



A report commissioned by:

**Pacific Coast**  
COLLABORATIVE

Leadership now  
for a sustainable tomorrow

NOVEMBER 2015

# West Coast Clean Economy: 2010-2014 Jobs Update

Prepared by:

**DelphiGroup**  
Environmental Strategies. Business Solutions.

## Pacific Coast Collaborative

On October 28, 2013, the Governors of California, Oregon, and Washington and the Premier of British Columbia announced the *Pacific Coast Action Plan on Climate and Energy*, which outlined a set of shared goals for reducing carbon emissions and building a clean energy economy on the West Coast. This effort was a landmark initiative of the Pacific Coast Collaborative (PCC), which launched in 2008 to set a cooperative direction in key policy areas of mutual interest among North America's West Coast jurisdictions. With a population of 54 million people and an economy that is the 5th largest in the world, the West Coast jurisdictions that compose the PCC are demonstrating that transitioning to a low-carbon economy can create jobs and support robust economic growth.

[www.pacificcoastcollaborative.org](http://www.pacificcoastcollaborative.org)

Prepared by:

## The Delphi Group

As a pioneer in sustainability and environmental risk management, The Delphi Group has more than 25 years of experience advancing a greener economy and helping to improve the sustainability of the organizations they work with, as well as the local and global communities in which they operate. Delphi's clients benefit from the unique combination of policy expertise, strategic thinking, and technical know-how that Delphi's inter-disciplinary team brings to every project.

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## Preface

In 2011-2012, California, Oregon, Washington, and British Columbia, as members of the Pacific Coast Collaborative, commissioned a study on the West Coast Clean Economy.

The resulting report, released in March 2012, provided an estimate of the number of clean economy jobs in 2010 across the region. It also identified opportunities for accelerated job creation, investment, and market capture by leveraging the potential of the emerging West Coast “clean economy” through the power of regional collaboration and policy development.

This report provides an update on the economic and employment activity that has occurred across the PCC region since 2010 and serves as a benchmark for progress.

# Regional Overview

Since 2010, members of the Pacific Coast Collaborative have signed a number of Action Plans and Memorandums of Understanding (MOUs), including in the areas of carbon pricing, energy efficient buildings, climate change adaptation, clean energy development, vehicle emission standards, electric vehicle procurement, regional transportation networks, and resilient infrastructure. The PCC jurisdictions are also founding members of the “Under 2 MOU”, a commitment by states and provinces from developed and developing nations calling for reductions of greenhouse gas emissions by 80-95 percent below 1990 levels. Combined with initiatives at the state and provincial level, these regional efforts have been supporting investments and job growth in the West Coast region’s clean economy.

