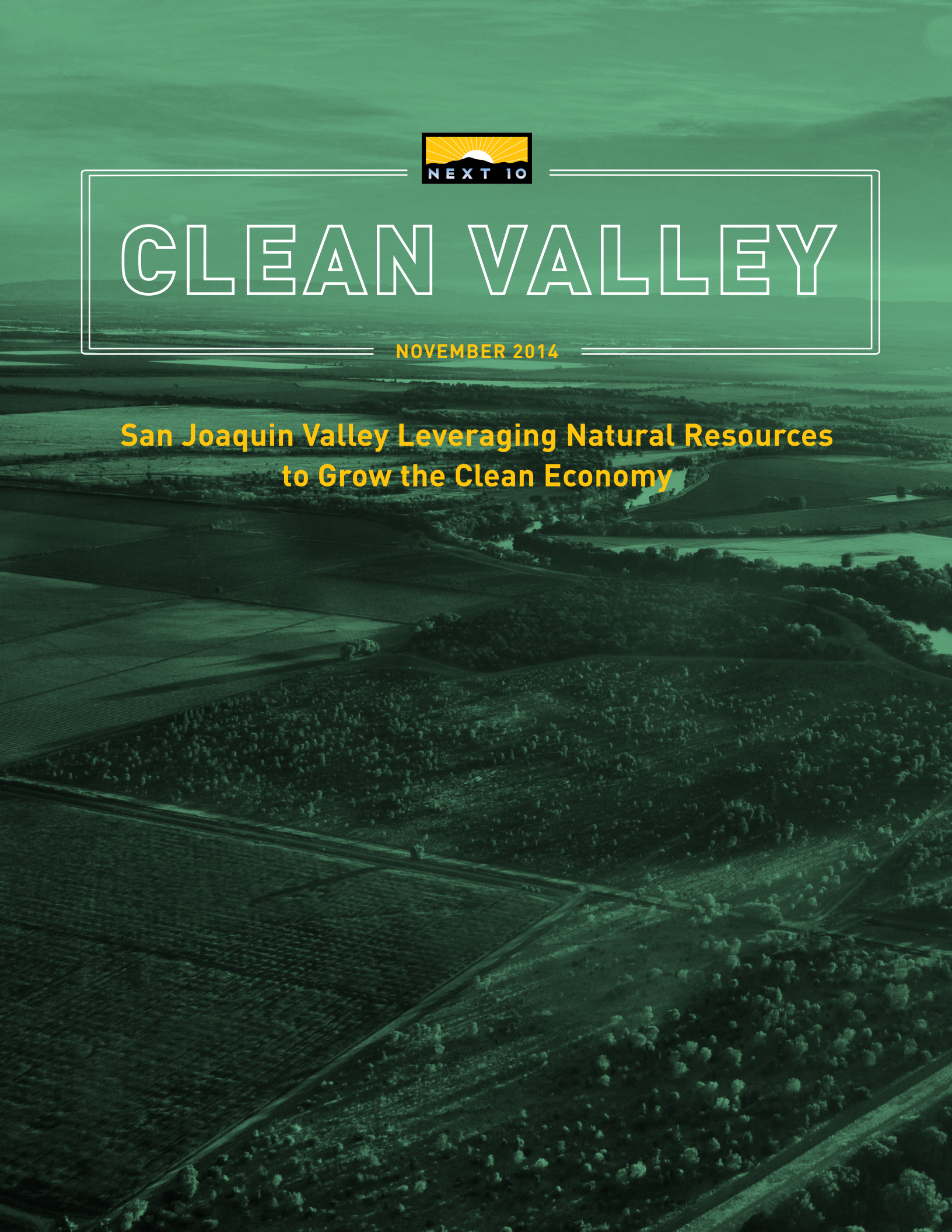

NEXT 10

CLEAN VALLEY

NOVEMBER 2014

San Joaquin Valley Leveraging Natural Resources to Grow the Clean Economy

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Next 10 is an independent nonpartisan organization that educates, engages and empowers Californians to improve the state's future.

Next 10 is focused on innovation and the intersection between the economy, the environment, and quality of life issues for all Californians. We provide critical data to help inform the state's efforts to grow the economy and reduce global warming emissions. Next 10 was founded in 2003 by businessman and philanthropist F. Noel Perry.

