economics and the regional team work together to develop a regional diagnostic package of relevant research and analyses, to increase understanding of the region's economic and workforce opportunities in the alternative fuels and vehicles cluster

Action Clinic #1 in Sacramento - September 2013

STAGE 2
Collaborative Priority-Setting
October 2013-March 2014

Regional teams design and implement a collaborative cluster engagement process, in which they identify, invite, and host employers in cluster meetings to develop the Industry Sector Partnership. Meetings are designed to elicit (1) priority opportunities for cluster growth, (2) priority requirements to capitalize on those opportunities (both workforce and economic development related), and (3) employer "champions" who will work with community partners to design and implement a cluster investment strategy and sustainability plan.

Action Clinic #2 in Sacramento - January 2014
Site Visits by Technical Assistance team - #1 November 2013 and #2 March 2014 (or as needed)

STAGE 3
Clusters of Opportunity Investment Strategy
April-July 2014

The Industry Sector Partnership will identify and connect specific investments and commitments of local, state, and federal government partners, as well as private firms, industry associations, non-profit partners, private foundation partners, and others to advance the competitive position of regionally targeted clusters of opportunity. This activity should produce a cluster investment strategy with specific organizational commitments and champions organized around shared cluster priorities, which should be aligned with regional resources to form career pathways in alternative fuel and vehicle technology industries.

Action Clinic #3 in Sacramento - May 2014
Site Visits #3 by Technical Assistance team if needed

STAGE 4
Sustainable Implementation
August-December 2014

The Industry Sector Partnership will develop the support for long-term sustainability and growth, which should produce a set of broader organizational and policy changes to sustain and expand regional cluster of opportunity strategies, as well as a lasting mechanism to support ongoing collaboration among all the partners. Regional teams will produce an action plan, including a cluster investment strategy and sustainability plan, to be approved by the State Board. Regions are expected to begin implementation before the grant period ends on December 31, 2014.

Showcase Event in Sacramento - September 2014

HOW TO USE THE DIAGNOSTIC PACKAGE

The goal of the RICO process is to develop and implement alternative and renewable fuel and vehicle (ARFV) regional clusters of opportunity strategies, mobilizing employers and regional partners to advance the competitive position of targeted clusters. This RICO initiative is a structured process that supports Regional Economic and Workforce Development Networks. These Networks consist of economic and workforce development practitioners and industry, forming Industry Sector Partnerships and developing action plans to support and advance targeted industry clusters. Regions are focusing on one or more established and/or emerging clusters of opportunity in the alternative fuel and vehicle transportation sector.

This Diagnostic Package is designed to provide data to illustrate regional progress, strengths, and emerging opportunities in a range of AB 118 areas. The data, along with your personal knowledge and experience of activities and priorities in the region, and other resources from your region if available, can allow you to make data-based decisions when determining or reviewing your RICO area of focus.

Each section of the Diagnostic Package ends with questions to help focus the conversation on identifying clusters of opportunity to prioritize in the RICO process.

Advanced Transportation in Silicon Valley

As a global innovation leader, Silicon Valley has the potential to become a center of advanced transportation technology. Silicon Valley, along with the wider nine-county Bay Area, has a high concentration of jobs in the electric vehicle segment as well as high adoption rates for electric vehicles. Silicon Valley is home to Tesla, a growing market leader in electric vehicles and a sector anchor for the region. Leveraging the region's innovation assets as well as the concentration of ARFV activity will help to accelerate growth in the industry.

Identifying Clusters of Opportunity

This diagnostic package presents a variety of data specific to your region that can help identify regional "clusters of opportunity" in advanced transportation. A cluster of opportunity is a combination of related sectors that are growing in terms of jobs, companies, investment, and/or innovation. Typically, a cluster of opportunity is comprised of sectors that are export-oriented, population driven, and offer occupations with career potential, creating workforce opportunities for regions in the state. The data provided in this package is focused around workforce, technology adoption, and innovation in the industry. We suggest using the following four kinds of information to help identify advanced transportation areas of opportunity in your region:

1. **Growth in employment** (e.g. jobs by segment and occupation opportunities)
2. **Growth in companies** (e.g. new establishment formation or existing business growth)
3. **Growth in technology adoption** (e.g. biofuel production projects, alternative vehicles, clean vehicle rebates, and fueling infrastructure)
4. **Growth in innovation** (e.g. investments and patents)

WORKFORCE OPPORTUNITIES

The advanced transportation industry has created jobs across the state, many of which require new training programs to prepare the workforce. This section provides an overview of employment and common occupations in the industry, as well as the educational profile for the region.