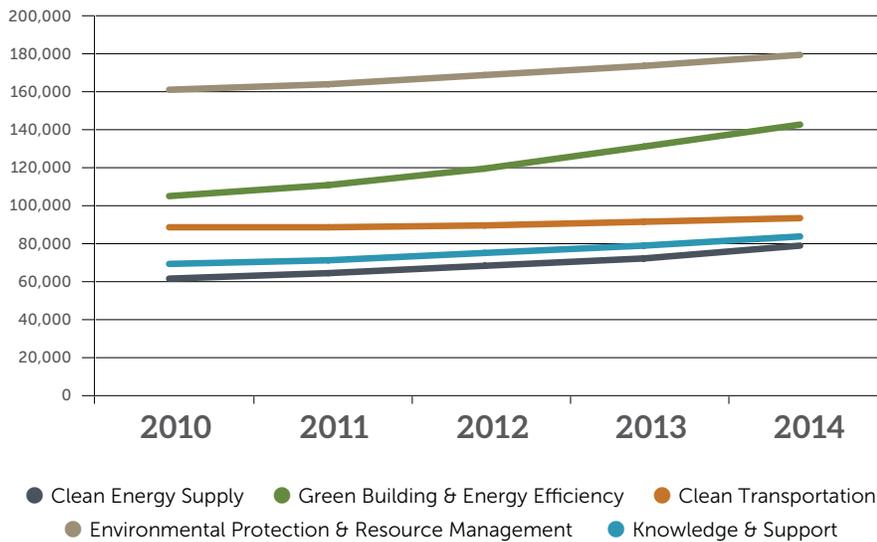
## 18.9%

Overall growth rate for clean economy jobs across the PCC

## 91,705

More clean economy jobs in 2014 over 2010

## Clean Economy Job Growth by Sector



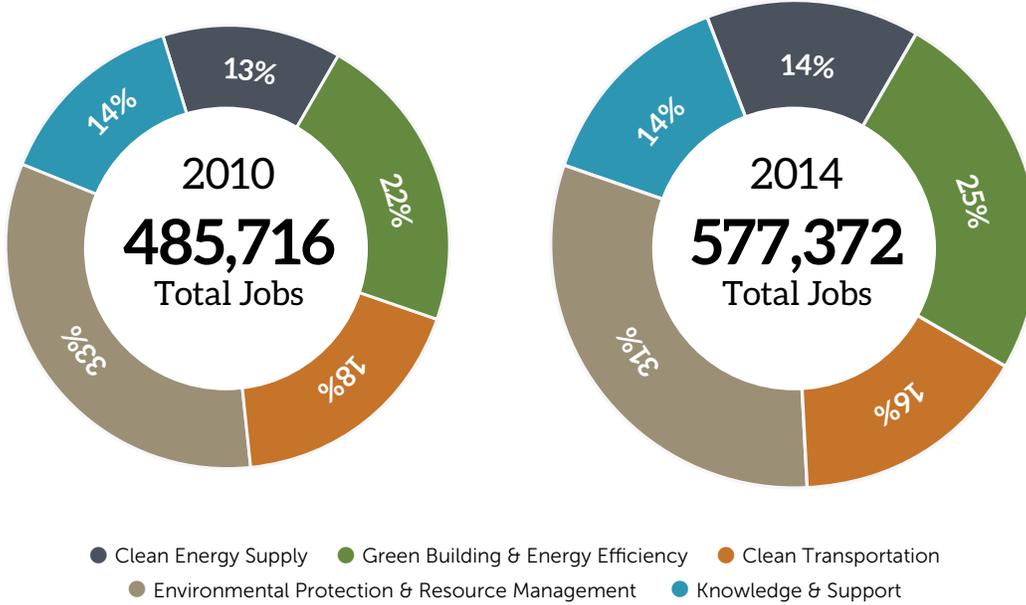
Between 2010 and 2014, clean economy jobs within the Pacific Coast Collaborative region grew at a rate of 18.9 percent, more than twice (2.2 times) as fast as jobs overall. As of 2014, the region includes 577,370 clean economy jobs – equal to 91,700 more clean economy jobs in 2014 over 2010. New investments, supportive public policy (including energy efficiency regulations and building codes), and shifting market demand for more sustainable products are all contributors to this job growth.

## Transitional Jobs vs. Net New Growth

	CA	OR	WA	BC	Total	
<b>Transitional Growth</b>	44,347	2,309	4,114	3,299	54,068	59%
<b>Net New Growth</b>	26,702	2,511	4,119	4,304	37,637	41%
<b>Total Growth</b>	71,049	4,820	8,233	7,603	91,705	100%

Jobs in Green Building and Energy Efficiency have grown in relative importance between 2010 and 2014.

### Clean Economy Jobs by Sector



Clean economy jobs across 4 jurisdictions of the PCC region have grown at an overall rate that is **more than 2X** faster than jobs in the economy as a whole between 2010-2014.

### Clean Economy Jobs vs. Total Economy

Clean Economy Jobs in PCC					
2010	2014	2010-2014	Total Growth Rate	AAGR	Data Source
485,716	577,372	91,656	18.9%	4.7%	Delphi Clean Economy Model

Total Jobs in PCC					
2010	2014	2010-2014	Total Growth Rate	AAGR	Data Source
21,044,332	22,854,068	1,809,736	8.6%	2.2%	Statistics Canada & United States Bureau of Labor Statistics

In terms of overall employment in the region's clean economy, jobs in Environmental Protection and Resource Management dominate, although their overall share decreased from 33 percent in 2010 to 31 percent in 2014, while jobs in Green Building and Energy Efficiency grew in relative importance from 22 percent to 25 percent. Green architecture and related construction services dominated in terms of overall employment in 2014 with nearly 92,000 clean economy workers, followed by jobs in mass transit and rail at approximately 83,900.

## Top 10 Segments (2014)

### Top 10 Segments

Green Architecture & Construction Services	91,976
Public Mass Transit & Rail	83,886
Public Sector (All Levels)	62,559
Recycling & Reuse	35,395
Organic Food & Sustainable Farming	31,945
Waste Management & Treatment	30,673
Solar Photovoltaic	30,427
Professional Energy Services	27,796
Hydropower	22,055
Education & Training	21,111

### Top 10 Fastest Growing

Lighting	153.8%
Solar Photovoltaic	122.1%
Appliances	100.3%
Solar Thermal	94.6%
Wind	92.3%
HVAC and Building Control Systems	60.5%
Energy-saving Consumer Products	40.7%
Green Architecture & Construction Services	36.2%
Recycling & Reuse	27.8%
Energy-saving Building Materials	25.8%

Green Building and Energy Efficiency, as well as Clean Energy Supply, were the dominant sectors in terms of employment growth across the region as whole, growing at 36 percent and 30 percent respectively between 2010 and 2014. The growing market demand for programs such as Leadership in Energy and Environmental Design (LEED) and for energy efficient products and materials (such as those certified as ENERGY STAR) means that the fastest growth has been in segments that include lighting, appliances, HVAC, and building control systems.

Regional commitments to clean energy are also driving economic growth and creating jobs. Employment related to solar and wind energy projects have seen strong net new growth across the region and have overtaken hydro-electric power as the dominant clean energy sector job generator since 2010.



# Profiles by Jurisdiction

British Columbia

Washington

Oregon

California



# British Columbia

Between 2010 and 2014, clean economy jobs in British Columbia grew at an overall rate of 12.5 percent. As of 2014, B.C. had 68,165 clean economy jobs – equal to 7,600 more clean economy jobs than in 2010.