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SAN JOAQUIN VALLEY REGION COMPANIES NOTED IN THIS REPORT

ClimateMinder

PureSense

RAIN BIRD

BIOFILTRO
Innovation and Efficiency for Water

E&J Gallo Winery

Hilmar Cheese Company

Grimmway Farms

GRID ALTERNATIVES

ABOUT THIS REGIONAL CLEAN ECONOMY SERIES

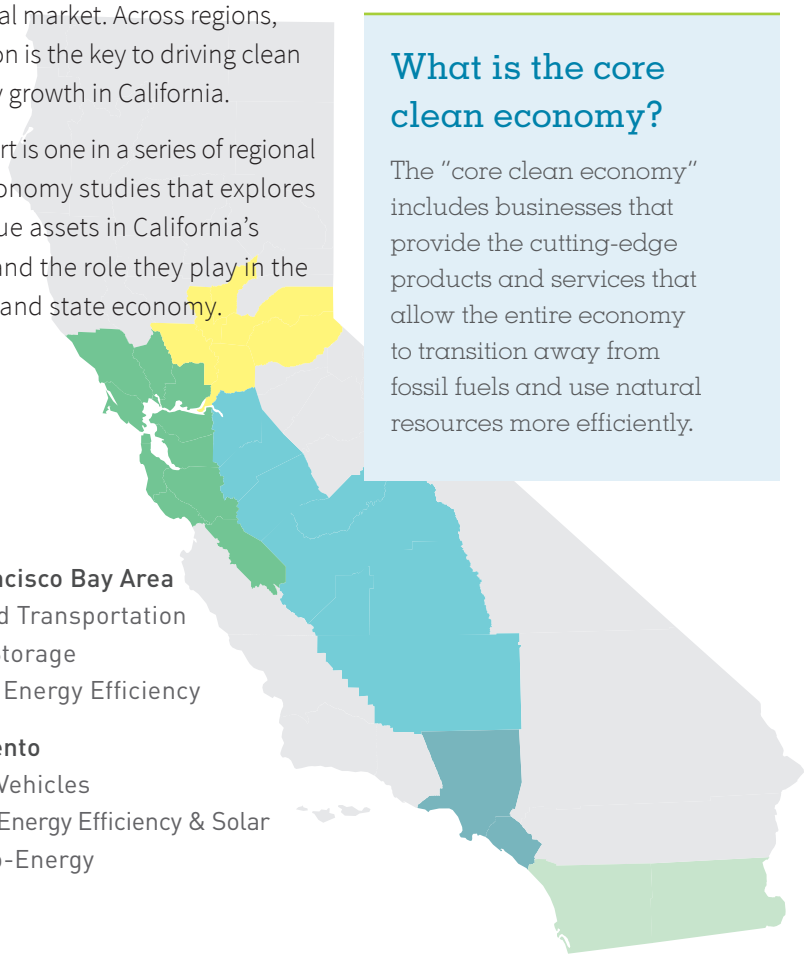
California is a national leader in the clean economy, with companies pushing the envelope developing and deploying clean technologies, spurred by progressive state policies stimulating company growth. As a result, the core clean economy has become an important driver of California's overall economic vitality, employing over 185,000 workers as of January 2014 while protecting the state's natural resources.

California's statewide economy is comprised of regional economies, each with distinct assets and strengths. Regional stakeholders are leveraging their unique assets in innovative ways to develop and expand clean technologies within their region, with potential applications in the broader state and global market. Across regions, innovation is the key to driving clean economy growth in California.

This report is one in a series of regional clean economy studies that explores the unique assets in California's regions and the role they play in the regional and state economy.

What is the core clean economy?

The "core clean economy" includes businesses that provide the cutting-edge products and services that allow the entire economy to transition away from fossil fuels and use natural resources more efficiently.



San Joaquin Valley
Water-Agriculture
Renewable Energy

San Diego - Imperial
Smart Grid
Biorenewables

Los Angeles & Orange
Advanced Transportation

San Francisco Bay Area
Advanced Transportation
Energy Storage
Building Energy Efficiency

Sacramento
Electric Vehicles
Building Energy Efficiency & Solar
Waste-to-Energy

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EXECUTIVE SUMMARY

This report explores innovations that are driving San Joaquin Valley's clean economy. These innovations include both the development and creation of new technologies and companies, as well as applying and deploying clean technologies in new ways. Based on new data analysis and interviews with regional stakeholders, water-agriculture technologies and renewable energy were identified as major areas of clean economy innovation in the region, as well as areas of opportunity for continued growth and specialization. The San Joaquin Valley has leveraged its land assets to drive innovation in these sectors to generate economic and environmental benefits.