Core Employment in Regional Advanced Transportation Segments

This section examines a snapshot of the region's employment as of January 2011 (most recent year available) to profile the sector's core employment and diversity of activities. Employment data used in this analysis is built from the National Establishments Time Series database, which contains employment at the establishment level throughout the state of California. Using industry organization membership lists, private and public financing reports, local government programs and industry codes to identify specific companies active in the sector, companies were identified that are developing, producing, supplying and servicing products in the advanced transportation industry. The table below details the types of technologies included within each industry segment.

Segments of the ARFV Industry

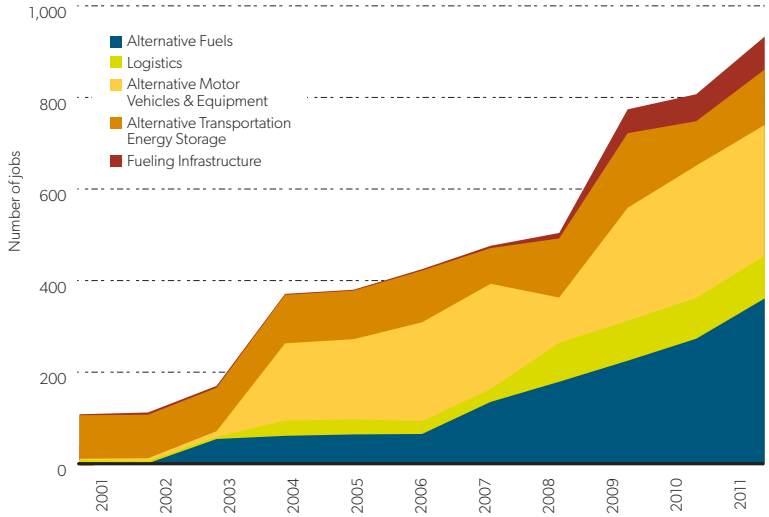
Alternative Motor Vehicles & Equipment	**Motorized vehicle and equipment technology** including, electric, hybrid and natural gas vehicles, as well as diesel technology, and efficiency-enhancing vehicle/engine components.
Alternative Fuels	**Transportation fuels** including biodiesel, ethanol, hydrogen, and algae-based.
Fueling Infrastructure	**Technology enabling vehicle fueling and storage of alternative fuels,** including electric vehicle charging, and hydrogen, natural gas, ethanol and biodiesel fueling.
Alternative Transportation Energy Storage	**Power and energy storage technology for alternative motor vehicles,** including advanced batteries (advanced lead-acid, lithium-ion, nickel-metal hydride and ultracapacitors), proton exchange membrane (PEM) fuel cells, and hybrid hydrogen storage systems.
Logistics	**Products and services to enhance efficiency in transportation** including fleet tracking and traffic monitoring.

Analysis: Collaborative Economics

Employment levels represent core employment in companies directly related to alternative fuels and vehicles in the region. This dataset includes companies that devote a majority of their business efforts to advanced transportation technologies and services, but does not include companies that have some activity but not an explicit focus on the industry. For example, a vehicle repair shop with employees that service some electric vehicles, but work primarily with conventional vehicles are not included in this analysis. Similarly, a farmer or processing facility supplying a cellulosic ethanol pilot plant with leftover biomass and large automakers like General Motors and Honda are not included. Companies that are shifting into advanced transportation activities from the "adaptive" sector and are important for overall market growth, but this section will focus on core alternative fuel and vehicle companies that are leading change in the industry.

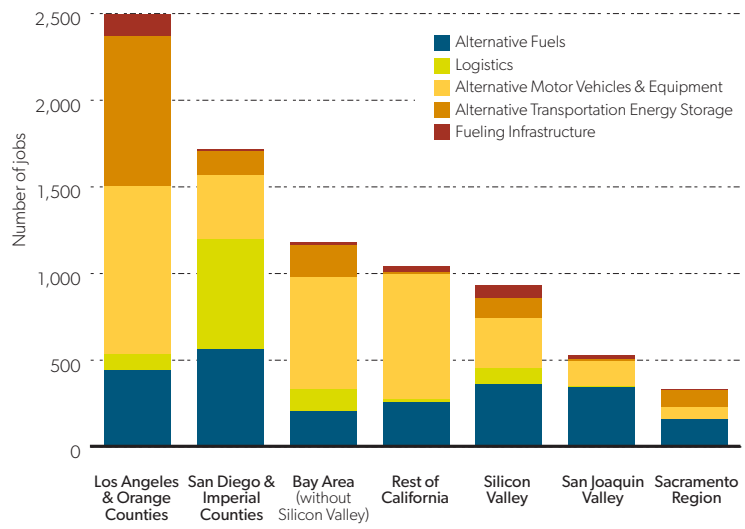
Core Employment by Segment

Silicon Valley, 2001-2011



Core Employment by Region

2011



Data Source: National Establishments Time Series Database, Green Establishments Database
Analysis: Collaborative Economics

Silicon Valley's ARFV industry employed over 930 people in January 2011, more than doubling the number of jobs since 2006.