Green Building and Energy Efficiency was the dominant sector in terms of employment growth in B.C., growing a total of 32 percent between 2010 and 2014. Growth in market penetration of green building certification programs (particularly in the commercial and institutional sectors) has resulted in expansion of green architecture and construction services, as well as jobs in energy efficient equipment and related technology.

British Columbia also saw a diversification of its renewable energy generation portfolio over the five year period, resulting in new jobs for segments that include wind, waste-to-energy, and bioenergy. Municipal efforts have also been supporting clean economy job growth with the City of Vancouver for example experiencing a 19 percent increase in green and local food jobs from 2010-2013 tied to its 2020 “Greenest City Action Plan”.



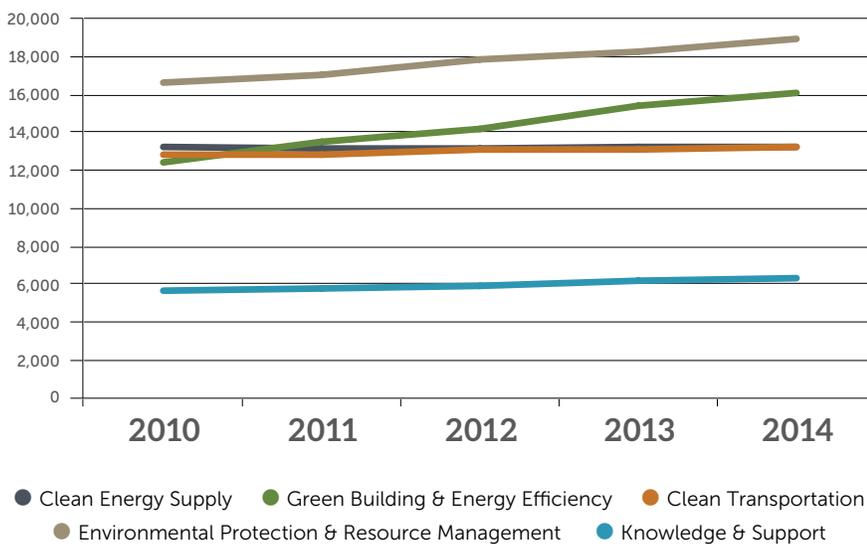
## Carbon Neutral Government: spurring job growth and investments.

British Columbia was the first jurisdiction in North America to become carbon neutral across its public sector. B.C. also remains the only carbon neutral province, territory, or state on the continent. B.C.'s public sector organizations have been actively investing in carbon reduction projects within their buildings, fleet vehicles, and operations, creating jobs related to energy efficiency products and services. In addition, the B.C. public sector has been investing in high-quality carbon offset projects that either reduce greenhouse gas emissions or remove them entirely from the atmosphere. These investments have helped to stimulate innovation across sectors that include manufacturing and transportation while also supporting companies that are part of B.C.'s growing clean technology ecosystem.

## Green building industry serving as an engine of economic growth.

Green buildings are an engine of economic growth in British Columbia. This has been driven in part by leaders in the B.C. real estate community, as well as by the province's progressive building code and actions by a number of municipalities. B.C. is the Canadian leader in terms of the total number of LEED certified projects per capita, with total certified square footage up 17% since 2010. In April 2013, B.C. became one of the first jurisdictions in Canada to adopt the new National Building Code energy-efficiency requirements for housing and small buildings, as well as the National Energy Code for Buildings and the ASHRAE 90.1 (2010) standard that applies to large buildings. Innovative projects, such as the new LEED Platinum TELUS Garden building in Vancouver and the Wood Innovation and Design Centre on the University of Northern B.C.'s campus in Prince George, are integrating technology and design to create healthier, more productive work places.

## Job Growth by Sector





Wood Innovation and Design Centre, Prince George. Source: [partnershipsbc.ca](http://partnershipsbc.ca)

## Top 10 Segments (2014)

### Top 10 Segments

Public Mass Transit & Rail	12,246
Green Architecture & Construction Services	11,698
Hydropower	8,821
Sustainable Forestry Products	6,166
Recycling & Reuse	3,660
Education & Training	3,645
Waste Management & Treatment	3,259
Public Sector (Federal, Provincial, Local)	2,827
Smart Grid	2,518
Professional Energy Services	2,308

### Top 10 Fastest Growing

Wind	790.5%
Waste-to-Energy	445.1%
Lighting	158.3%
Appliances	85.0%
Biofuels/Biomass	73.6%
HVAC & Building Control Systems	60.8%
Remediation	46.6%
Professional Environmental Services	39.6%
Conservation	40.5%
Recycling & Reuse	34.2%

## Clean energy diversification creating job opportunities province-wide.

B.C. has seen a diversification of its clean electricity generation portfolio over the last five years, particularly in the areas of wind, biomass, and small-scale hydro. There are currently more than 150 renewable energy projects in operation or under construction in B.C., employing approximately 14,000 workers province-wide. Along with the power project diversification has come new investments and job creation across the entire value chain, from research and development to manufacturing, construction, and engineering services. Collaborative efforts between industry, government, and academia have spawned new partnerships and initiatives, both locally and globally, through programs such as B.C.'s Innovative Clean Energy (ICE) Fund and the BC Bioenergy Network.