Highlights from this report include:

- The San Joaquin Valley is leveraging its agriculture and traditional energy expertise to develop innovations at the nexus of water and agriculture, and to expand its renewable energy generation capacity.
- The region is a hub for developing and testing new water technologies for irrigation, conservation, and metering. The region is known as Blue Tech Valley and is becoming a center for water-agriculture innovation. The region's water cluster includes over 200 companies that are located in the region and nationwide, including technology businesses, farmers, and researchers, as well as academic and government stakeholders. Strategic partnerships among these cluster stakeholders have streamlined testing, development, and implementation of new water technologies. The region is home to a water and energy incubator and multiple testing facilities based at California State University, Fresno.
- The San Joaquin Valley is the statewide leader in installed renewable energy capacity, driven by innovative permitting processes and partnerships. Kern County has the highest installed renewable energy capacity in the state, with over 8,750 MW permitted as of September 2014. Renewable energy projects in the county have attracted $25 billion in investment and can generate electricity for more than seven million people in the state. In addition, the region also has nearly 65 MW in rooftop solar installations and innovative community programs to help lower-income residents install solar panels on their homes.

INTRODUCTION TO SAN JOAQUIN VALLEY'S CLEAN ECONOMY

The San Joaquin Valley is a vast region that encompasses eight counties in the center of California. The region is making strides in advancing its clean economy, increasing local jobs while improving resource efficiency and reducing air pollution. As the population and economy continues to grow in the region, energy consumption also increases, making clean energy solutions ever more important. In particular, the region is making headway in expanding its utility-scale energy projects and residential solar installations, as well as developing innovative water technologies used in the agriculture sector to address efficiency and conservation.

As a national leader in food production and irrigation technologies, the San Joaquin Valley's unique innovations are occurring at the convergence of water and agriculture. Energy is an important component in this equation, as it is increasingly needed to extract water used for agriculture. The region has prioritized the development of renewable and energy efficiency technologies to transport water, as 20 percent of California's electricity consumption is used for the transmission of water.[1] Building on its traditional leadership in energy and natural resources, the San Joaquin Valley has also become a leading innovator in renewable energy.

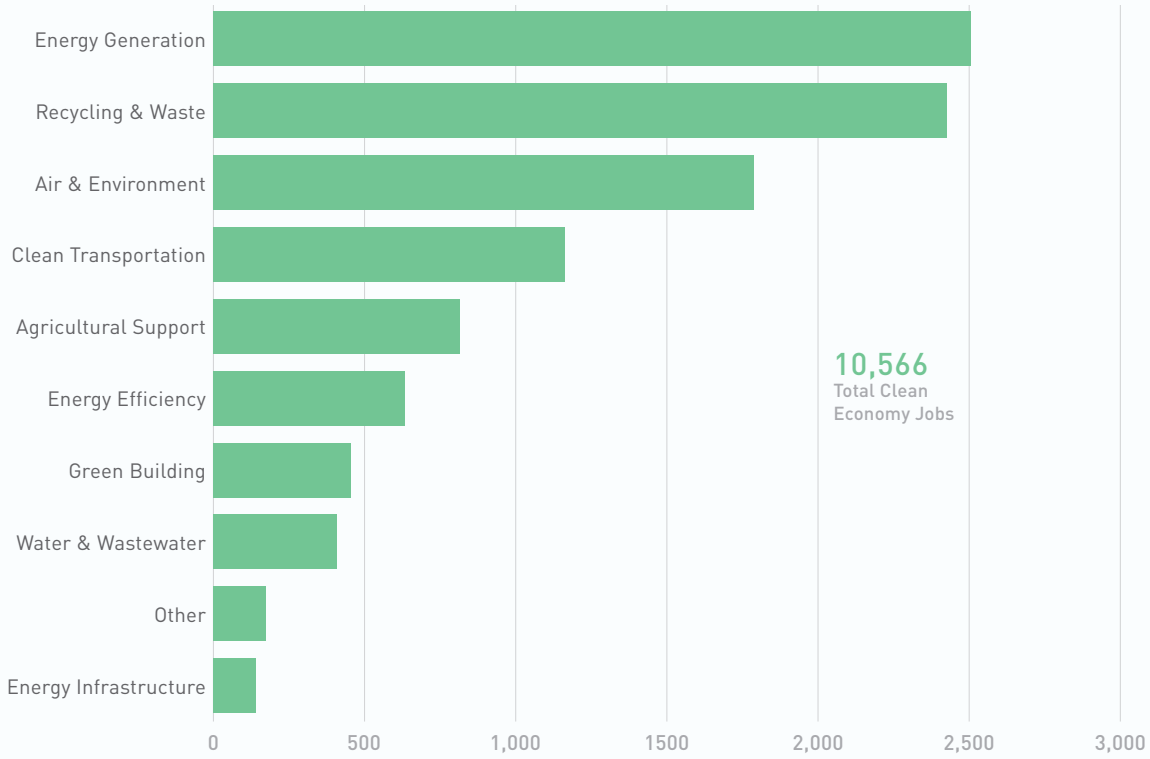
The San Joaquin Valley is mobilizing efforts to grow a number of sectors in the clean economy, including water, alternative fuels, and renewable energy. The region benefits from vast open land and fertile soil, which stakeholders are leveraging to develop and deploy clean technologies including large scale renewable energy installations, water innovations for agriculture applications, and advanced biofuel facilities that use agricultural waste or sugar beets. Covering such a large area, the partnerships between economic development organizations, community colleges, universities, businesses and government are critical to help the

What unique assets drive San Joaquin Valley's clean economy?