• • •

The greatest share of employment was in Alternative Fuels, with about 360 jobs in 2011. This segment is led by Codexis Inc., a biobased chemical company that employed over 200 people in 2011, while other companies in the segment are focused on developing next generation biofuels.

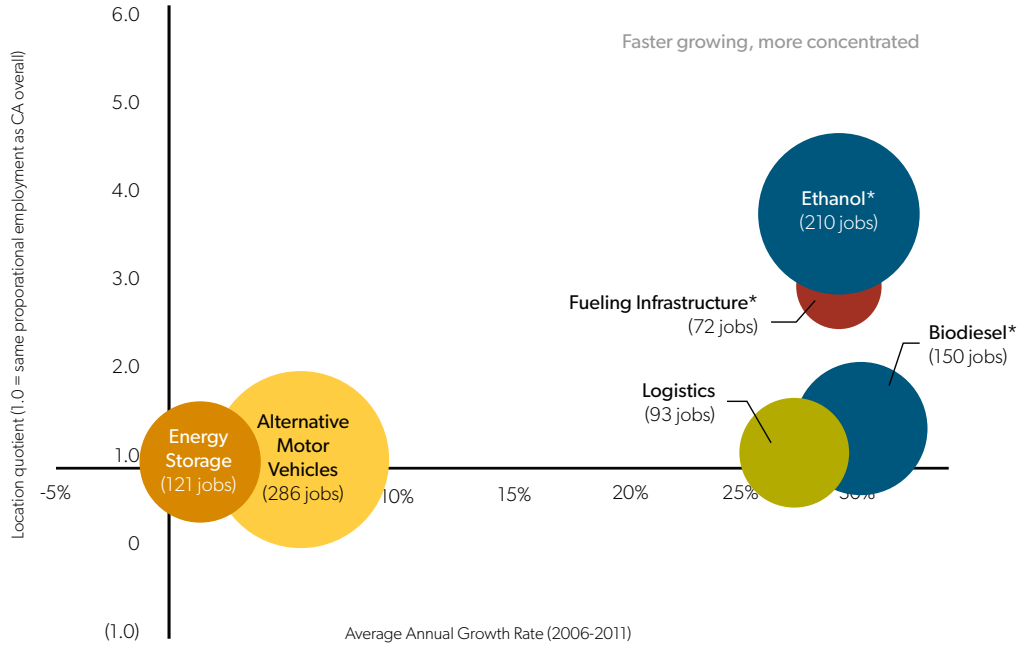
• • •

Alternative Motor Vehicles & Equipment, a segment that includes electric and hybrid vehicles, was the second-largest segment, employing nearly 300 people in 2011. The rest of the nine-county Bay Area includes an additional 650 jobs in this segment, suggesting regional specialization. Fueling Infrastructure in Silicon Valley accounted for about 70 jobs, roughly half of which are electric vehicle charging companies in Silicon Valley.

The bubble chart provides perspective on three dimensions: the size, growth, and employment concentration in a cluster. Cluster bubbles arranged together in a chart help to communicate the overall regional picture. It tells what industries make up the region, their size, growth, and relative employment concentration. The size of the bubble shows the employment size for the industry cluster. The horizontal x-axis displays the annual average growth rate between 2006 and 2011. The vertical y-axis displays the employment concentration of each industry which is a sign for potential regional specialization and competitive advantage. A concentration greater than one indicates that the region's employment in that cluster represents a larger percentage of the region's total employment than is the case for the state as a whole. In other words, a concentration greater than one suggests that the region is relatively specialized in the cluster when compared with the state.

Core Employment

Employment Level, Concentration Compared to California and Growth Rate
Silicon Valley, 2006-2011

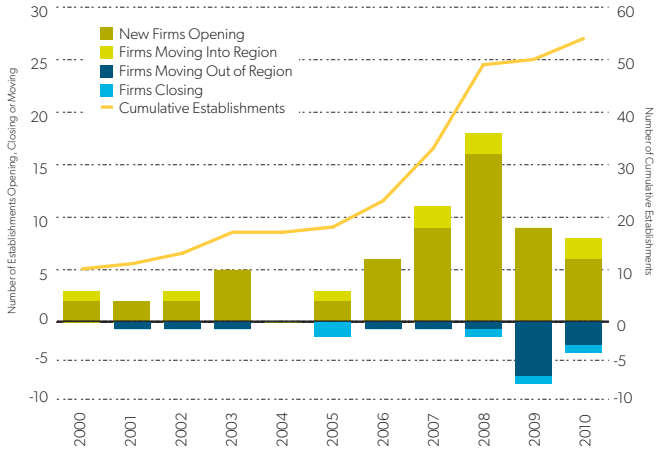


*Reflects average annual growth rates higher than 30%
Data Source: National Establishments Time Series Database, Green Establishments Database-
Analysis: Collaborative Economics

The following regional employment charts provide a closer look at what types of jobs are in each segment, including the establishment's primary function or daily activity along the production value chain.

