

SOLANO COUNTY'S ENERGY CLUSTER PROFILE

Presented by
Collaborative Economics, Inc.

Overview

- **Solano County's energy cluster** is rapidly transforming, creating new opportunities for economic prosperity and job growth.
- **Opportunities exist for growing Solano County's energy cluster** given the county's substantial natural assets, strategic location, positive industry trends and innovative public and private projects.

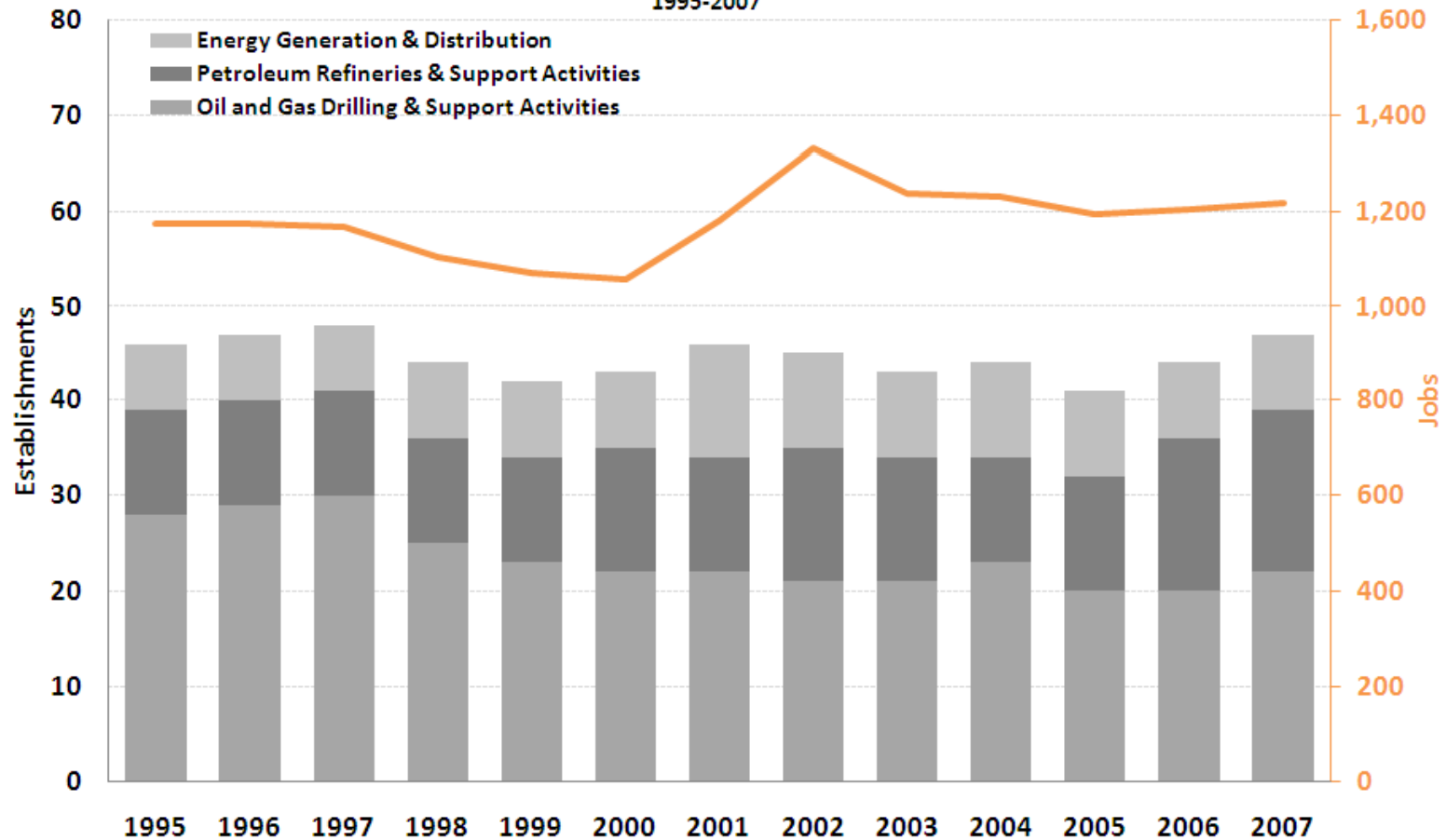
ENERGY CLUSTER TRENDS

Solano County's energy cluster is diverse and transforming with new opportunities for economic prosperity and job growth

- **Carbon-based energy** remains the largest sector, but has experienced only two years of annual growth between 1995 and 2007.
- **Clean energy is a small, but fast growing sector**, increasing 72% in employment between 1995 and 2007.

The carbon-based energy sector expanded 4 percent between 1995 and 2007

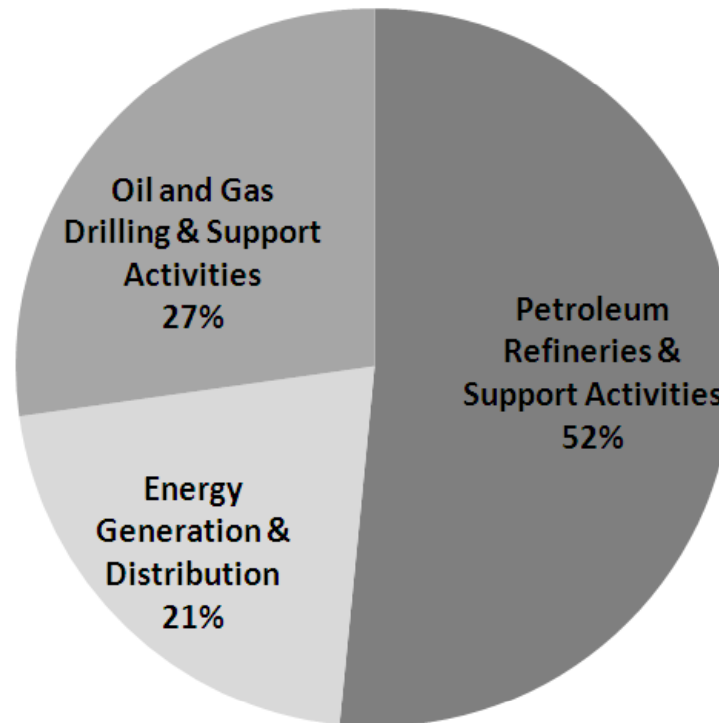
Carbon-Based Energy Distribution & Production
Business Establishments & Jobs
Solano County
1995-2007



Data Source: National Establishment Time Series Database
Analysis: Collaborative Economics

In 2007, most of Solano County's carbon-based energy jobs are related to petroleum refining

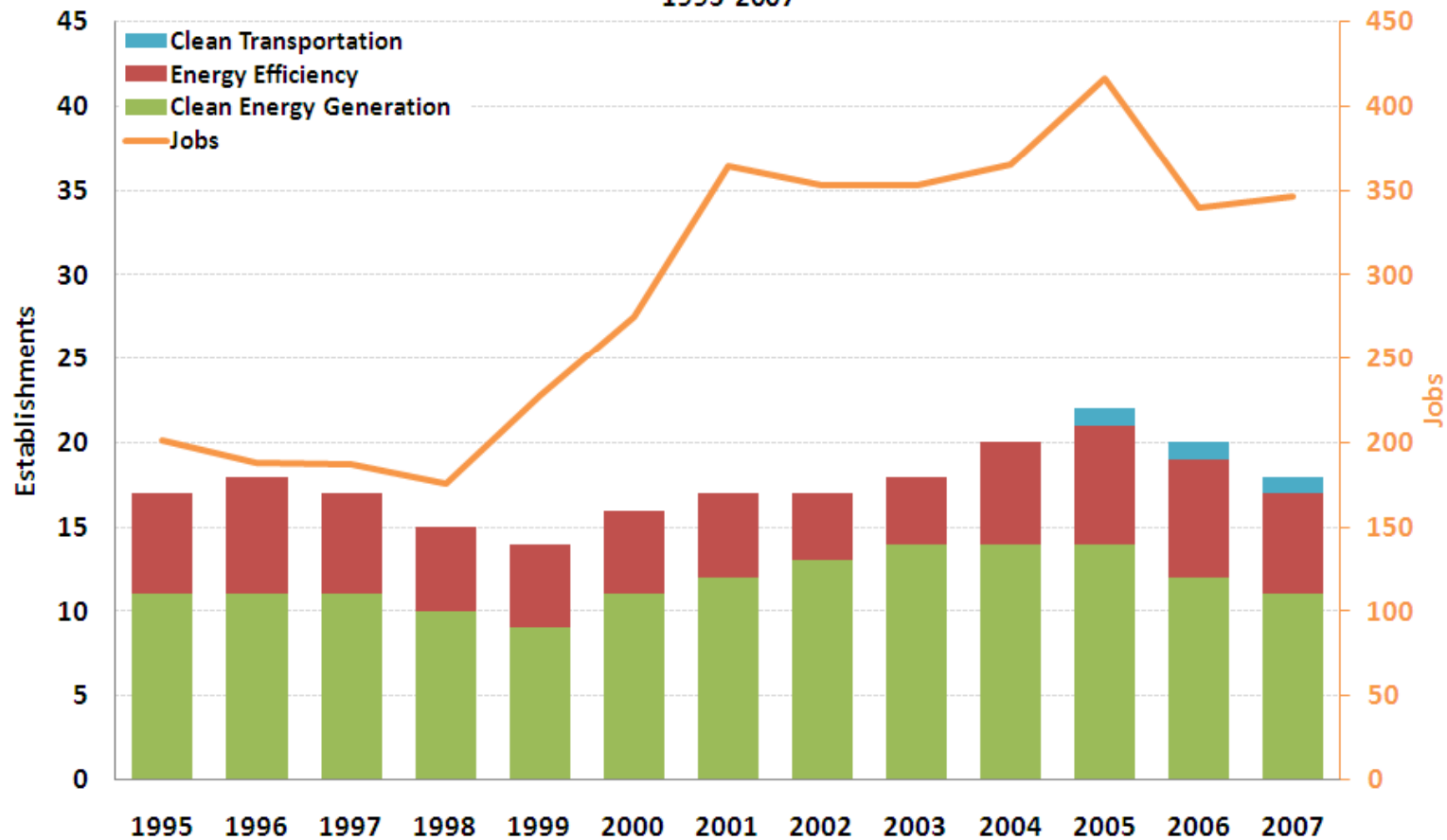
**Carbon-Based Energy Distribution & Production Jobs
Solano County
2007**