As a national center for agriculture and with increasing water concerns due to the statewide drought, the San Joaquin Valley has positioned itself as a leader in developing and implementing water-saving technologies. The region has also built on its traditional leadership in fossil fuel energy to become a leading innovator in renewable energy.

Widely considered to be the first region in the nation to develop an industry-led water technology cluster.

Figure 1: Core Clean Economy Jobs, San Joaquin Valley, 2014



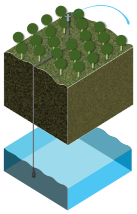
In January 2014, there were over 10,500 jobs in San Joaquin Valley's "core" clean economy. These core jobs were in a range of businesses that provide the products and services that allow the entire economy to transition away from fossil fuels and improve efficiencies in the use of natural resources.

Employment in the San Joaquin Valley's clean economy is driven largely by Energy Generation, Recycling & Waste, and Air & Environment sectors, though the region's clean economy includes a wide range of sectors and activities. This report focuses on the segments of the clean economy that are driving innovation in the region, both in terms of new technologies and deployment strategies. For a more in-depth analysis of employment data in the clean economy, see Next 10's *California Green Innovation Index,* which tracks the clean economy statewide and includes an analysis of the fifteen segments of the clean economy.

NOTE: The Other category includes Energy Storage, Business Services and Finance & Investment.
ANALYSIS: Collaborative Economics

The larger Central Valley is home to eight out of the ten top agriculture producing counties in the U.S.

region coordinate efforts and grow these sectors. This report will explore how the San Joaquin Valley has strengthened their clean economy by developing new technologies at the intersection of water and agriculture and increasing the number of renewable energy installations in the region.



SAN JOAQUIN VALLEY'S WATER AND AGRICULTURE CONVERGENCE

The San Joaquin Valley is a national leader in water technologies, and is widely considered to be the first region in the nation to develop an industry-led water technology cluster—a strategic group of business leaders within an industry, community partners and academia, who are working together to leverage the region's assets to create economic prosperity.

The larger Central Valley is home to eight out of the ten top agriculture producing counties in the U.S., and largely depends on its agriculture output for regional economic prosperity. With the current drought in California and higher demand for food in terms of volume, there is growing pressure to find new sources and ways to store and deliver water, as well as conserve and use water more efficiently. To ensure the success of its agriculture sector, particularly in light of recent drought conditions in the state, the region has focused on developing and implementing water innovations with local and global applications. These new water technologies can more efficiently utilize this important resource in an effort to reduce environmental degradation and increase agricultural output while growing the local economy.

Industry Partnerships Driving Water Innovation

The region has developed innovative partnerships between academia, technology companies, farmers, and community organizations to bolster the success of the water technology sector. These partnerships allow companies to seamlessly develop, test and implement technology improvements that conserve water resources and benefit the agriculture sector.

The Fresno water cluster, first organized in 2001 as a partnership between the Fresno Business Council and Office for Community and Economic Development, is an industry-driven partnership that paved the way for water collaborations nationwide. At both the regional and national level, the Fresno water cluster has served as a model for cluster development. The cluster was originally designed to develop a skilled local workforce and accelerate development of water technologies in the region, as well as increase research and development investments and conduct foreign trade missions. Since then, the cluster has evolved to include a wider range of companies and stakeholders both in the region and across the nation, and is gaining interest internationally. Large national companies have acquired water technology companies located in Fresno and international companies have tested their technologies in the region. The Fresno water cluster includes over 200 companies nationwide, including

Water Technology in San Joaquin Valley

Community organizations, universities, and local, national and international companies are driving water technology innovation in the region to support resource conservation and sustainable agricultural practices.

The water technology sector in the San Joaquin Valley includes high-tech irrigation and field monitoring products, farming analytics, water recycling and reuse systems and sustainable wastewater treatment solutions.

technology businesses, farmers, and researchers, as well as academic and government stakeholders.[2]

The San Joaquin Valley is a hub for testing and implementing water technologies, leveraging both university facilities and agriculture lands. In 2011, in an effort to establish the San Joaquin Valley as a recognized leader of water technology and innovation, the Blue Tech Valley initiative was formed and governed by a steering committee comprised of private industry, academia, entrepreneurs, and enabling organizations. Blue Tech Valley as a geographical location represents a unique set of resources and assets that cannot be replicated anywhere in the world. The region now markets itself as Blue Tech Valley, with a vision to create a hotspot for water technology that will be globally recognized. The San Joaquin Valley is a living lab, making it an ideal testing ground to bring new technology to market.