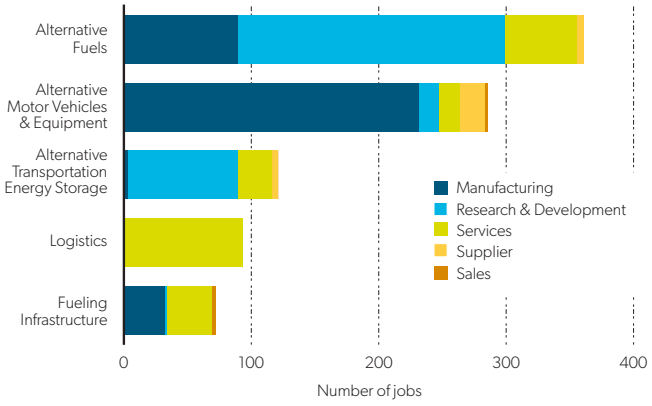
Core Establishments Churn

Silicon Valley, 2000-2010



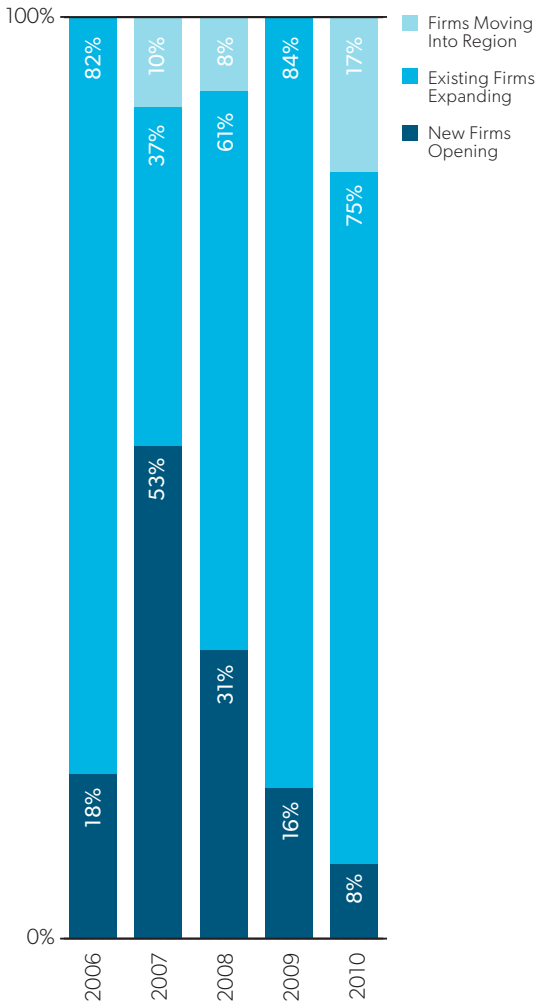
Core Employment by Value Chain Activity

Silicon Valley, 2011



Core Employment Growth by Source

Silicon Valley, 2006-2010



Data Source: National Establishments Time Series Database, Green Establishments Database
Analysis: Collaborative Economics

Occupations in Advanced Transportation

The ARFV industry includes workers in a wide variety of occupations throughout the supply chain, ranging from research and development, to manufacturing and sales. The Bureau of Labor Statistics (BLS) used green survey results and interviews with industry experts to identify common occupations in the electric vehicles industry. BLS identified a total of 23 occupations using the Standard Occupational Classification system, which allows for cross referencing with employment and wage data. While the list of occupations is not exhaustive for the ARFV industry, it does provide the most comprehensive list available of the most common occupations in ARFV businesses. Some occupational skills may transfer directly from a different industry into an ARFV business, though other occupations or skills may require additional training for an ARFV specific skill set. This list can be a starting point for regions to target certain occupations for training and emerging growth opportunities.

Common occupations for electric vehicle industry are listed in the following table. The number of employees, average annual wage, typical entry education levels, green outlook, and employment projections for each identified occupation are detailed below. Occupation titles are standardized across industries, so the results below are for all industries and not ARFV specific, though this does provide a snapshot of the potential workforce pool for the ARFV industry. The Green Outlook (see table below) is the result of research by the Occupational Information Network's (O*NET) National Center for Development, which analyzed occupations in the green economy to identify how worker requirements and demand is expected to change.