TELUS Garden Building, Vancouver.  
Source: [telusgarden.com](http://telusgarden.com)

# Washington

Between 2010 and 2014, clean economy jobs in Washington State grew at an overall rate of 9.7 percent. As of 2014, Washington had 92,650 clean economy jobs – equal to 8,230 more clean economy jobs than in 2010. Energy efficiency services, product manufacturing, renewable energy, recycling, and organic farming were the dominant growth segments over the five year period.

Green Building and Energy Efficiency was the dominant sector in terms of employment growth in Washington, growing a total of 23 percent between 2010 and 2014. Growth of the sustainable building industry in Washington (particularly in urban centers such as Seattle) is linked to the well-established ecosystem of local expertise, service providers, and materials distributors. Washington's electricity grid generated 76 percent of its power from renewable sources in 2014 as compared to 71.5 percent in 2010, which had a positive effect on jobs in the Clean Energy Supply sector.

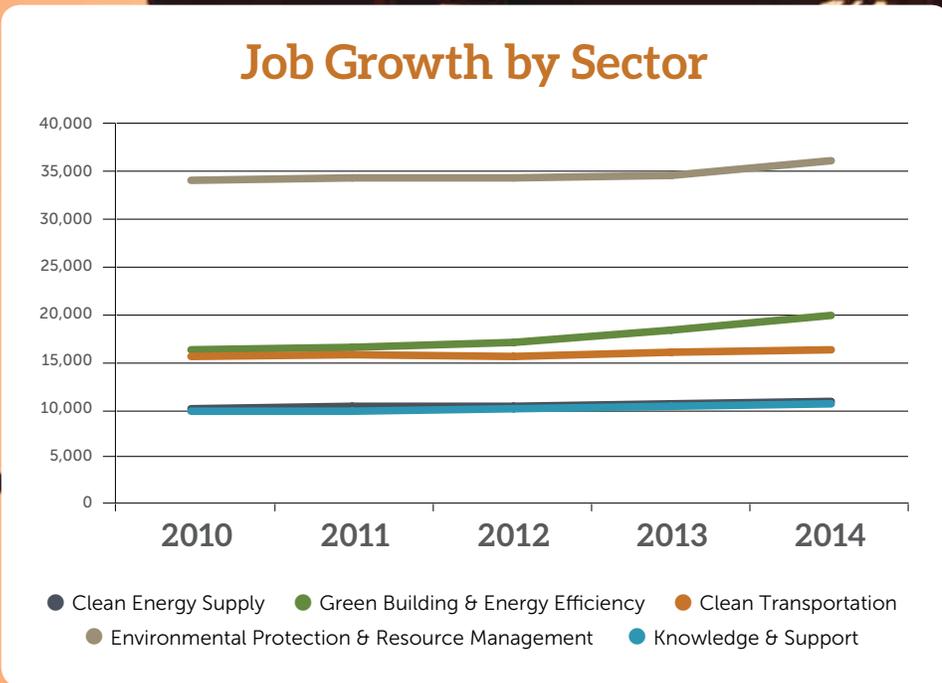
	2010	2014
Clean Economy Jobs	84,427	92,658
Clean Economy GDP (USD)	\$11.6B	\$14.1B

**Grid modernization and energy storage research breaking ground.**

Electricity grid modernization and energy storage are keys to realizing the full potential of clean energy and a lower-carbon economy. The Pacific Northwest / Bonneville Power Administration is a leading test-bed for electricity grid modernization in the United States. In addition, Washington State's Clean Energy Fund is supporting jobs and investments in ground-breaking research, development, and demonstration projects with three of the largest public and investor-owned utilities in order to evaluate both the technical and economic advantages of different grid-scale battery storage systems. Approximately \$28 million has been invested in these grid projects, making the modeling and validation of these use cases some of the most extensive to date anywhere in the world and helping to uncover the stacked benefits of energy storage systems and inform the future of the electricity grid.

**Investments in green buildings and manufacturing spurring innovation.**

Energy efficiency investments are directly supporting family wage jobs and encouraging innovation in sectors that include construction and green manufacturing. In the construction sector, Washington ranks in the top 10 states (#8) for energy efficiency with Seattle more than doubling the number of LEED certified commercial buildings between 2010 and 2014. Innovative projects such as Seattle's Bullitt Centre are world leading and have put an international spotlight on Washington's leadership in this space. In addition, Washington's Clean Energy Fund invested \$40 million to leverage another \$200 million in a revolving loan fund for consumer residential and commercial building energy efficiency loans. In terms of green manufacturing, BMW and SGL Automotive invested \$100 million to build a carbon fiber production facility and bring over 100 jobs to Moses Lake, Washington. The companies are now investing an additional \$200 million in order to make it the world's largest carbon fiber manufacturing plant, currently employing close to 200 workers.