Data Source: National Establishment Time Series Database
Analysis: Collaborative Economics

In the past few years, clean energy has both grown and diversified in Solano County

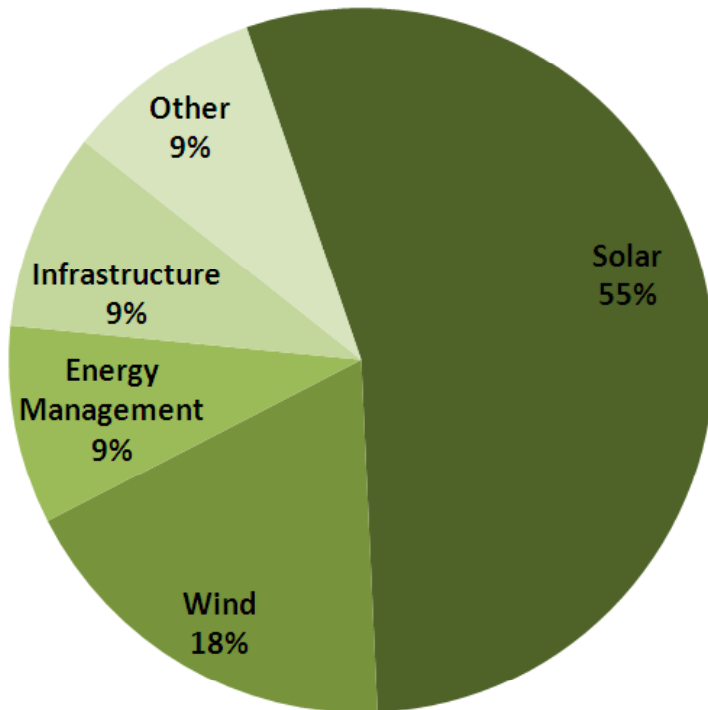
Clean Energy & Transportation
Business Establishments & Jobs
1995-2007



Data Source: Green Establishments Database
Analysis: Collaborative Economics

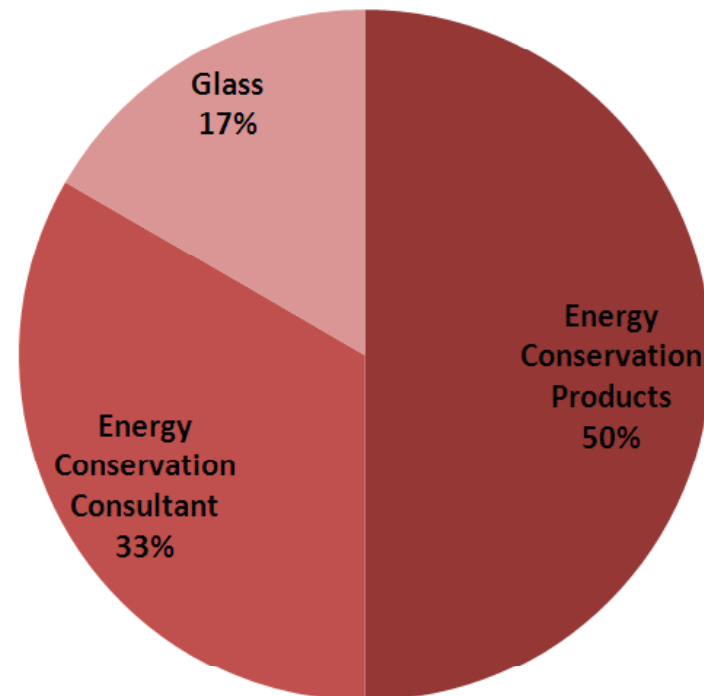
In 2007, a majority of clean energy jobs were in clean energy generation and energy efficiency

**Clean Energy Generation Establishments
Solano County
2007**



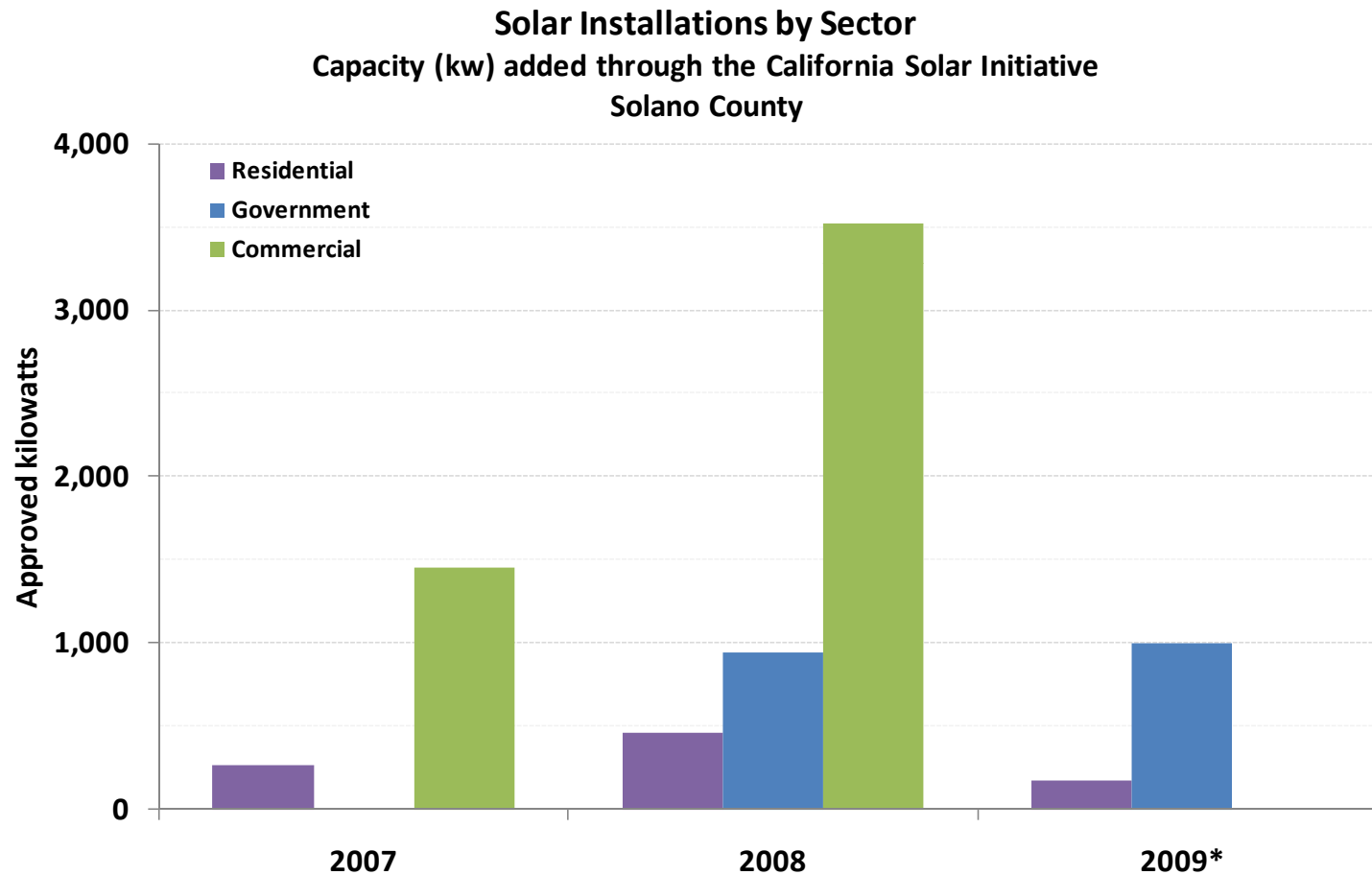
Data Source: Green Establishments Database
Analysis: Collaborative Economics

**Energy Efficiency Establishments
Solano County
2007**



Data Source: Green Establishments Database
Analysis: Collaborative Economics

Local businesses are driving growth in solar generation capacity



*As of July 22, 2009.

