The West Coast Clean Economy

Opportunities for Investment & Accelerated Job Creation

A report commissioned by the
Pacific Coast Collaborative

Prepared by:

GLOBE ADVISORS
A division of the GLOBE Foundation

THE CENTER FOR CLIMATE STRATEGIES

Methodology Document

March 2012

The Pacific Coast Collaborative

On June 30, 2008, the leaders of the States of California, Oregon, Washington, and Alaska, and the Province of British Columbia, signed the Pacific Coast Collaborative (PCC) Agreement. Through annual meetings, the PCC promotes a common front for cooperative policy alignment, action, and information sharing among the Governors of the states of Washington, Oregon, California, and Alaska, and the Premier of British Columbia.

For more information on the PCC, please visit:
www.pacificcoastcollaborative.org

Authors

GLOBE Advisors, a subsidiary of the Vancouver-based not-for-profit GLOBE Foundation, was established in 2005 in response to an increasing demand for project-based consulting services in the environmental business sector.

GLOBE's vast networks and extensive experience in the areas of international project management and consulting, partnership development, and market research makes them well-positioned to undertake a number of endeavors to further the business of the environment.

For more information on GLOBE Advisors, please visit:
www.globeadvisors.ca

The **Center for Climate Strategies** (CCS) is a public purpose, nonpartisan, non-profit, partnership organization. As the US nation's premiere catalyst for state climate action planning and local, state and federal policy integration, CCS combines expertise in facilitation, technical analysis, policy design and implementation assistance through public private partnerships to provide reliable, cutting edge solutions.

CCS is headquartered in Washington, DC with over 40 national and field experts across the U.S. Team members have extensive qualifications in environmental science, public policy, economics, management, business, law, education, communications, and finance. Many have experience as public officials, high-level policy advisors, and academic, non-profit, community, and business leaders.

For more information on CCS, please visit:
www.climatestrategies.us

Methodology

ESTIMATING BASELINE EMPLOYMENT

The baseline clean economy jobs presented in this report represent a snapshot in time and were quantified using the methodology employed by the Brookings Institute in their 2011 *Sizing the US Clean Economy* study which looks purely at "output" or "production-side" jobs as defined by the US Bureau of Labor Statistics (BLS), rather than the "process" jobs which are larger in size and beyond the scope of this analysis.[1] The approach used by the Brookings Institute does allow for the comparison of baseline job numbers across the West Coast jurisdictions.

In addition to the US analysis, we estimated the clean economy jobs baseline for British Columbia by employing the Brookings Institute methodology and using BC company records that were purchased from the Hoovers' database. Similar to the Brookings Institute's approach to measuring employment, a two step method was used. First, a set of industries were identified as being exclusively part of the clean economy using the eight-digit Standard Industrial Classification (SIC) system developed by the business intelligence firm Dun and Bradstreet (D&B) and maintained by Hoovers.

To develop this list, the GLOBE and CCS team used the same 222 SIC codes applied by the Brookings Institute study that were considered fully part of the clean economy. After removing establishments that were obviously misclassified as part of the clean economy, a second step was carried out to cross-check these companies with existing clean economy firms in GLOBE's database.

It should be noted that jobs in the clean economy segments of sustainable agriculture and forestry, as well as within the Knowledge & Support sector, are not fully captured using the Brookings methodology and as a result, total job numbers presented in this report are considered conservative estimates of the total baseline number of production-side jobs in the clean economy in the region. Further analysis will develop forecasted baselines at a higher level of resolution and will address a broader set of dynamics in the marketplace.

1 Brookings Institute (2011), Sizing the US Clean Economy: A National and Regional Green Jobs Assessment. Available at: http://www.brookings.edu/metro/Clean_Economy.aspx

CONVERTING JOB ESTIMATES TO GDP

The input-output accounts in both Canada and the United States have multipliers representing jobs created per million dollars of gross output and algorithms to convert gross output to gross domestic product. They represent a reasonable sense of direction and magnitude for job creation. However, these figures may not fully capture net effects or other market system dynamics, and will be augmented with supplemental analysis.

1. As the input-output matrices in both countries operate with the North American Industry Classification System (NAICS), the best codes which fit the clean economy segments where identified. To the extent possible, we worked with the same NAICS categories that aligned with the Brookings Institute job data by industry.

2. The detailed input-output matrix for the United States was used to calculate GDP to gross output ratios for each NAICS code representing the clean economy.[2] This input-output table was based on the 2002-benchmark series. More recent input-output matrices do not provide sufficient detail.