The Bullitt Centre in Seattle is one of the world's greenest buildings. Source: Nic Lehoux

## Top 10 Segments (2014)

### Top 10 Segments

Public Mass Transit & Rail	14,511
Green Architecture & Construction Services	13,683
Organic Food & Sustainable Farming	10,245
Public Sector (Federal, State, Local)	8,414
Hydropower	6,789
Recycling & Reuse	6,123
Remediation	5,673
Waste Management & Treatment	4,631
Sustainable Forestry Products	3,482
Professional Energy Services	2,929

### Top 10 Fastest Growing

Lighting	152.9%
Appliances	106.7%
HVAC & Building Control Systems	72.4%
Energy-saving Consumer Products	51.9%
Solar Thermal	51.3%
Solar Photovoltaic	51.2%
Wind	38.0%
Recycling & Reuse	33.4%
Organic Food & Sustainable Farming	23.2%
Green Architecture & Construction Services	21.6%

## Hybrid and electric vehicles experiencing rapid market adoption.

Washington State has seen rapid market adoption for electric vehicles (EVs), ranking as one of the top 5 U.S. states per capita. Between 2010 and 2014, Washington State added 75,000 more hybrid and EVs to the road with 2013-2014 seeing EV numbers alone grow by 4,500, equal to a 56% increase. While manufacturing for these vehicles in Washington State is minimal, the market uptake is resulting in growth of transitional jobs with respect to repair and maintenance, as well as related equipment and components. Indirect jobs are also impacted by this market transition as the dollars shifted from fuel purchases to other spending has been found to create 16 times more jobs in the economy (WSDOT report).



Utility-scale vanadium batteries, a project with support from Washington's Clean Energy Fund. Source: Government of Washington

# Oregon

Between 2010 and 2014, clean economy jobs in Oregon grew at an overall rate of 11.0 percent. As of 2014, Oregon had 48,320 clean economy jobs – equal to 4,800 more clean economy jobs than in 2010. Energy efficiency products and services, renewable energy, professional environmental services, remediation, and conservation were the dominant growth segments over the five year period.

Green Building and Energy Efficiency was the dominant sector in terms of employment growth in Oregon, growing a total of 26 percent between 2010 and 2014. Jobs related to the manufacturing and installation of energy efficient products saw the highest rate of growth in this space. Oregon's Clean Energy Supply sector grew at an overall rate of 22 percent, in part due to efforts to expand its clean technology clusters with global manufacturers of renewable energy systems and equipment.

	2010	2014
Clean Economy Jobs	43,519	48,321
Clean Economy GDP (USD)	\$5.6B	\$7.0B

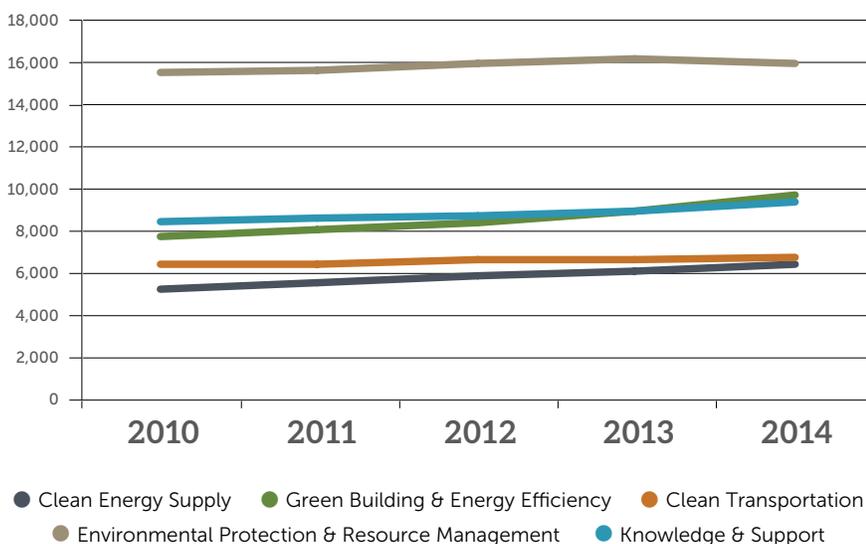
## Clean technology cluster development paying off for local SMEs.

Business Oregon, the state's economic development agency, has worked closely with the Portland Development (PDC) and other key partners to actively grow its clean technology cluster through a targeted strategy over the last decade. Currently, Oregon's clean technology cluster (based in and around Portland), employs more than 12,500 people. Between 70-80% of the job growth has come from organizations that are based in the community. Business Oregon and the PDC have actively recruited anchor companies that include Vestas, Iberdrola Renewables, SolarWorld, Panasonic, BMW, and others, forming a backbone for an entrepreneurial ecosystem of small and medium-sized enterprises (SMEs). Oregon has also made significant investments in connecting cutting-edge university research and development (R&D) with industry strengths to develop the next generation of energy solutions through its three signature research centers.

## Industry collaboration delivering conservation efforts and affordable, clean energy for rural and urban utility customers.

The Energy Trust of Oregon (ETO) is an independent, not-for-profit founded in 2002 and funded by the 1.5 million customers of four Oregon electric and natural gas utilities in urban and rural communities including Portland, Prineville, Klamath Falls, Bend, and Ontario. ETO has been supporting energy conservation efficiency measures for residential and commercial customers, low income housing energy assistance, and renewable energy programs across the state. The net economic benefits of ETO's efforts between 2002 and 2014 added \$3.9 billion to the local economy, including employment equivalent to 3,200 full-time jobs. In 2014, ETO achieved one of its highest-savings years on record, despite dynamic market conditions, continued low natural gas prices, and shifting state and federal tax credits. The program also completed a record 1,124 projects in 2014.