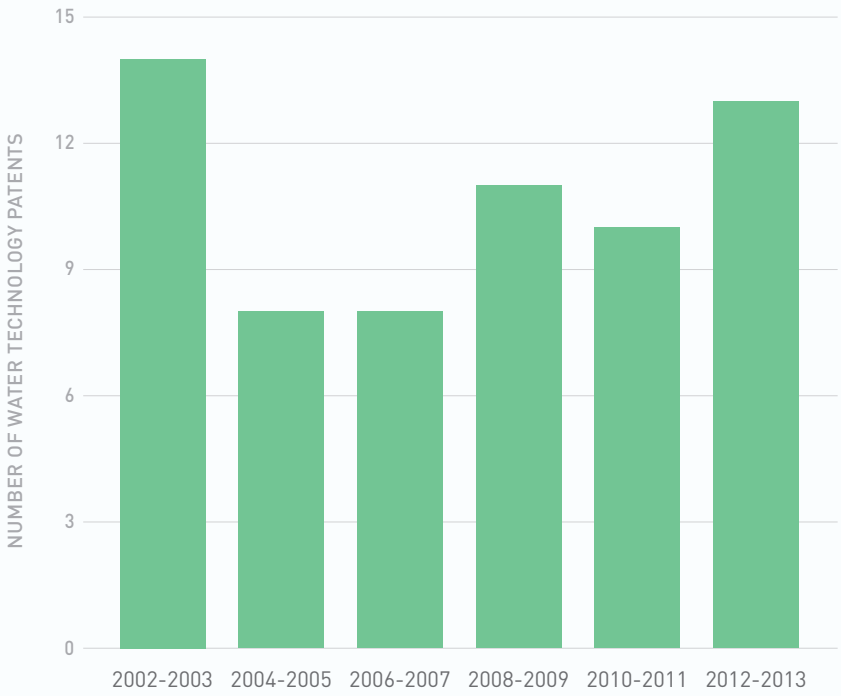
Much of the activity that takes place under Blue Tech Valley occurs at California State University, Fresno. For example, the Center for Irrigation Technology (CIT), located at the university, is a certified testing laboratory that has been conducting independent testing and research at its facility since 1980.[3] The CIT does hundreds of tests on water hydraulics and equipment each year, including field and forensic testing throughout the Valley. The center is a fee-for-service testing facility that works with the public and private sector, and often attracts business from larger corporations in and outside of the region that need to test new water technologies and have third party validation. The International Center for Water Technology (ICWT) is also located at the university. The ICWT focuses on water use efficiency through education, research and policy development, as well as the development and application of such technologies in the agricultural sector along with others.[4]

At the heart of water efforts in the region is the Water Energy Technology Center (WET Center), also located at Fresno State. The WET Center was built in 2007 to accelerate growth in the water, energy, and agriculture-tech sectors, and is the link between entrepreneurs, innovators, companies, training providers, and academia.[5] The WET Center houses on-site testing facilities including the CIT and an incubator that is working to support local innovation and business development. The WET Center's incubator currently has 20 start-up companies, six onsite and 14 located remotely. These companies are provided access to physical space, business services and connections to funding resources. In 2013, the WET Center's member companies raised $7 million in capital and created 26 jobs in one year alone.[6]

WET Center member companies are achieving increasing success, expanding to new locations and being acquired by larger companies. PureSense, for example, develops high-tech irrigation and field monitoring solutions. The company continues development efforts at their Fresno headquarters and recently expanded to include a software team in the Bay Area. ClimateMinder is another WET Center company that developed an innovative monitoring and control product for agriculture, and was purchased by the large irrigation company Rain Bird. Biofiltro is an international company based in the WET Center that created a ground-breaking sustainable wastewater treatment solution, with testing facilities on the Fresno campus in

> The Blue Tech Valley offers companies a fertile space to develop and test water technologies, with an incubator space through the WET Center, certified testing facilities, and connections to farmers for field testing. This regional collaboration among business, economic development, workforce, and community partners creates an opportunity for the region to be a leader in water innovations.
>
> **– Helle Petersen,** WET Center

Figure 2: Water Technology Patents, San Joaquin Valley



SOURCE: 1790 Analytics, Patents by Technology; USPTO Patent File
ANALYSIS: Collaborative Economics

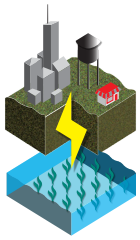
In 2011, in an effort to establish the San Joaquin Valley as a recognized leader of water technology and innovation, the Blue Tech Valley initiative was formed

addition to 100 sites in five countries.