Data Source: California Public Utilities Commission, California Solar Initiative

Analysis: Collaborative Economics

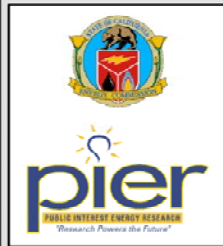
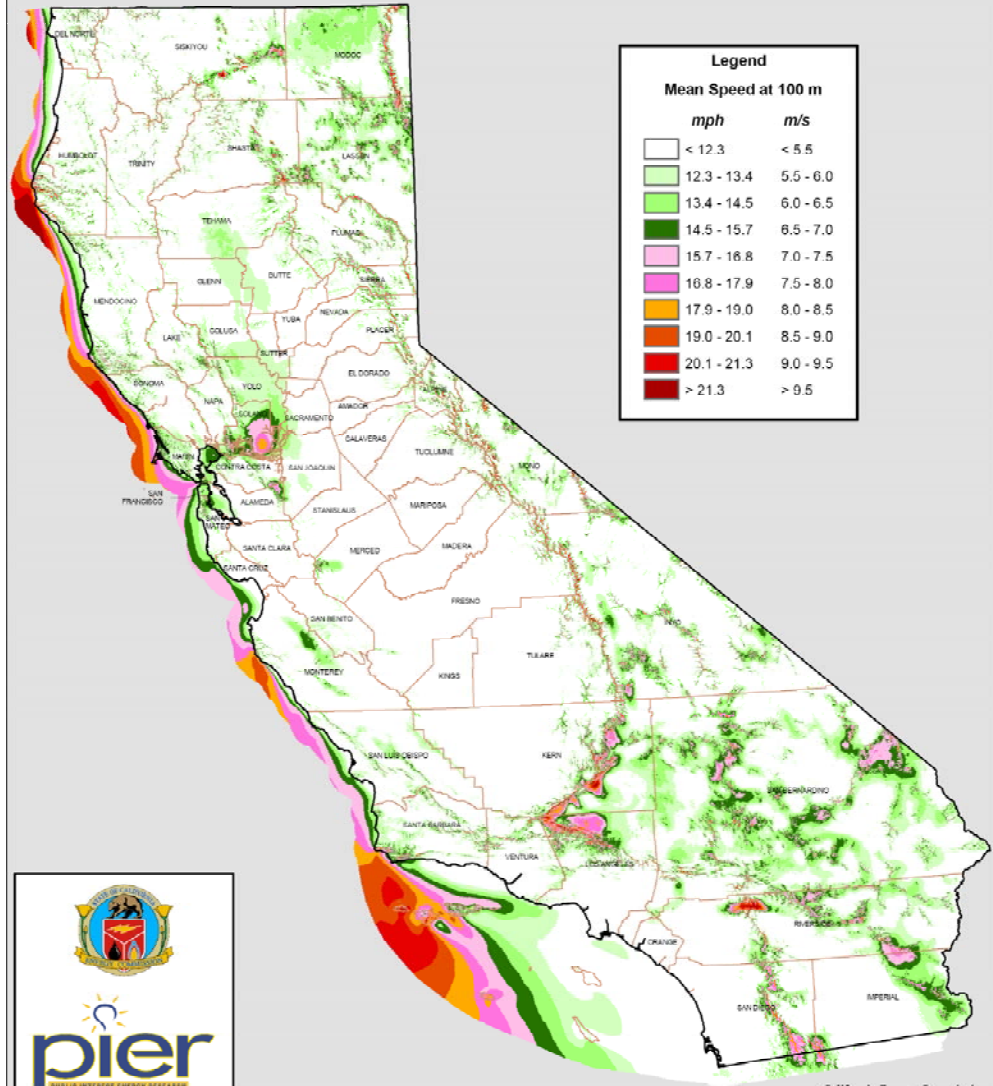
Wind energy is picking up in Solano County

Renewables Portfolio Standard Facilities in Solano County				
Facility Name	City	Commercial Operations Date	Capacity (MW)	Technology
Michael W. Stephens	Dixon	1982	0.01	Wind
High Winds Energy Center	Birds Landing	2003	162	Wind
Solano Wind Facility - Solano Wind Phase 1 & 2	Rio Vista	2003	102	Wind
Shiloh I Wind Project	Birds Landing	2006	150	Wind
Montezuma Wind Energy Center (FPL Energy Montezuma Wind, LLC)	Birds Landing	2007	34.5	Wind
Shiloh Wind Project 2, LLC	Rio Vista	2009	150	Wind
Solano Irrigation District (SID) - Monticello Dam	Vacaville	1983	11.9	Small Hydroelectric
City Of Vallejo	Vallejo	1985	0.06	Small Hydroelectric

Data Source: California Energy Commission, California's Renewables Portfolio Standard (RPS) Eligible Facilities

California Wind Resources

Annual Wind Speed at 100 Meter Elevation



This map was created by AWS TrueWind Solutions using the Mesomap system and historical weather data. Although it is believed to represent an accurate overall picture of the wind energy resource, estimates at any location should be confirmed by measurement. Data current 2006

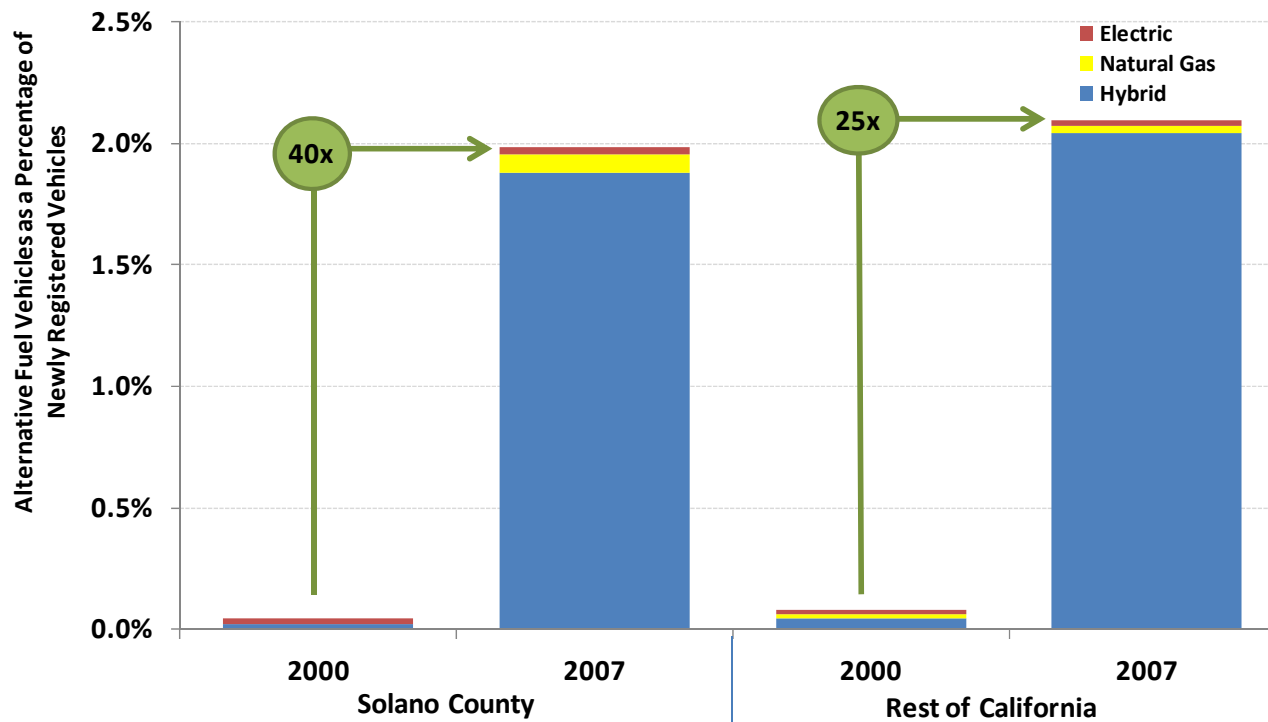
T:\PIER\CEC\2014\201406\Wind Maps 2006 A Map of CALIFORNIA Wind Speed 100m_ A 800.mxd