Green Outlook Descriptions

Enhanced Skills Occupations	**Green economy activities and technologies are likely to cause significant change to the work and worker requirements.** New tasks, skills, knowledge, credentials may be needed. Employment demand remains the same, but there is potential for an increase.
New and Emerging Occupations	**The impact of green economy activities and technologies is sufficient to create the need for unique work and worker requirements,** which results in the generation of new occupations.
Increased Demand	**Green economy activities and technologies are likely to increase the employment demand,** but will not lead to significant changes in the work and worker requirements.

Data Source: O*Net

The electric vehicles industry has 23 common occupations identified by BLS in areas such as scientific research, design and development, manufacturing, electric vehicle maintenance, infrastructure development, and sales and support.

Electric Vehicle Industry-Related Common Occupations

Silicon Valley and San Francisco Region

Occupation Title	Regional Average Annual Wage (Q1 2013)	Regional Employment (May 2012)	General Education Category	Green Outlook
Industrial production managers	$119,908	2,550		
Software developers, applications	$116,207	38,230		Not available
Electronics engineers, except computer	$115,136	9,380		
Industrial engineers	$108,715	5,230		
Electrical engineers	$106,132	7,790		
Chemical engineers	$103,128	450		
Materials scientists	$100,716	440		
Materials engineers	$98,744	517		Not available
Chemists	$90,922	2,570		
Urban and regional planners	$89,647	327		
Electrical power-line installers and repairers	$86,804	210		
Commercial and industrial designers	$80,867	550		
Electricians	$77,121	5,630		
Mechanical engineering technicians	$65,580	1,440		
Mechanical drafters	$62,366	700		Not available
Machinists	$51,983	3,210		
Automotive Service Technicians and Mechanics	$51,531	5,920		
Customer service representatives	$45,888	23,950		
Computer-controlled machine tool operators, metal and plastic	$40,729	987		
Electrical and electronic equipment assemblers	$36,183	5,860		
Team assemblers	$35,223	7,820		
Engine and other machine assemblers	$33,832	*		
Electromechanical equipment assemblers	$30,470	1,670		Not available
Retail Salespersons	$27,543	51,980		Not available

Average Wage Levels
- $80,000 and up
- $40,000 - $79,999
- Below $39,999

General Education Category
- Bachelor's Degree or Higher
- Post-High School Training to Associate's Degree
- High School Diploma or Less

Green Outlook
- Enhanced Skills Occupations
- New and Emerging Opportunities
- Increased Demand

*Regional data unavailable, state average annual wage provided.

Note: Regional data is for Metropolitan Statistical Areas within the region.

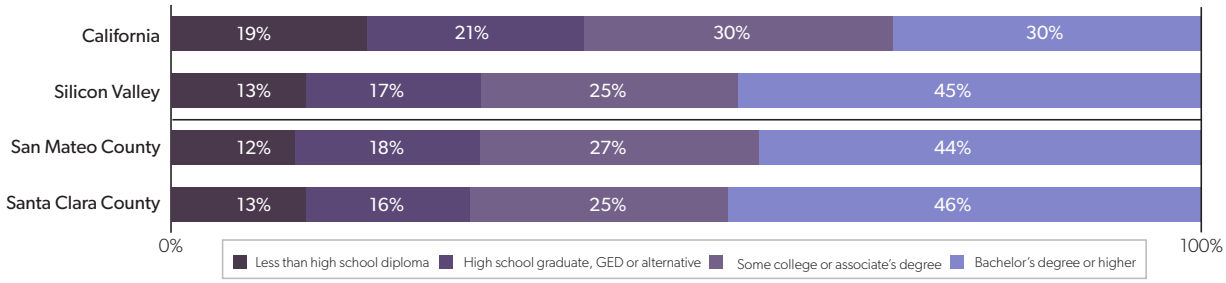
Data Source: California Employment Development Department, U.S. Bureau of Labor Statistics, and O*NET Online

Analysis: Collaborative Economics

Educational Attainment in the Region

Educational Attainment

Silicon Valley, 2011



Data Source: U.S. Census Bureau, American Community Survey Analysis: Collaborative Economics

Workforce Opportunities Questions for Discussion

1. **What are your region's most important segments for employment?** Consider employment size and growth as well as degree of specialization. How have these changed over time?