## Job Growth by Sector





SolarWorld's U.S. headquarters in Hillsboro is the largest and most advanced solar PV production facility in the Western Hemisphere. Source: solarworld-usa.com

## Top 10 Segments (2014)

### Top 10 Segments

Public Sector (Federal, State, Local)	8,007
Green Architecture & Construction Services	6,601
Public Mass Transit & Rail	5,932
Sustainable Forestry Products	4,518
Recycling & Reuse	3,224
Hydropower	2,388
Organic Food & Sustainable Farming	2,301
Waste Management & Treatment	1,999
Solar Photovoltaic	1,761
Education & Training	1,381

### Top 10 Fastest Growing

Lighting	168.5%
Appliances	151.2%
Wind	80.5%
Energy-saving Consumer Products	50.4%
Professional Environmental Services	33.0%
Remediation	33.0%
Solar Photovoltaic	32.4%
Solar Thermal	27.9%
Conservation	24.9%
Education & Training	20.9%

## Portland's "We Build Green Cities" initiative boosting export jobs.

The "We Build Green Cities" initiative was launched by the Portland Development Corporation (PDC) with support from the Brookings Institute. The program involves showcasing Portland's strengths in planning, green architecture and design, renewable energy, and other areas to export markets including Japan and Colombia. The campaign builds on Oregon's sustainable tourism attributes and its support of local green infrastructure projects to attract international delegations and showcase Oregon's expertise. Through the program, PDC have been working toward a regional goal of doubling exports from US\$21 billion in 2010 to US\$42 billion in 2015. In 2014, a team of We Build Green Cities members, led by Portland firm ZGF Architects, signed its first contract with Japanese real estate development firm to provide planning and design services for an area energy management system within the Kashiwa-no-ha Campus City project near Tokyo.



Oregon Iron Works streetcar manufacturer, Portland. Source: oregoniron.com



The Klondike Wind Power Project in Sherman County, Oregon. Source: www.iberdrolarenewables.us

# California

Between 2010 and 2014, clean economy jobs in California grew at an overall rate of 23.9 percent. As of 2014, California had 368,200 clean economy jobs – equal to 71,000 more clean economy jobs than in 2010.

California's Clean Energy Supply sector showed the strongest growth overall at 49 percent between 2010 and 2014. Utility-scale clean electricity as a percent of total generation remained relatively constant between 2010 and 2014, despite hydro-electricity's share of the power supply decreasing due to the current drought conditions. However, strong growth in solar PV, and to a lesser extent wind, made up for the difference. Solar PV, particularly distributed generation, employed more than 28,000 people in manufacturing and installation in 2014, with some \$11.8 billion invested in solar installations in 2014 (up 66 percent over 2013).

The Green Building and Energy Efficiency sector also showed considerable growth as the market penetration for certification programs including LEED and ENERGY STAR increased relative to total building activity in California, which is reflected in the increased demand for related products and services.

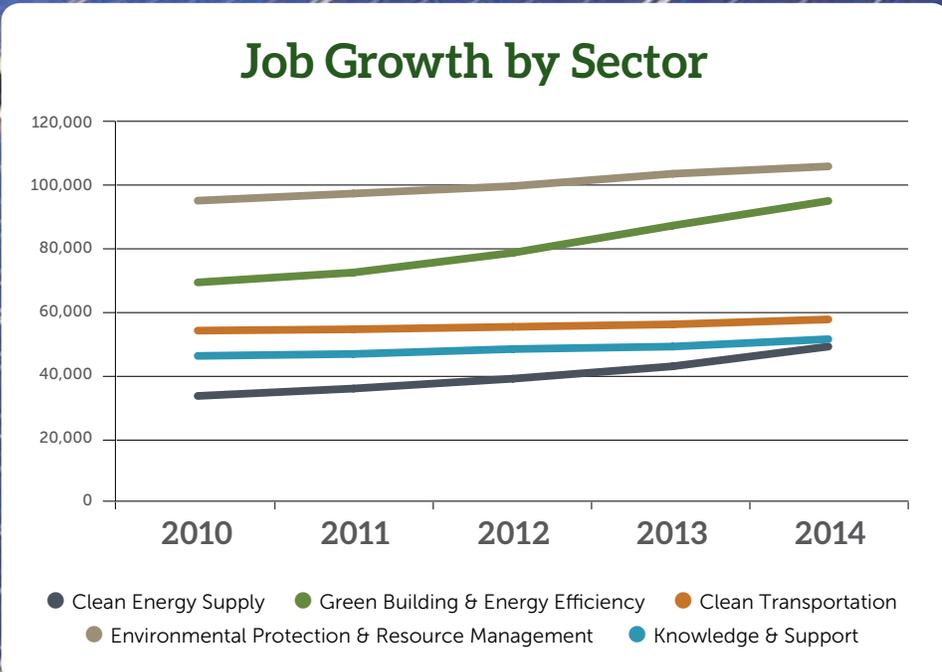
## Zero-emission vehicles scale up.