California Energy Commission
Facilities Siting Division
Cartography Unit
www.energy.ca.gov

To inquire about ordering this map or information on other types of maps call the map line at (916) 654-4182 or E-Mail: JGILBRE@ENERGY.STATE.CA.US

There are signs that alternative transportation may be a growing part of Solano County's future

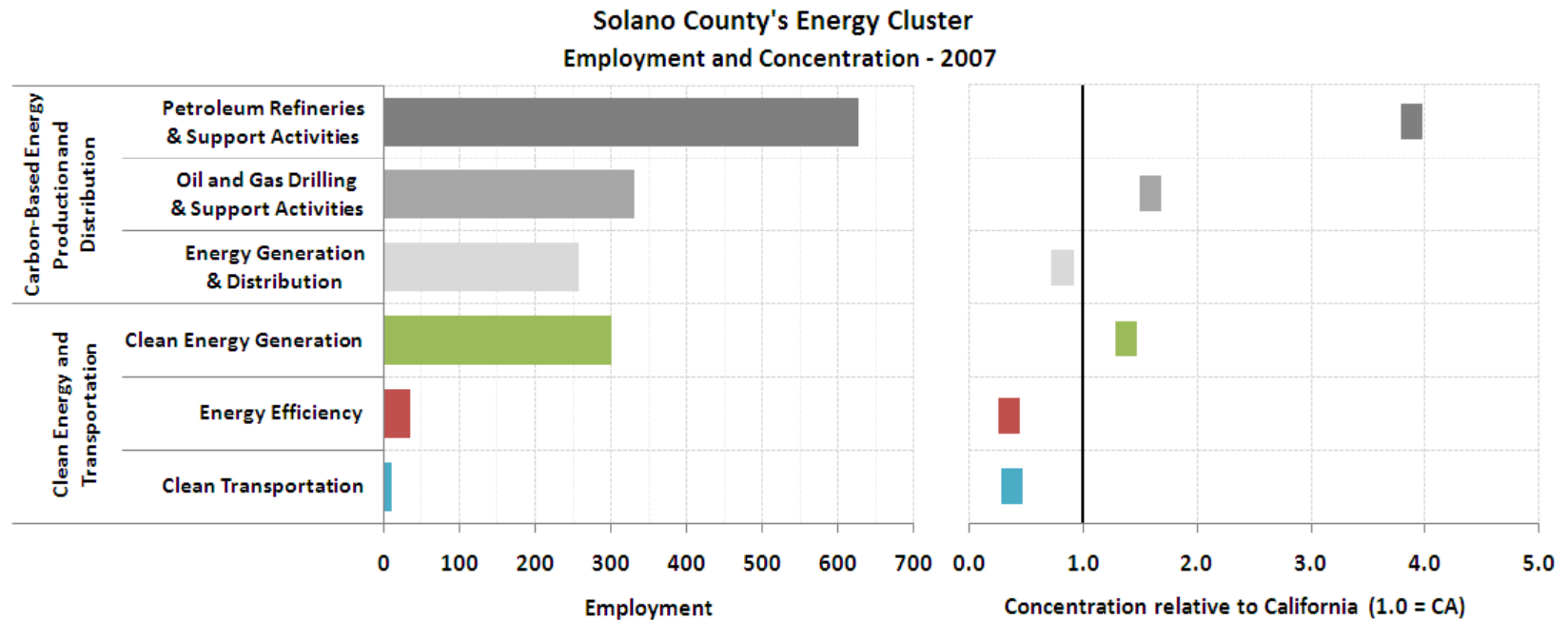
Alternative Fuel Vehicles as a Percentage of Newly (New & Used) Registered Vehicles by Fuel Type
Solano County and the Rest of California



Solano County % of California Newly Registered Alternative Fuel Vehicles (New and Used)	
2007	
Hybrid	1%
Natural Gas	4%
Electric	2%

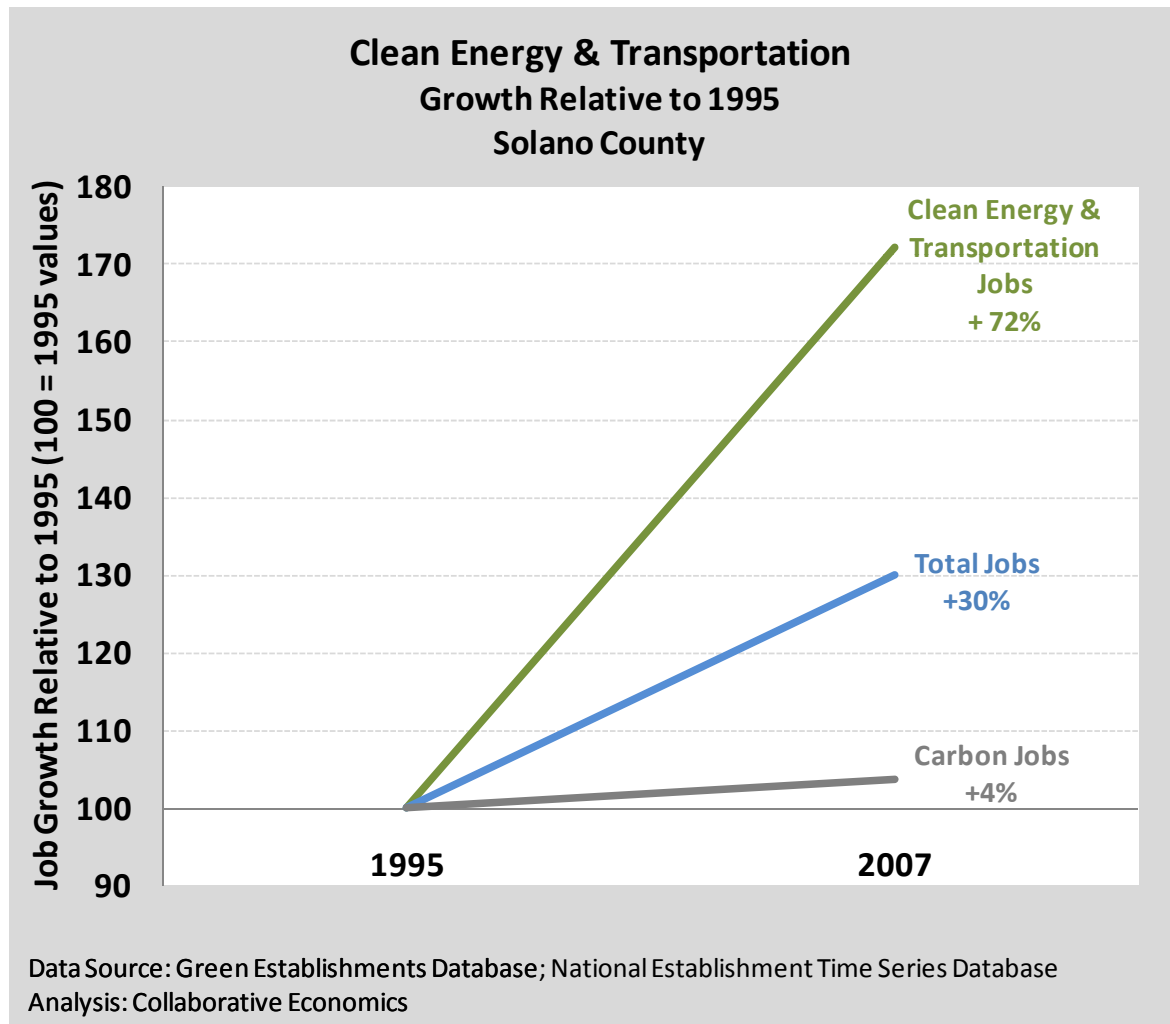
Data Source: R.L. Polk & Co.
Analysis: Collaborative Economics

Solano County's employment concentration in clean energy sectors is less than the California average – but this is changing



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

Solano County is growing jobs in Clean Energy and Transportation at a faster rate than the carbon-based energy, or even the overall economy



There is a wide variety of high, medium and entry-level jobs in the energy cluster, with substantial overlap in the occupations associated with carbon-based energy and clean energy clusters.