2. **What other companies in the adaptive advanced transportation economy are part of the supply chain in your region?** (e.g. original equipment manufacturers, auto repair shops)

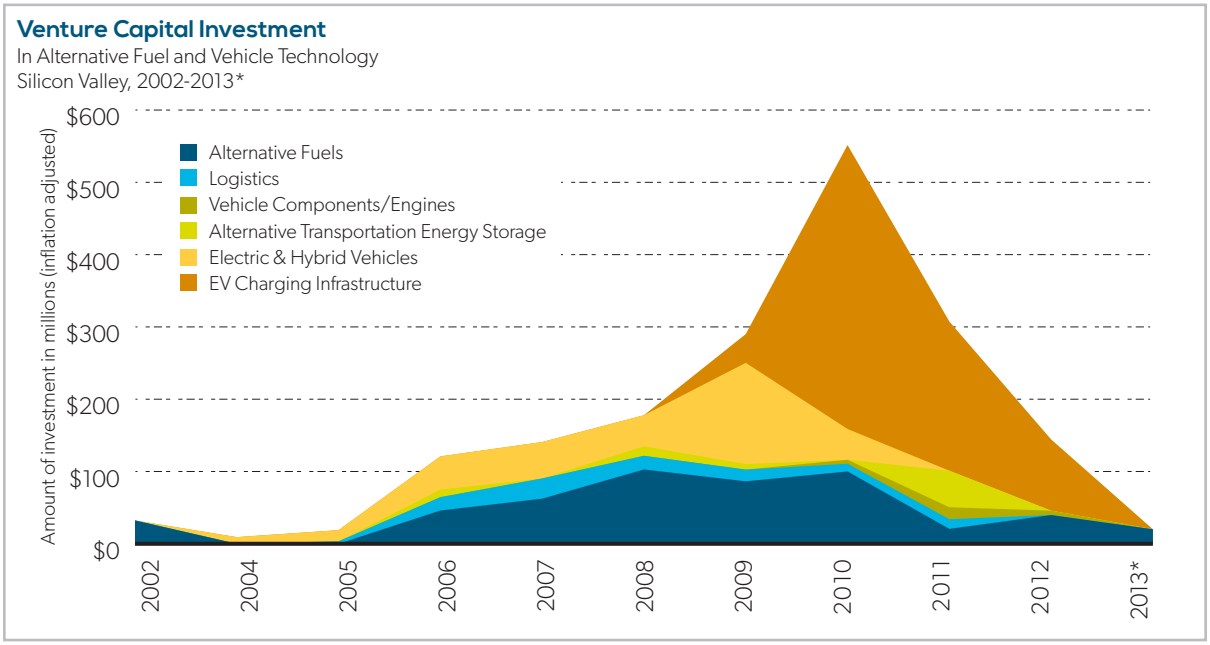
3. **Considering employment, specialization, wages, and education levels, which occupations are likely to be critical to future cluster growth?**

4. **Given the employment and occupation patterns identified, what are the implications for engaging regional partners and employers?**

INNOVATION IN ADVANCED TRANSPORTATION

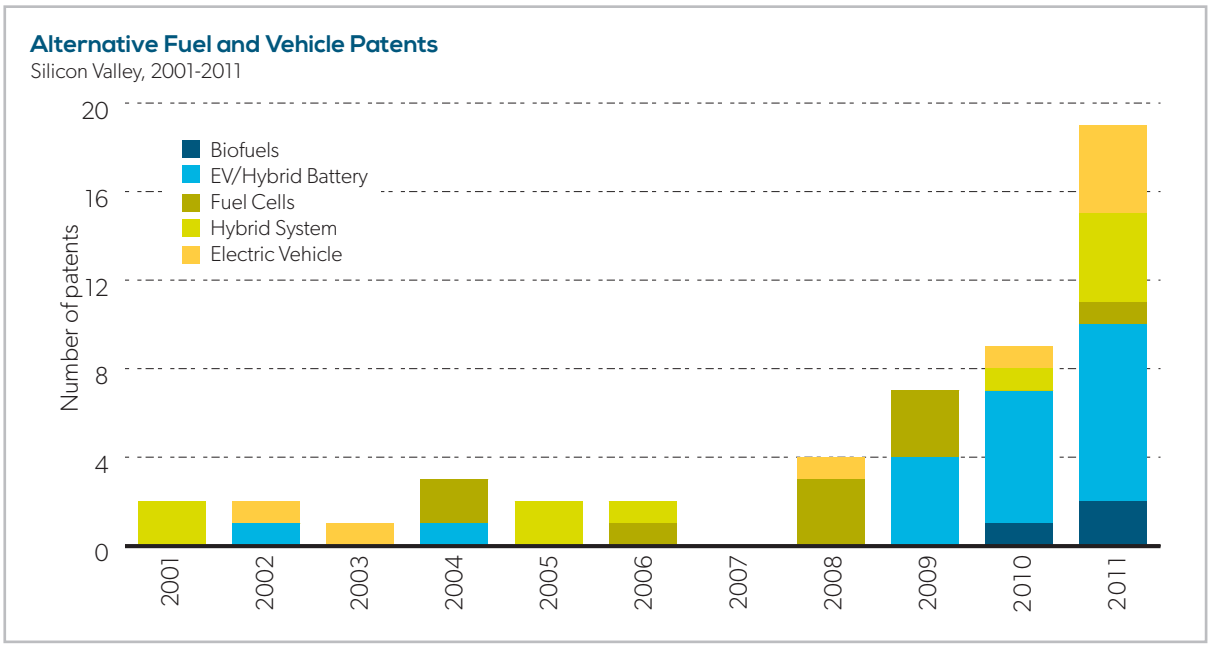
Transportation technologies have evolved dramatically in the last 100 years, but new innovations are still necessary for California to achieve its greenhouse gas reduction goals. California businesses and inventors are striving to make the shift from a carbon-based to a cleaner and more efficient economy. Financial investments in alternative fuel and vehicle technology companies help to commercialize and scale new products and services. Similarly, patent registrations reflect private and public research and development investments and industry growth potential.