California has long been at the forefront of automotive advancement, from the development of catalytic converters, to the early adoption of hybrids, to the large-scale manufacturing of electric vehicles. Driven by air quality standards and its leadership in technology, California has emerged as the epicenter of a new auto industry focused on zero-emission vehicles. Silicon Valley-based Tesla, best known for its sleek Model S, has gained rapid market capitalization in recent years. Less known companies including BYD and Proterra have established headquarters and opened manufacturing plants in the Golden State, viewing it as essential to maintaining a competitive edge technologically.

## Solar energy sees explosive growth.

California leads the nation in solar power, with more than four times the solar energy capacity as the next leading state. The solar sector in the Golden State has seen a 16% increase in jobs since 2013 (source: AEE Institute). The rapid growth of solar in California is due in large part to the success of programs such as the state's New Solar Homes Partnership and the California Solar Initiative, a 10-year, US \$2.2 billion incentive program designed to stimulate demand for rooftop installations and reduce costs through economies of scale. California has also seen unprecedented investments in large-scale solar projects, thanks to its commitment to increase renewables as a proportion of its overall energy mix. With the state's growing commitment and through its R&D public funding programs, California continues to attract investments to the solar industry that drive economic growth and job creation.

	2010	2014
Clean Economy Jobs	297,179	368,228
Clean Economy GDP (USD)	\$39.7B	\$52.6B





Proterra, the leading provider of zero emission battery-electric buses, recently opened its headquarters in Silicon Valley. Source: proterra.com

## Top 10 Segments (2014)

### Top 10 Segments

Green Architecture & Construction Services	59,994
Public Mass Transit & Rail	51,197
Public Sector (Federal, State, Local)	43,311
Solar Photovoltaic	28,256
Recycling and Reuse	22,388
Waste Management & Treatment	20,784
Organic Food & Sustainable Farming	17,905
Education & Training	14,058
Remediation	12,336
Professional Environmental Services	11,591

### Top 10 Fastest Growing

Lighting	152.7%
Solar Photovoltaic	133.9%
Solar Thermal	116.4%
Appliances	95.4%
Wind	95.1%
HVAC & Building Control Systems	55.9%
Green Architecture & Construction Services	42.8%
Energy-saving Consumer Products	41.0%
Recycling & Reuse	29.4%
Remediation	28.3%

### Energy efficiency investments deliver jobs and returns to consumers.

California's long history of investing in energy efficiency, starting in the 1970s, has been paying off for consumers while also creating jobs for manufacturers and installers of energy efficient products, equipment, and technology. Over the past 40 years, efficiency standards have kept per capita electricity consumption in the Golden State nearly flat. As a result, household electric bills in California are among the lowest in the nation, saving Californians an estimated \$65 billion since the 1970s. With strong bipartisan support, these policies have allowed the state to avoid at least 30 new power plants and as much carbon pollution as is spewed by five million cars annually. This sustained commitment has made California a nationally recognized leader in reducing energy consumption and improving quality of life for its residents.



# Methodology

The PCC has been showing leadership by working collaboratively to develop a common definition and methodology for tracking clean economy jobs and investments, recognizing that it is important to measure changes in order to manage the risks and seize the opportunities.

The economic impact estimates published in this report are based on a Clean Economy Model ("the Model") developed by The Delphi Group in 2015. The Model was used to estimate changes to "clean economy" GDP and employment figures for California, Oregon, Washington, and British Columbia, between 2010 and 2014. The methodology behind the Model and resulting numbers published in this report is described in below.

## Defining the Clean Economy & Related Jobs

The clean economy framework adopted in this report is based on one originally developed by the Brookings Institute as part of its 2011 *Sizing the U.S. Clean Economy* study and includes five "core" sectors and 38 sub-sectors: (1) Clean Energy Supply; (2) Clean Transportation; (3) Green Buildings and Energy Efficiency; (4) Environmental Protection & Resource Management; and (5) Knowledge and Support.

The definition for clean economy jobs comes directly from the United States Bureau of Labor Statistics (US BLS) definition of green jobs.<sup>1</sup> According to the US BLS, green jobs are either:

- A. Production Jobs** – Jobs in businesses that produce goods or provide services that benefit the environment or conserve natural resources; or
- B. Process Jobs** – Jobs in which workers' duties involve making their establishment's production processes more environmentally friendly or use fewer natural resources.

This report includes only "production" jobs as defined by the US BLS. Production jobs are related to producing a specific set of goods and services, and are in and of themselves not concerned with the environmental impact of the production process. These occupations, for example, include jobs in the clean technology design and manufacturing sector. Other examples of production jobs include wind farm technicians and electric vehicle engineers.