Example Occupations in Solano County's Energy Sector		
Clean Energy & Transportation Occupations		
Helpers--Electricians	\$34,082*	Short-Term On-the-Job Training
Semiconductor Processors	\$35,438*	Associate Degree
Environmental Engineering Technicians	\$48,573	Associate Degree
Environmental Science and Protection Technicians, Including Health	\$54,103*	Associate Degree
Mechanical Engineering Technicians	\$55,159*	Associate Degree
Electrical and Electronics Repairers, Commercial and Industrial Equipment	\$69,441	Post-Secondary Vocational Education
Industrial Engineers	\$81,015	Bachelor's Degree
Environmental Scientists and Specialists, Including Health	\$88,393	Bachelor's Degree
Materials Engineers	\$94,625*	Bachelor's Degree
Biochemists and Biophysicists	\$95,366*	Doctoral Degree
Energy Distribution & Carbon-Based Energy Production Occupations		
Helpers--Extraction Workers	\$37,788*	Long-Term On-the-Job Training
Roustabouts, Oil and Gas	\$40,831*	Moderate-Term On-the-Job Training
Derrick Operators, Oil and Gas	\$43,644*	Moderate-Term On-the-Job Training
Service Unit Operators, Oil, Gas, and Mining	\$48,117*	Moderate-Term On-the-Job Training
Wellhead Pumpers	\$50,099*	Moderate-Term On-the-Job Training
Rotary Drill Operators, Oil and Gas	\$53,948	Moderate-Term On-the-Job Training
Control and Valve Installers and Repairers, Except Mechanical Door	\$62,982	Moderate-Term On-the-Job Training
Petroleum Pump System Operators, Refinery Operators, and Gaugers	\$67,894*	Long-Term On-the-Job Training
Petroleum Engineers	\$126,528*	Bachelor's Degree
Occupations in Clean and Carbon-Based Energy		
Receptionists and Information Clerks	\$27,266	Short-Term On-the-Job Training
Helpers--Installation, Maintenance, and Repair Workers	\$31,719	Short-Term On-the-Job Training
Outdoor Power Equipment and Other Small Engine Mechanics	\$34,123	Moderate-Term On-the-Job Training
Construction Laborers	\$38,466	Moderate-Term On-the-Job Training
Bill and Account Collectors	\$39,937	Short-Term On-the-Job Training
Welders, Cutters, Solderers, and Brazers	\$40,493	Post-Secondary Vocational Education
Maintenance and Repair Workers, General	\$45,088	Long-Term On-the-Job Training
Pump Operators, Except Wellhead Pumpers	\$45,229*	Moderate-Term On-the-Job Training
Chemical Equipment Operators and Tenders	\$47,984*	Moderate-Term On-the-Job Training
Excavating and Loading Machine and Dragline Operators	\$52,009	Moderate-Term On-the-Job Training
Meter Readers, Utilities	\$54,262	Short-Term On-the-Job Training
Operating Engineers and Other Construction Equipment Operators	\$62,934	Moderate-Term On-the-Job Training
Electrical and Electronic Engineering Technicians	\$71,695	Associate Degree
Chemists	\$72,106	Bachelor's Degree
Electrical and Electronics Repairers, Powerhouse, Substation, and Relay	\$72,560*	Post-Secondary Vocational Education
Power Distributors and Dispatchers	\$79,276*	Long-Term On-the-Job Training
Electrical Engineers	\$79,628	Bachelor's Degree
Environmental Engineers	\$88,733	Bachelor's Degree
Engineering Managers	\$133,270	Work Experience, Plus a Bachelor's or Higher
Chief Executives	\$201,674	Work Experience, Plus a Bachelor's or Higher

*Statewide estimate for annual earnings.

Data Source: California Employment Development Department, Labor Market Information Division, Occupation Employment Statistics (OES) 1st Quarter 2009