The expansion of water technology patents are reflection of the growing expertise and commercialization potential in the region. San Joaquin Valley inventors filed a steady number of water patents over the decade (Figure 2). The region registered 13 water patents in the most recent period (2012-2013).

The WET Center and Blue Tech Valley stakeholders help to increase the economic impact, both directly through supporting the water technology companies, and indirectly through supporting agricultural companies' competitiveness. For example, the WET Center connects companies located in the Bay Area who are developing farming analytics with farms in the region to test their software. Farmers and food processing companies in the region are increasingly adopting technologies that conserve and reuse resources. Leading food companies in the region such as E & J Gallo, Hilmar Cheese and Grimmway Farms have already implemented innovative water recycling and reuse systems to help their farming, irrigation and processing operations. These innovations help food companies conserve, reuse and optimize water, generating both economic and environmental benefits for their businesses. The region's partnerships play a key role in helping to inform and connect water and agriculture technology companies (both in and outside of the region) with local farmers and facilities to test and implement these new technologies.

Fresno has been able to carve out a niche industry for itself in developing cutting-edge water technologies and supporting its local agricultural industry, creating both jobs and economic growth in the region. The continued success of Blue Tech Valley will be increasingly important as the global population continues to grow and increase demand for food, accelerating the need to produce more by utilizing fewer resources. The San Joaquin Valley will be an integral player in meeting local and global demand for new, efficient water technologies at the intersection of agriculture and water.



SAN JOAQUIN VALLEY SHINES ON RENEWABLE ENERGY DEVELOPMENT

The San Joaquin Valley is the statewide leader in producing renewable energy, leveraging its natural assets of high solar radiation and wind. Sections of the region, Kern County in particular, are tapping into this renewable energy potential, and have created incentives and streamlined processes to increase installations and overall capacity. Residential and large-scale solar continues to increase in the region, spurred by various state initiatives and rebate programs such as the California Solar Initiative and the state's Renewable Portfolio Standard (RPS). Local renewable energy projects are generating jobs and have helped shift the region's energy use from traditional fossil fuel sources to renewable sources. Partnerships between community colleges, workforce development organizations and companies have been crucial for the development and continued success of the industry.

Renewable Energy Development in the San Joaquin Valley

Regional organizations, community colleges, and companies are partnering to train workers and streamline processes to advance renewable energy deployment in the region.

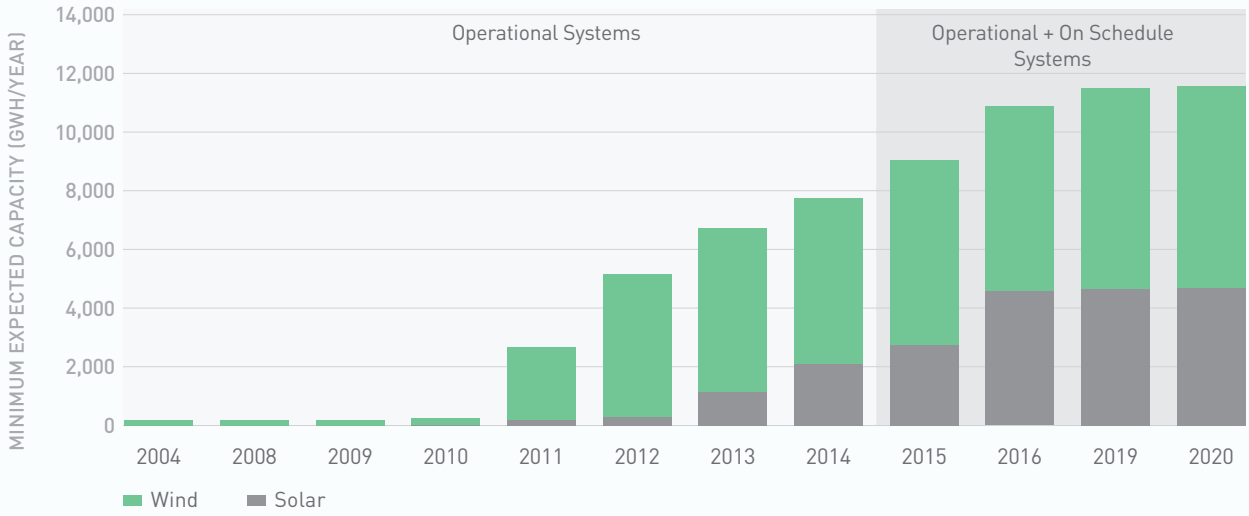
The renewable energy sector in the San Joaquin Valley includes residential and commercial solar installations, but is concentrated in Kern County with utility-scale wind and solar projects.