Investment in Regional Advanced Transportation Companies



*2013 data as of July 1, 2013
Data Source: CB Insights
Analysis: Collaborative Economics

Patents in Advanced Transportation Technologies



Source: US Patent Trade Office, 1790 Analytics
Analysis: Collaborative Economics

Innovation Questions For Discussion

1. Which new and innovative technologies are being developed and scaled in your region?

2. Are there any existing academic or sector partnerships to leverage to expand regional innovation capabilities?

3. Are there other industries or research institutions in the region that could be leveraged to expand regional innovation capabilities?

4. Given innovation activity in the region, what are the implications for engaging partners and employers?

ADVANCED TRANSPORTATION TECHNOLOGY IMPLEMENTATION AND GROWTH

The following charts show how the region has been adopting new alternative vehicle technologies and deploying supportive alternative vehicle infrastructure. This section can show where market demand in your region is focused and therefore where opportunities are to leverage the market and advance the industry.

Alternative Vehicle Registrations in the Region

Alternative Vehicle Registrations

Silicon Valley, 2011

	Silicon Valley Total	Proportion of Regional Registrations by Vehicle Fuel Type
All Fuels	1,985,108	
Flex Ethanol	30,076	1.5%
Electric	1,917	0.1%
Natural Gas	1,531	0.1%
Propane	175	0.0%
Plug In Hybrid	147	0.0%
Hydrogen	-	0.0%

Data Source: California Energy Commission
Analysis: Collaborative Economics

Alternative vehicles include zero emission vehicles such as electric and hydrogen fuel cell and low-emission/low carbon fuel vehicles using fuels such as natural gas, ethanol, and propane.

Clean Vehicle Rebates Issued in the Region

Clean Vehicle Rebates Issued

Silicon Valley, 2010-2013*

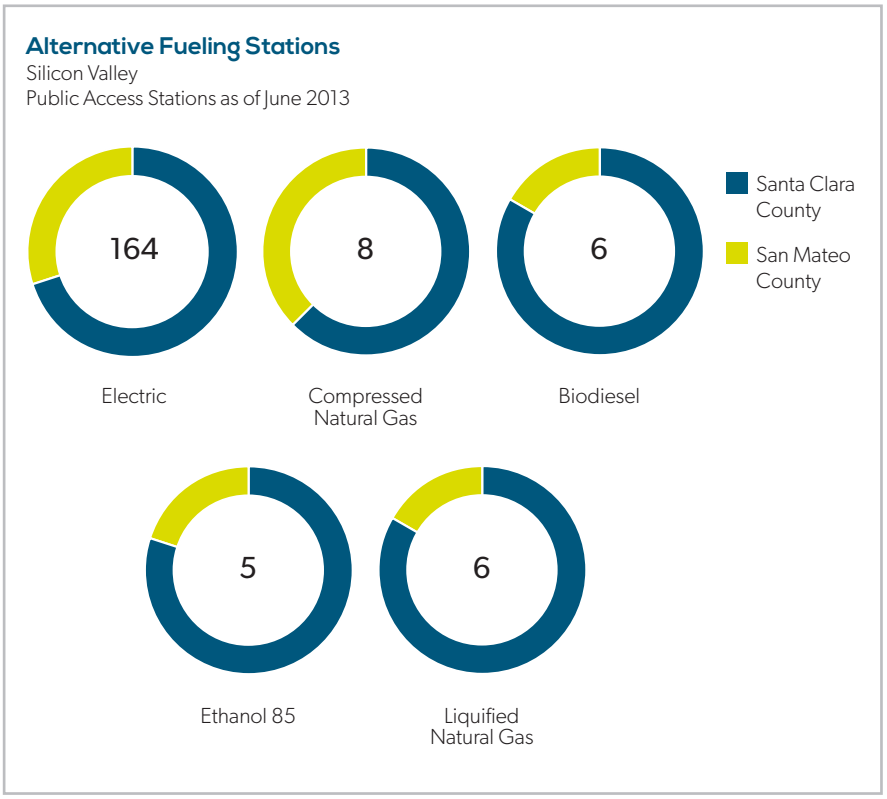
	2010	2011	2012	2013*	Grand Total
SAN MATEO COUNTY					
Plug-in Hybrid Electric Vehicles			213	143	356
Zero Emission Vehicle	4	250	181	359	794
SANTA CLARA COUNTY					
Plug-in Hybrid Electric Vehicles			865	653	1518
Zero Emission Vehicle	11	722	705	971	2409
REGIONAL SHARE OF TOTAL CALIFORNIA REBATES					
Plug-in Hybrid Electric Vehicles			15%	17%	15%
Zero Emission Vehicle	20%	22%	24%	24%	23%