Analysis: Collaborative Economics

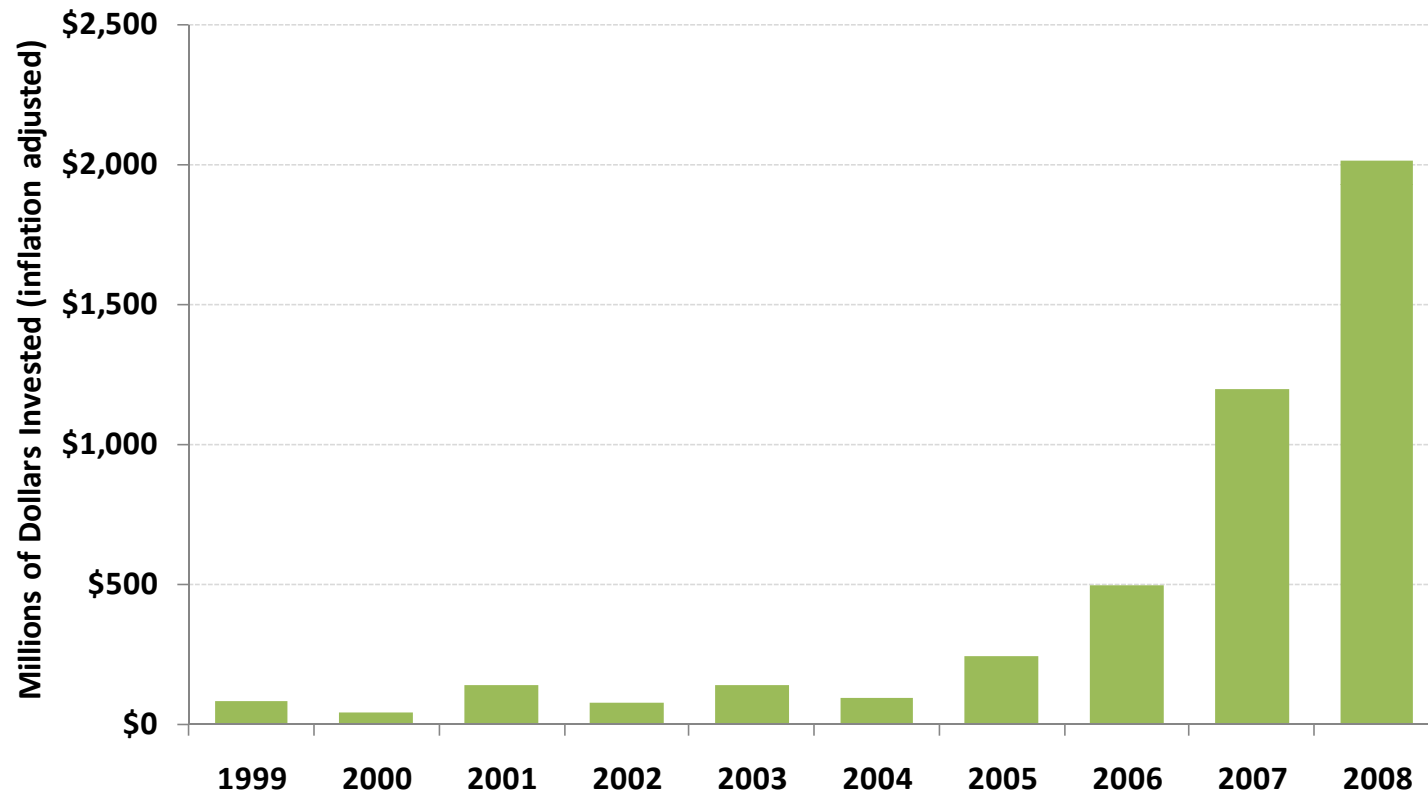
**OPPORTUNITIES TO
GROW SOLANO
COUNTY'S ENERGY
CLUSTER**

CAPTURE REGIONAL INNOVATION

**Expand Solano County's
role in the Northern
California Energy Economy**

Solano County is in the middle of Northern California's energy innovation hub

Venture Capital Investment in Clean Technology
San Francisco Bay Area



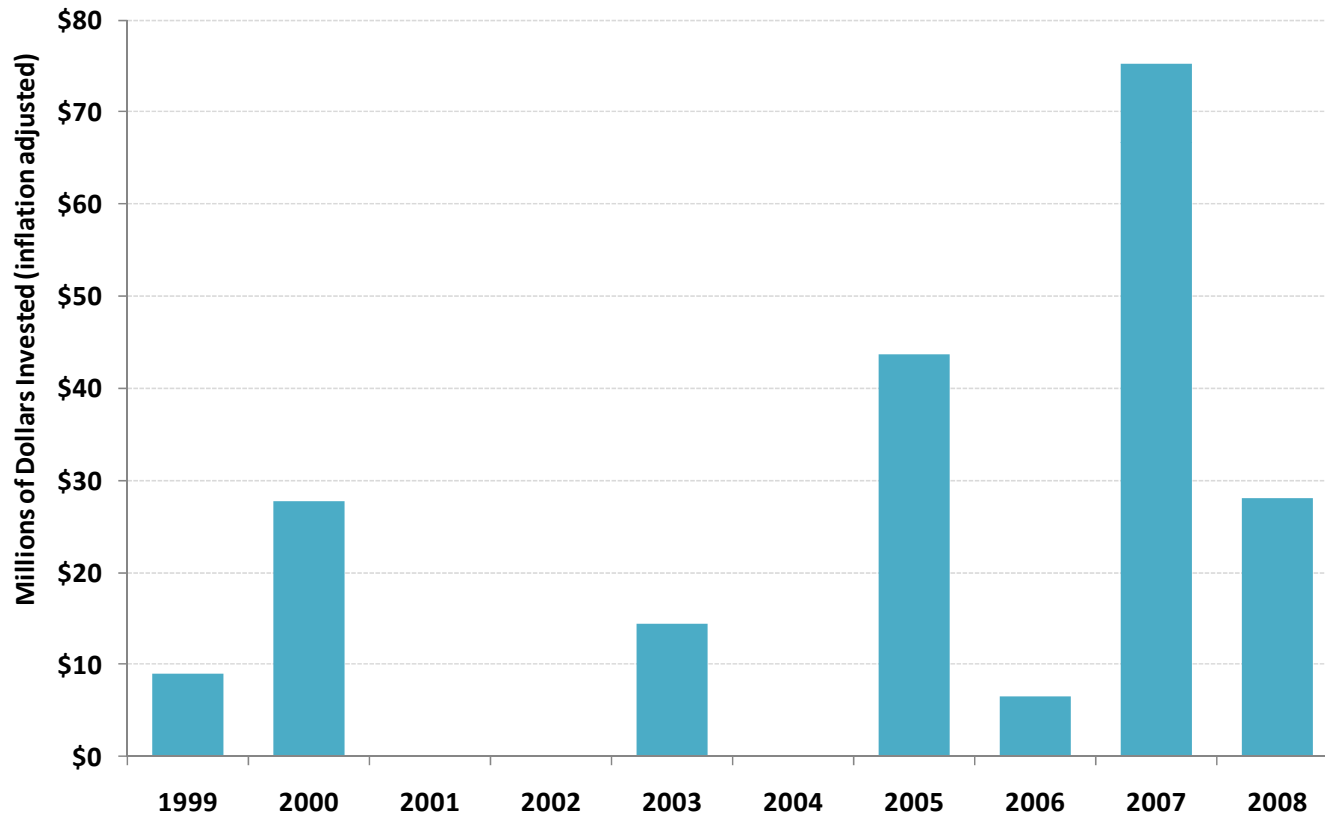
Note: San Francisco Bay Area includes Alameda, Contra Costa, Napa, Marin, San Francisco, San Mateo, Santa Clara, Solano, Sonoma Counties.

Data Source: Cleantech Group™, LLC (www.cleantech.com)

Analysis: Collaborative Economics

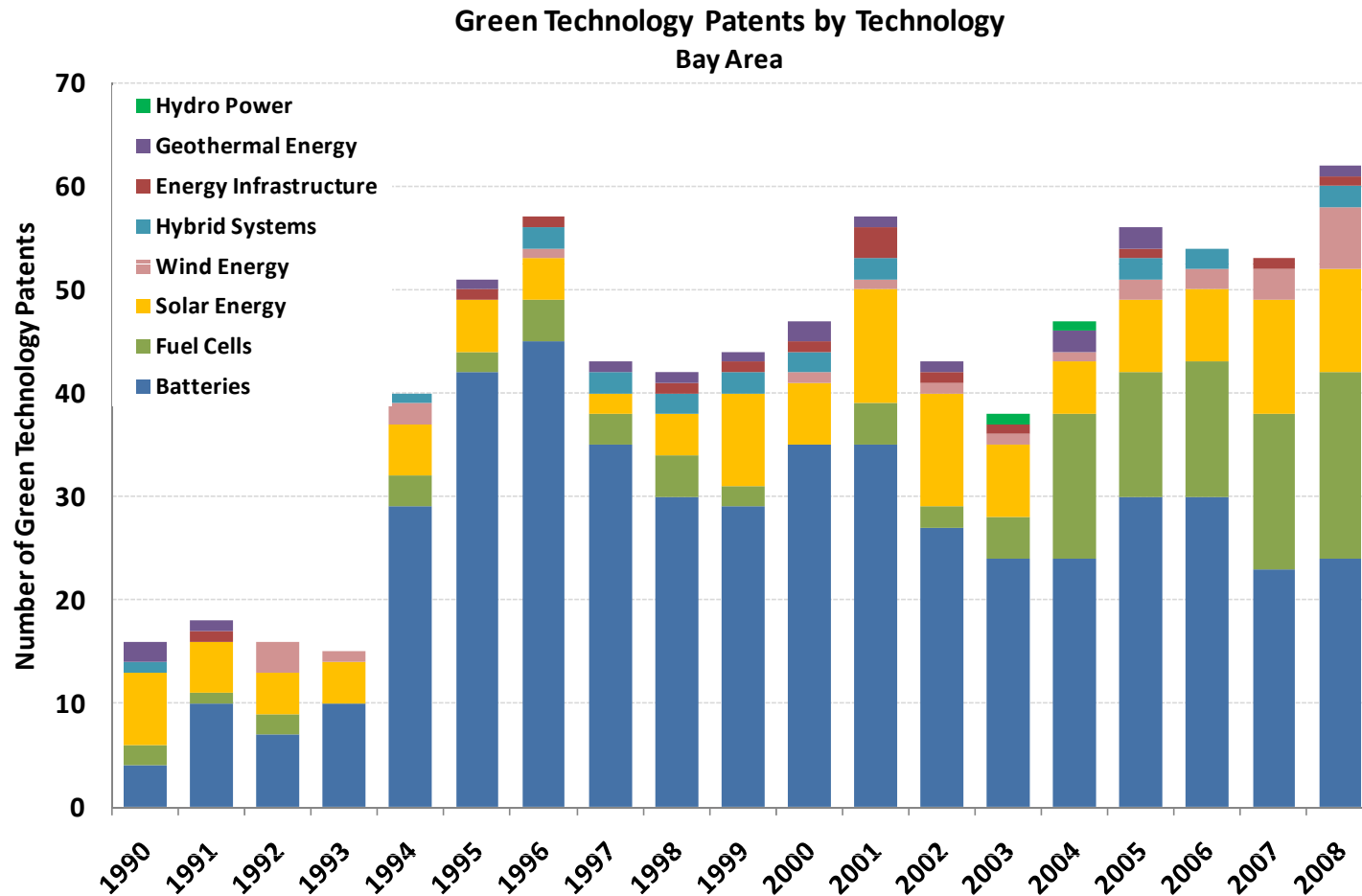
Combined, Sacramento and Yolo Counties attracted nearly \$30 million in cleantech venture capital funding in 2008

Venture Capital Investment in Clean Technology
Sacramento & Yolo Counties



Data Source: Cleantech Group™, LLC (www.cleantech.com)
Analysis: Collaborative Economics

In addition to VC funding, Northern CA is a center for Green R & D



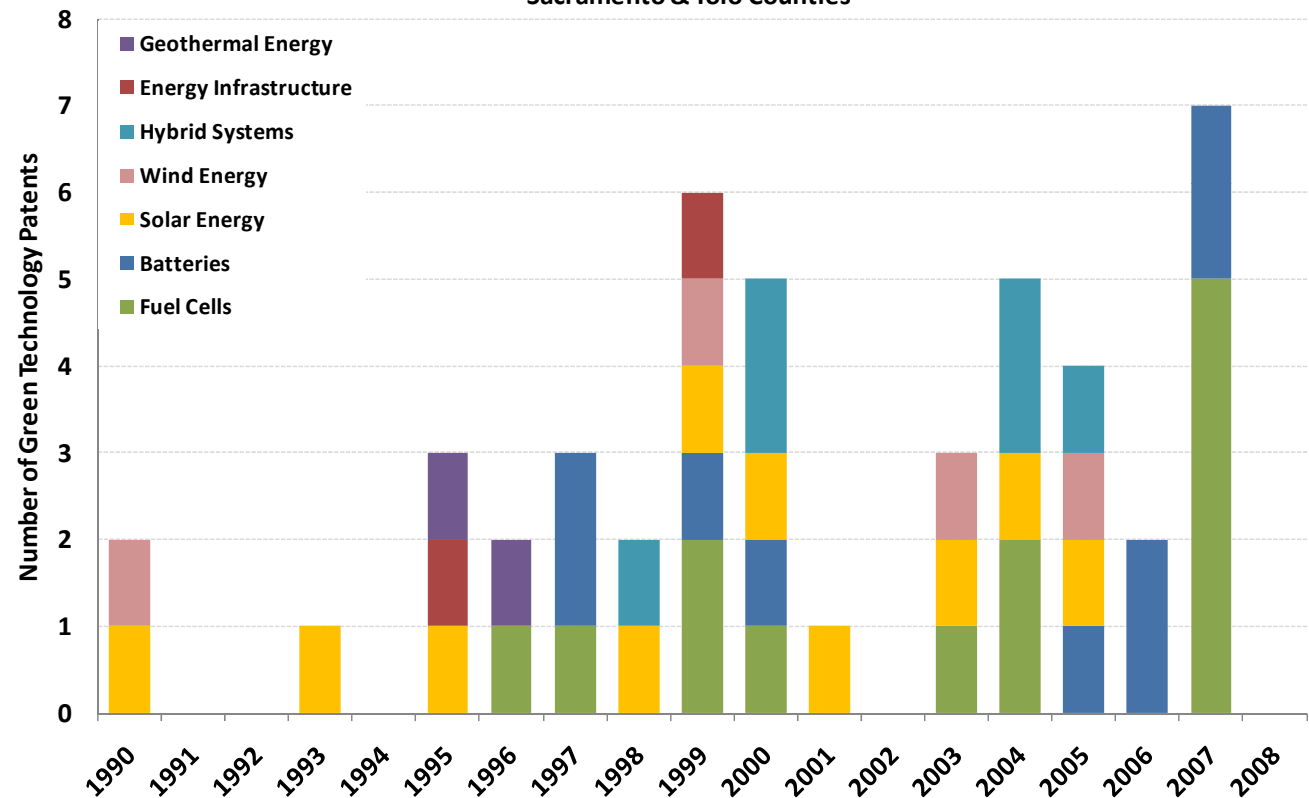
Note: San Francisco Bay Area includes Alameda, Contra Costa, Napa, Marin, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma Counties.
Data Source: 1790 Analysis, Patents by Green Technology; USPTO Patent File
Analysis: Collaborative Economics