Creating a Renewable Energy Hub

Kern County has been an energy center in the San Joaquin Valley for nearly 100 years, with historical strengths in the oil industry. Building off of its strong energy history, the County Board of Supervisors has embarked on a renewable energy goal of 10,000 MW in production by 2015, which will allow the state to surpass its goal of 33 percent renewable energy by 2020.[7] To jumpstart the local industry, they leveraged the construction of a new transmission line in the region, as well as 4,600 MW of authorized power from the utility Pacific Gas & Electric. Kern County is increasing utility-scale solar projects and is the largest single wind energy source in the state, with further expansions planned. As of September 2014, the county has permitted over 8,750 MW of renewable energy projects, more than any other county in the state.[8]

The current cumulative annual operational capacity of solar and wind RPS projects in the San Joaquin Valley is 7,726 GWh/yr, 42 percent of the cumulative solar and wind RPS capacity installed in the state (Figure 3). These installations are key to ensuring the state stays on track to reach its RPS goal, which requires that 33 percent of electricity from California investor-owned utilities be from renewable sources by 2020. Kern County is continuing to work with companies to develop new

Figure 3: Cumulative Operational Capacity of Renewables Portfolio Standard Projects by Investor-Owned Utilities, San Joaquin Valley



SOURCE: California Public Utilities Commission, 2014 Data as of June 2014
ANALYSIS: Collaborative Economics

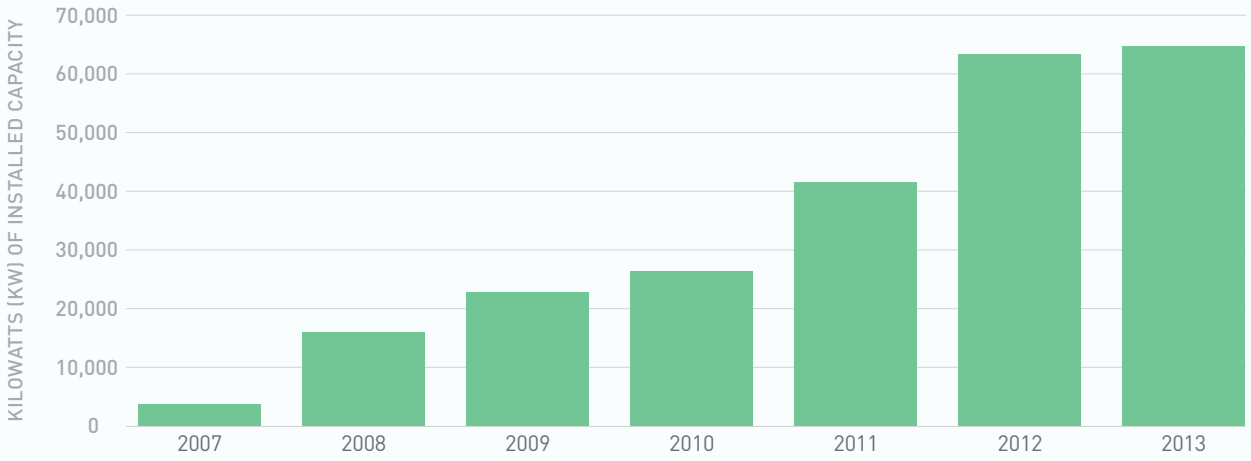
"Kern County saw an early opportunity to develop renewable energy after the California Air Resources Board announced its renewable goal in 2004. We wanted to be proactive and have the renewable energy installations here in Kern County in the right locations, and we have been actively creating policies and programs to pursue this sector."

- Lorelei Oviatt, Kern County Planning and Community Development Director

renewable energy projects in the region and expects to have new large solar and wind installations starting in coming years.

Renewable energy installations have had positive economic benefits for the region. Renewable energy projects in Kern County have created 6,000 construction jobs and 1,500 operational jobs, attracted $25 billion in investment, generated electricity for more than seven million people and added $100 million in property tax revenues.[9] These projects have also helped bring county unemployment rates from 17.5 percent in 2007 down to ten percent in 2013.[10] To help ensure that local residents are benefiting from the growth in this industry, Kern County established a 25 percent local hire condition on installation contracts,

Figure 4: New Solar Installations, Capacity (kW) Installed Through the California Solar Initiative San Joaquin Valley, 2007-2013



SOURCE: California Public Utilities Comission - California Solar Initiative
ANALYSIS: Collaborative Economics

Kern County has developed innovative ways to streamline the permitting process for utility scale renewable energy projects to encourage companies to locate their projects in the county.

which requires coordination with local training and apprenticeship programs. Companies have exceeded this threshold and are hiring 75 to 80 percent local employees. Recently Kern County raised this condition to 50 percent.