<sup>1</sup> See: <http://www.bls.gov/green>

### Clean Energy Supply

- Biofuels/Biomass
- Geothermal
- Hydropower
- Renewable Energy Services
- Smart Grid
- Solar Photovoltaic
- Solar Thermal
- Waste-to-Energy
- Wave/Ocean Power
- Wind

### Clean Transportation

- Public Mass Transit & Rail
- Fuel Cells
- Battery Technologies
- Electric Vehicle Technologies
- Natural Gas Vehicles
- Non-motorized Transport

### Green Building & Energy Efficiency

- Energy-saving Consumer Products
- HVAC & Building Control Systems
- Lighting
- Energy-saving Building Materials
- Green Architecture & Construction Services
- Professional Energy Services
- Appliances
- Green Building Materials

### Environmental Protection & Resource Management

- Air & Water Purification Technologies
- Carbon Storage & Management
- Pollution Reduction
- Professional Environmental Services
- Recycled-Content Products
- Recycling & Reuse
- Remediation
- Waste Management & Treatment
- Water Management
- Conservation
- Organic Food & Sustainable Farming
- Sustainable Forestry Products

### Knowledge & Support

- Public Sector (all levels)
- Education & Training

## Establishing the 2010 Clean Economy Baseline

The 2010 clean economy employment baseline for each jurisdiction was developed based on the results of the Green Goods and Services (GGS) Survey that was carried out by the US BLS in 2010-2011.<sup>2</sup> The GGS Survey was a multi-million dollar effort based on a sample of approximately 120,000 worksites across the United States.

The GGS Survey estimated the amount or percentage of clean economy production activity (or intensity factor) found within 98 'green' goods and service-based industries in the U.S. states based on the North American Industry Classification System or NAICS at the 4-digit level. Intensity factors for British Columbia's clean economy were estimated based on research by Delphi and, in some cases, applying the average clean economy production (intensity) factors between Oregon and Washington states.

The 2010 baselines for clean economy job numbers for the four PCC jurisdictions were estimated by applying these national intensity factors (adjusted for differences at the state level) to total employment within each green industry at the 4-digit NAICS code level.<sup>3</sup> For a select number of industries where additional data existed and could act as key indicators to the amount of clean economy activity in that given industry (such as for NAICS 2211 – Electricity Power Generation, Transmission, and Distribution), the intensity factors published by the US BLS GGS Survey were not used but were instead altered to reflect the available indicator data.

Gross Domestic Product (GDP) for each clean economy related industry was estimated based on capital labor ratios (at 4-digit NAICS code level) for each jurisdiction, using compensation multipliers to convert wages to GDP.<sup>4</sup>

## Estimating Changes to the 2010 Baseline

The Model was designed to capture changes to clean economy jobs and GDP coming from 2 factors:

- 1. New growth** – through new investments and factors that grow the overall labor pool (i.e., net new jobs).
- 2. Transitional growth** – through the 'greening' of industries over time as the percentage of time spent on clean economy activities increases due to market transformation.

From an employment perspective, transitional production jobs can increase the total number of green jobs in a given jurisdiction even though the overall labor pool may not have increased. As an example, construction workers who increasingly work on projects that are verifiably green in nature (i.e., certified to a green building standard or similar), can be considered transformational green jobs based on the amount of work they perform on green projects relative to total work done in the field. As such, a certain percentage of the construction labor pool can be counted as green jobs.

In order to estimate net new growth (or decline) to clean economy employment and GDP, growth / decline rates were estimated from changes to actual total employment reported by either the US BLS or Statistics Canada within the relevant 4-digit clean economy NAICS codes between 2010 and 2014 with the relevant intensity ratios applied.

Estimating transitional growth between 2010 and 2014 was based on an analysis of key indicators related to each of the clean economy sectors / segments from secondary sources and published by market research firms such as Portland-based Clean Edge, as well as changes to the market penetration of third-party "green" certification programs, where data was available across all four jurisdictions.

Key indicators include clean electricity as a percentage of total generation and registered hybrid and electric vehicles as a percentage of total vehicles registered. Third-party certification programs considered in the analysis include LEED (for both new construction and existing buildings), BOMA BEST (for existing buildings in B.C.), ENERGY STAR (for buildings, homes, equipment, and appliances), certified organic agriculture and food sales, and sustainable forestry programs (including FSC, SFI, ATFS, USFS, and FIA).

Changes to market penetration rates were estimated for each region and converted to intensity ratio changes between 2010 and 2014 that were applied to the relevant industries at the 4-digit NAICS code level.

For some industries, indicator data was unavailable. As such intensity ratios were not adjusted in these cases over the five-year period. In addition, it should be noted that some activities that may be 'green' in nature are not fully captured by this approach because they are not linked to third-party certification programs or clear indicator data. As such, total clean economy growth rates between 2010 and 2014 may be understated.

<sup>2</sup> [www.bls.gov/ggs](http://www.bls.gov/ggs)

<sup>3</sup> Total employment for the three US states for each 4-digit NAICS code was based average annual employment data published by the US BLS for each state (available at <http://www.bls.gov/cew/datatoc.htm>) for 2010. Total employment for BC was based on data published by Statistics Canada's Survey of Employment, Payrolls, and Hours (CANSIM Table 281-0024) or estimated from the 2011 National Household Survey where data was suppressed.

<sup>4</sup> The source for compensation multipliers for the three US states can be found at the following webpage: [http://www.bea.gov/industry/io\\_annual.htm](http://www.bea.gov/industry/io_annual.htm). For BC, the compensation multipliers come from Statistics Canada's Publication 15F0046XDE, available by special order.

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