Green technology patent registrations are on the rise in the greater Sacramento area

Green Technology Patents Registered by Inventors based in Solano County		
Patent Field	Year	City of Primary Inventor
Hydro Power	1983	Vallejo
Wind Energy	1983	Vallejo
Batteries	1986	Benicia
Batteries	1987	Benicia
Hydro Power	1988	Vallejo
Batteries	1995	Suisun City
Batteries	1996	Vallejo
Batteries	1997	Fairfield
Batteries	2002	Fairfield

Data Source: 1790 Analysis, Patents by Green Technology; USPTO Patent File
 Analysis: Collaborative Economics

Green Technology Patents by Technology
 Sacramento & Yolo Counties



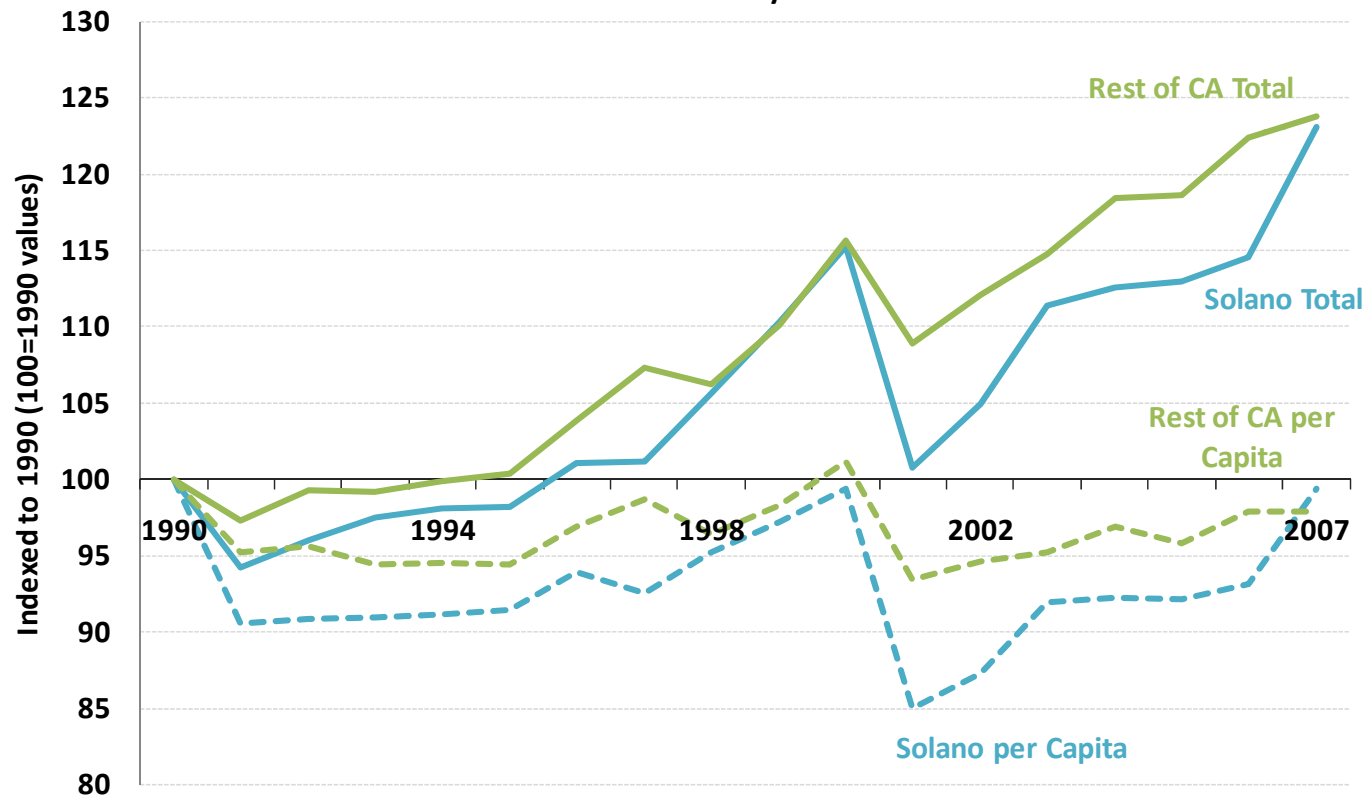
Data Source: 1790 Analysis, Patents by Green Technology; USPTO Patent File
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EXPAND LOCAL MARKETS

**Stimulate demand for energy
efficiency and transportation
alternatives in Solano County**

Solano County has a growing market for energy efficiency as indicated by an above average consumption of electricity . . .

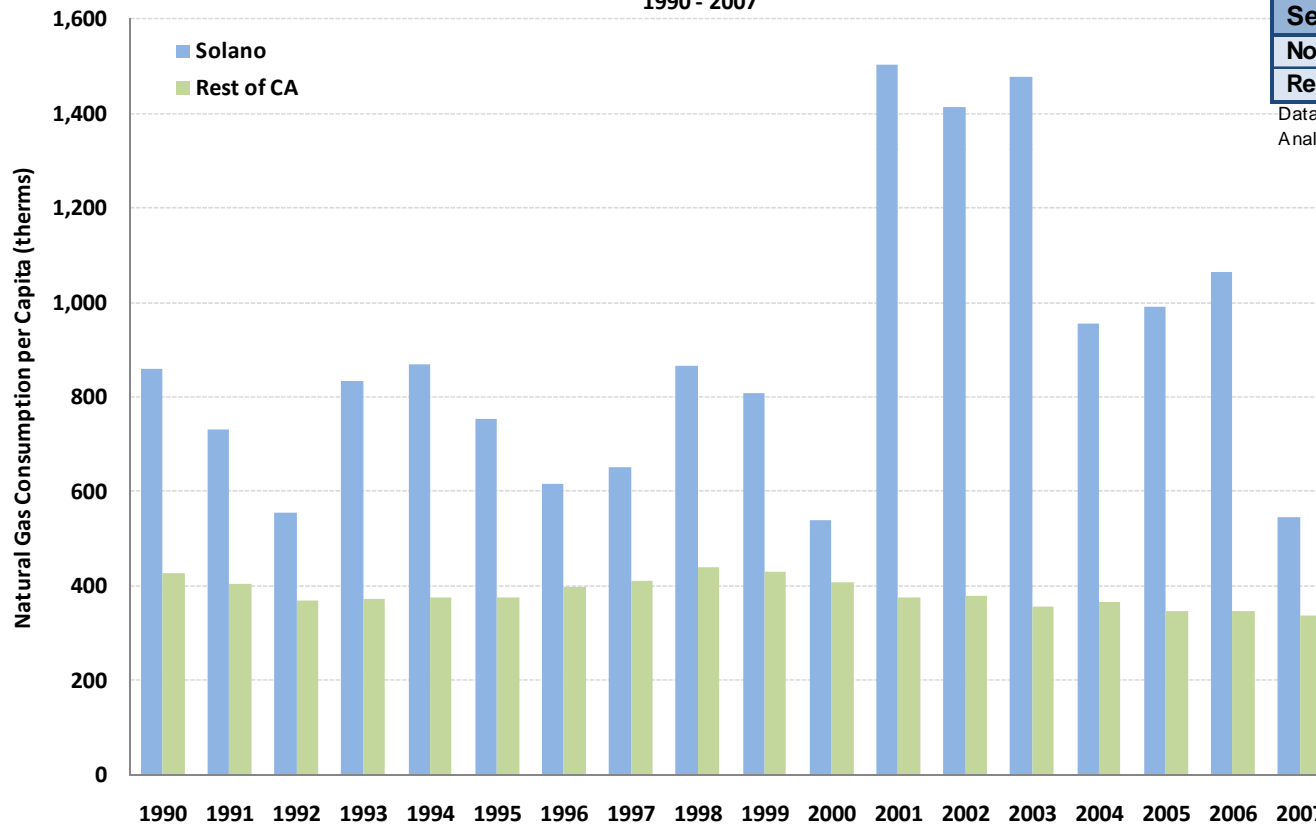
Electricity Consumption Relative to 1990
Total and per Capita
Solano County



Data Source: California Energy Commission, QFER
Analysis: Collaborative Economics

... and natural gas.