Kern County has also linked apprenticeship programs to contractors in the region and made companies aware of training programs and skilled workers in the area. For example, Kern County Community College District developed the Clean Energy Center to train utility-scale solar and wind operators and maintenance technicians, as well as energy auditors and solar installers for both residential and commercial sectors. This Center is the gathering place for the Clean Energy Industry Driven Regional Collaborative, which is a group of over 15 colleges, workforce boards, economic development agencies, industry members and local and state groups.[11] This organization ensures that training is consistent across colleges and that it meets the needs of clean technology businesses.

In addition to large-scale solar projects, residential solar installations have continued to increase throughout the San Joaquin Valley. New solar installations through the California Public Utilities Commission's California Solar Initiative reached 64,722 kW in 2013, representing 20 percent of the state's installed capacity through this initiative in 2013 (Figure 4). This incentive program provided cash back for individuals who installed solar at their home or business. Residents in the region increasingly understand the economic and environmental benefits of installing solar panels on their roofs, including reduced utility costs.

Streamlining Processes

Kern County has developed innovative ways to streamline the permitting process for utility scale renewable energy projects to encourage companies to locate their projects in the county. For example, the county allows multiple sites to be grouped into one Environmental Impact Report, and designated two preferred firms to conduct analysis, which reduces the volume of applications, increases application consistency and ensures expertise surrounding local requirements. This speeds up the approval process and gets projects started more quickly. Kern County has also worked to change the zoning ordinance for the region, so they can more easily put solar power behind the utility meter. Grimmway Farms, for example, took advantage of this new zoning rule to install 3.4 MW of solar in 2012 and recently expanded to 4.2 MW allowing them to power their production facilities on-site. This has been an effective way to incentivize companies to locate projects in Kern County.

Kern County has been able to successfully permit the large number of utility scale solar projects due to the region's proximity to substations and the amount of solar-radiation the region receives. Substations, which are connected to transmission lines and convert power from high to lower voltage, are located in underutilized land throughout the region and are a key interconnection component for Kern County's large and growing renewable energy capacity. Recognizing the importance of the agriculture fields in the region, Kern County aims to use land that does not have other uses as sites for commercial scale solar. For example, they approved a solar project on a bare area that was not able to receive surface water, and therefore not suitable for farming. This helps to maximize the tax benefits of the region and protect important agriculture land.

Kern County's Planning and Community Development Department anticipated pitfalls and developed solutions by strategically thinking about their renewable energy industry. For example, the county was concerned that utilities would start buying completed private land for renewable energy projects that would limit the authority of the county on mitigation, operations, and economic benefits. To alleviate this concern, they devised a Memorandum of Understanding that renewable energy applicants have to sign in order to develop in the region. The memorandum states that companies are not exempt from zoning and environmental laws if they sell controlling interest to utilities and that they will pay the county a direct payment to replace property taxes. This allows the county to maintain control of the land and economic benefits of the renewable projects while allowing for market flexibility for the utilities and private partners. The Los Angeles Department of Water and Power (LADWP) is one such partner with Kern County, with the majority of their wind and solar projects located in Kern County. The Memorandum of Understanding signed by both the Kern County Board of Supervisors and the Los Angeles City Council provides a strong working relationship that supports achievement of LADWP renewable energy goals.

GRID Alternatives

GRID Alternatives is a nonprofit organization that is helping lower-income families participate in the renewable energy industry by installing subsidized solar panels on homes throughout the region. As a non-profit organization, GRID Alternatives works with community partners, volunteers and job trainees to reach out to the families and install the modules.[12]

GRID Alternatives involves the family throughout the process, utilizing their help in installation, articulating the economic and environmental benefits of the system and checking in a year later to see if they are satisfied with their savings.

GRID Alternatives also formed relationships with local high schools, Youth Build organizations and community colleges to provide students with opportunities to gain hands on experience installing solar panels. In addition to short-term volunteering opportunities, GRID offers a longer-term Team Leader program, which involves additional training and gives individuals experience in leading crews of volunteers. Team Leaders are highly sought after by for-profit companies.

Since opening their doors five years ago, the San Joaquin Valley office has installed 744 systems, equating to 2,525 kW of capacity and almost $21 million in lifetime savings.[13]

CONCLUSION

The San Joaquin Valley has made significant progress in developing new water technologies to support local and global agriculture, as well as facilitating new renewable energy installations in the region. Private and public stakeholders are utilizing agriculture strengths to become a center for developing and testing water and agriculture technologies, attracting company interest from across the state and other countries. The San Joaquin Valley has also become a state leader in renewable energy development. By tapping into the substations located in region, capitalizing on underutilized land, and creating streamlined permitting processes, Kern County has become the place in the San Joaquin Valley to permit utility-scale renewable energy projects. These sector developments are creating jobs in the region, while protecting agriculture land and decreasing dependency on fossil fuels.

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