*Note: 2013 data is as of June 17, 2013
Data Source: Center for Sustainable Energy California, Clean Vehicle Rebate Project
Analysis: Collaborative Economics

In addition to supporting alternative vehicles that use a range of lower emission fuel types, California has taken specific actions to stimulate demand for zero emission vehicles. Since alternative vehicle registration data is only available through 2011, clean vehicle rebates are used as a proxy for the number of alternative vehicles purchased in the last two years. Clean vehicle rebates apply to plug-in hybrid electric and zero emission vehicles (fuel cell or all electric), not other alternative vehicle types such as natural gas or flex ethanol.

Alternative Fueling Infrastructure Available in the Region

Widely-available alternative fueling infrastructure is a critical requirement of widespread adoption of new alternative vehicles. Range anxiety is a common concern among electric vehicle owners as the batteries are generally not able to provide enough charge for long distance trips. Private fueling stations are important to support individual businesses, fleets, or individual use, but public access stations are essential for wider adoption of alternative vehicles.



Data Source: U.S. Department of Energy, Alternative Fuels Data Center
Analysis: Collaborative Economics

Technology Growth and Implementation Questions for Discussion

1. **How is the adoption rate for alternative vehicles changing in your region?** What are the implications?

2. **How are the alternative fueling infrastructure needs in your region changing based on regional demand for alternative vehicles and supply of biofuels?** Are there opportunities to better align demand for vehicles and access to fueling infrastructure?

3. **What policies or partnerships (e.g. business or economic development organizations) are currently in place to support the industry?**

4. **Based on these technology deployment patterns, what are the implications for engaging regional partners and employers?**

EMPLOYER ENGAGEMENT

The following list of companies are identified as high-potential employers because they have high levels of employment, high growth rates, received venture capital investments, registered patents, and/or were identified by a regional organization as a leader.

Potential Companies to Engage for RICO

Silicon Valley

Company Name	Segment	20+ Employees in Core ARFV Industry (2011)	Fast Growing Employer (2006-2011)	Registered Patents (2007-2013)	Investments Received (2010-2012)
Altex Technologies	Advanced Transportation Energy Storage	✦	✦		
Amprius	Advanced Transportation Energy Storage				✦
Atieva	Advanced Transportation Energy Storage				✦
Polyfuel	Advanced Transportation Energy Storage	✦		✦	
Amemetis	Alternative Fuels	✦	✦		
Catilin	Alternative Fuels				✦
Cobalt Technologies	Alternative Fuels	✦	✦		✦
Codexis	Alternative Fuels	✦	✦		
LS9	Alternative Fuels				✦
Propel Fuels	Alternative Fuels				✦
Solazyme	Alternative Fuels	✦	✦		✦
Virdia	Alternative Fuels				✦
Pinnacle Engines	Alternative Motor Vehicles & Equipment				✦
Tesla Motors	Alternative Motor Vehicles & Equipment	✦	✦	✦	
Wrightspeed	Alternative Motor Vehicles & Equipment				✦
Think	Electric & Hybrid Vehicles				✦
ChargePoint	Fueling Infrastructure	✦	✦	✦	✦
E-Fuel Corporation	Fueling Infrastructure	✦			

Note: Employment data includes only companies in the core ARFV industry
Data Source: Employment data from National Establishments Time Series Database; Patent data from US Patent Trade Office, 1790 Analytics; Investment data from CB Insights
Analysis: Collaborative Economics

Employer Engagement Questions for Discussion

1. What do you know about the employers on the list above?

2. In addition to the list above, what other employers need to be engaged?

3. **What is your current employer engagement strategy?** How can it be expanded for the advanced transportation cluster?