Natural Gas Consumption per Capita
Solano County and Rest of California
1990 - 2007



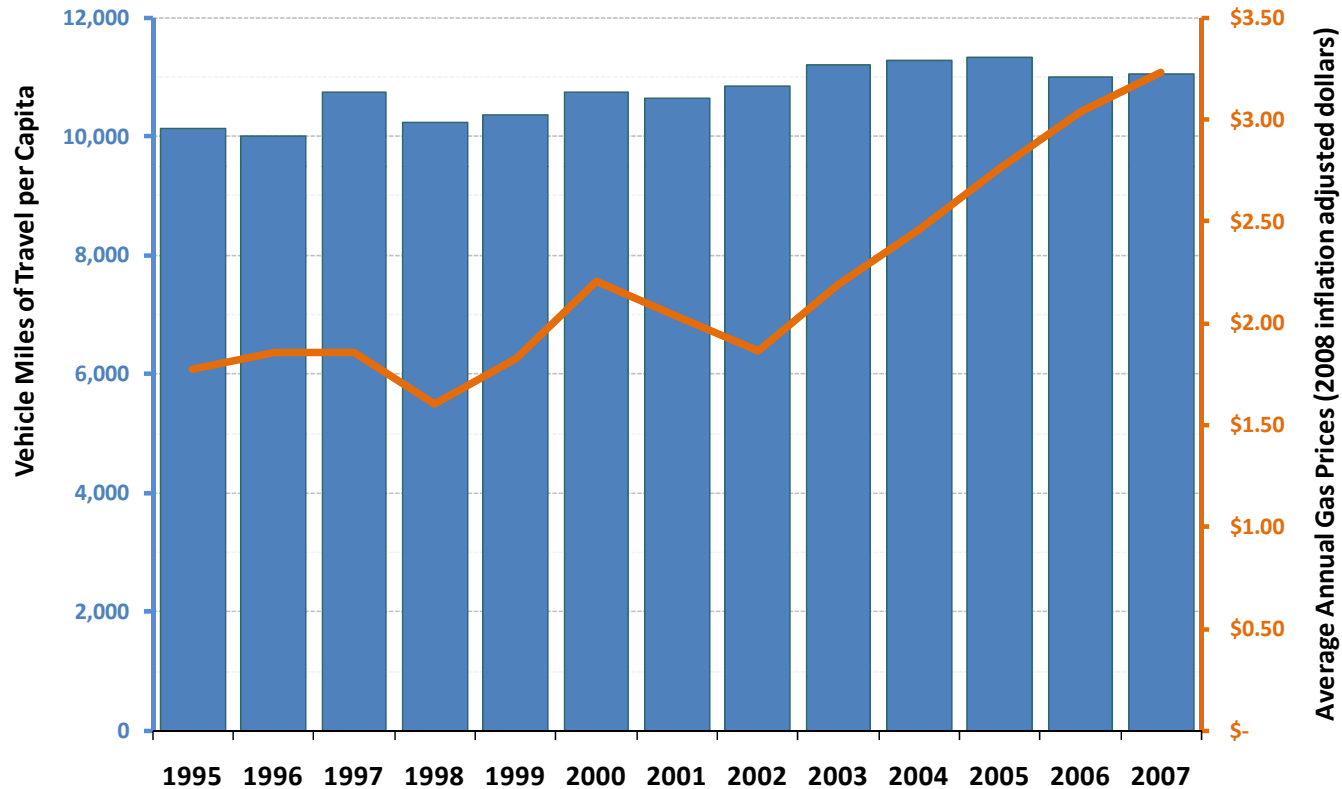
Sector	2006	2007
Non-Residential	86%	74%
Residential	14%	26%

Data Source: California Energy Commission, QFER
Analysis: Collaborative Economics

Data Source: California Energy Commission, QFER
Analysis: Collaborative Economics

Solano County also has a growing market for transportation alternatives with its large commuter population and increasing miles of travel

Vehicle Miles of Travel per Capita & Gas Prices
Solano County



Note: Gas prices are average annual retail gas prices for California

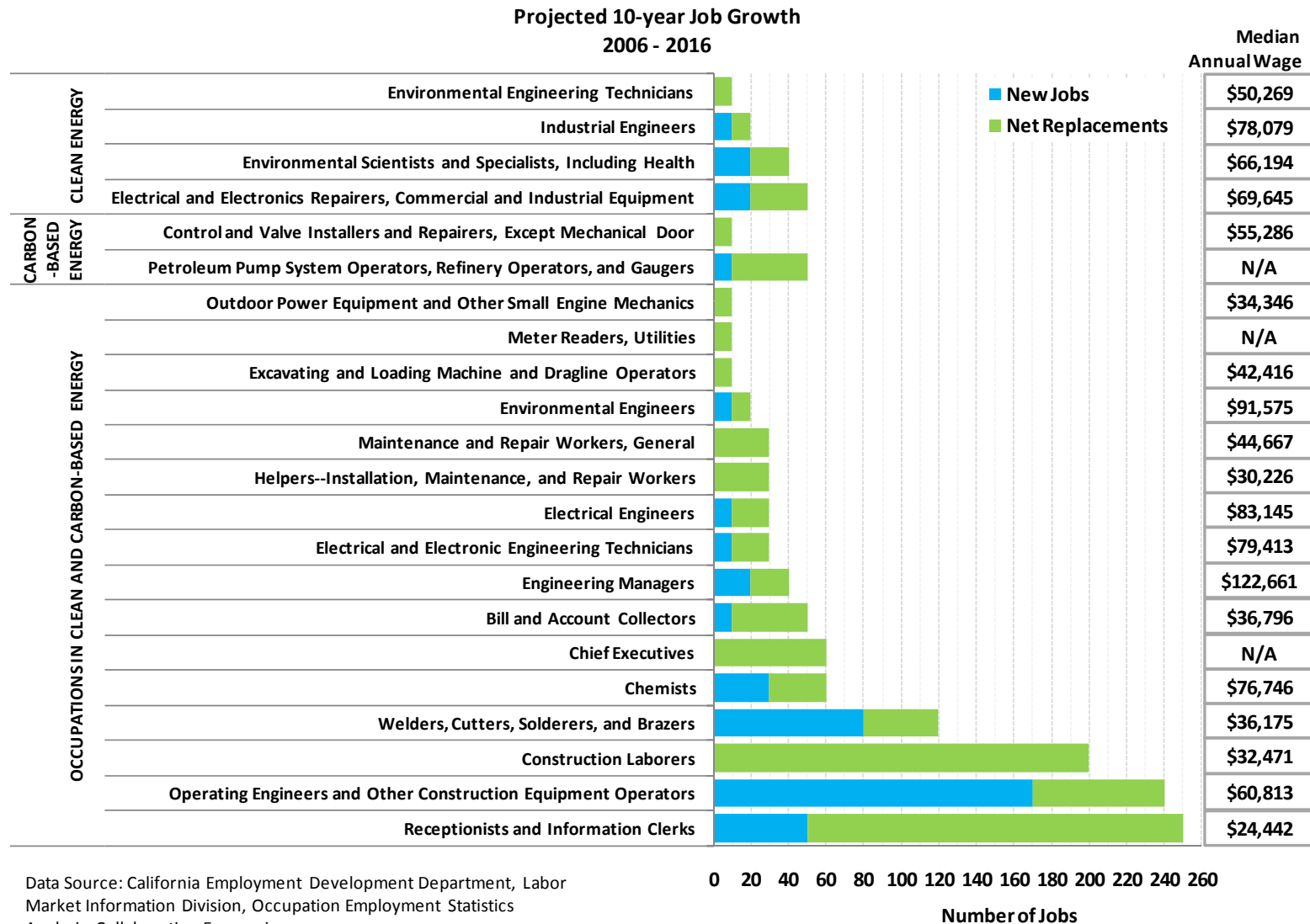
Data Source: California Department of Transportation; Energy Information Administration, U.S. Department of Energy; California Department of Finance

Analysis: Collaborative Economics

PREPARE COUNTY RESIDENTS

**Prepare county residents
for growing jobs and
careers in Solano County's
energy cluster**

The bulk of job openings will be in occupations that exist in both carbon-based and clean energy



Data Source: California Employment Development Department, Labor Market Information Division, Occupation Employment Statistics
Analysis: Collaborative Economics

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www.solanocounty.com/energycluster