3. Employment multipliers for each clean economy segment NAICS code were calculated based on employment published in the US Economic Census for the same benchmark year.[3]

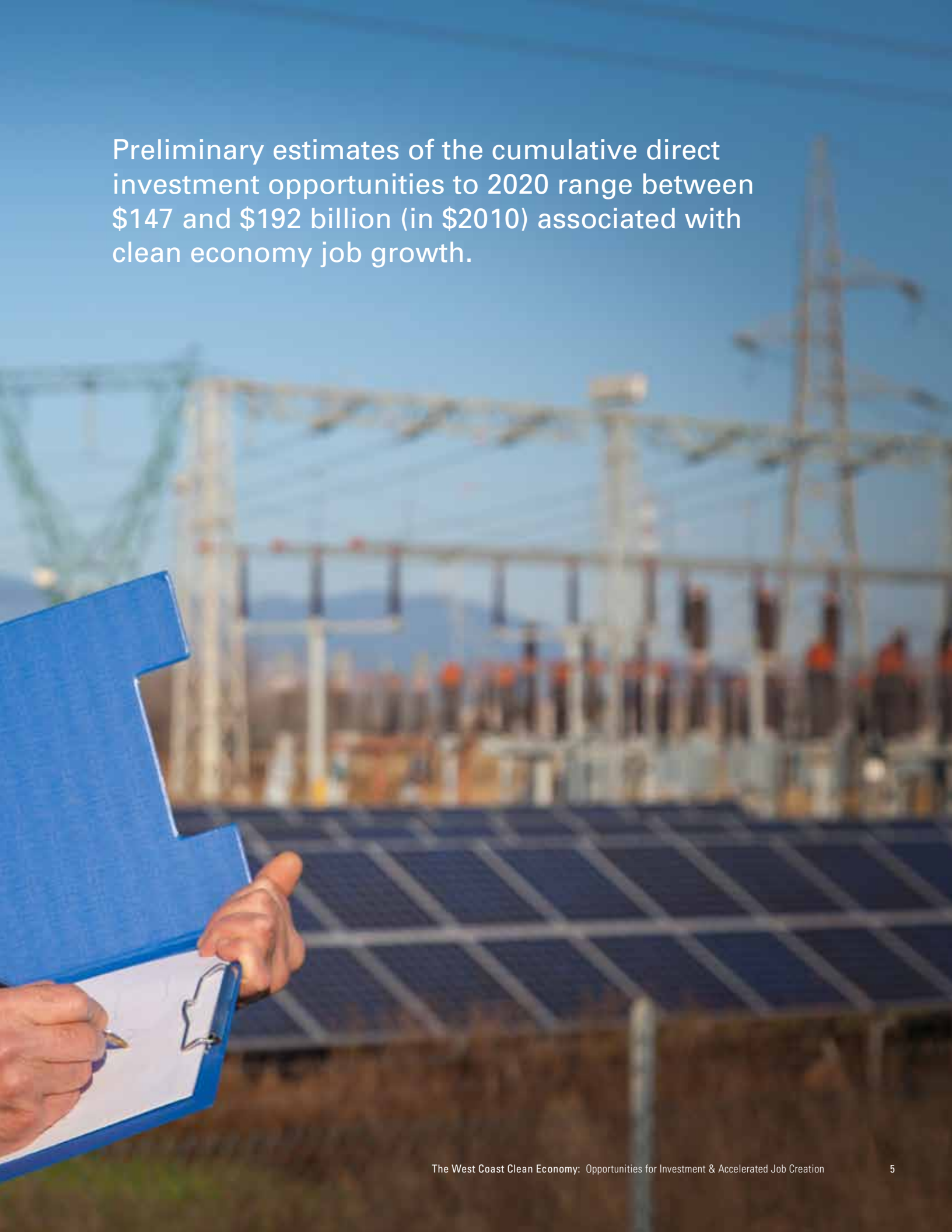
4. The detailed input-output multipliers for British Columbia were purchased from Statistics Canada (Catalogue no.: 15F0046XDB), which provide job-to-output algorithms and GDP-to-gross output ratios.

5. The baseline employment data was converted to both gross output and GDP based on the US and BC job-to-output and GDP-to-output ratios.

2 The US input-output matrix is available at: http://www.bea.gov/industry/io_benchmark.htm

3 Available at: http://www.census.gov/econ/census02/guide/SUBSUMM.HTM

Preliminary estimates of the cumulative direct investment opportunities to 2020 range between $147 and $192 billion (in $2010) associated with clean economy job growth.



MODELED SCENARIOS TO 2020

Business-as-Usual (BAU) Scenario – We divide the growth in the clean economy into two categories. The first is growth in BAU jobs and GDP from existing policy actions and market conditions. We assume that the BAU clean economy growth potential is equal to forecasted non-farm payroll and income growth due to continued permanent shifts in consumer preferences and policy decisions that favor growth in the clean economy sectors. We use state and regional economic growth forecasts to estimate increases in BAU market opportunities.

Jurisdictional forecasts for 2011-2013 show slower than trend growth in income and jobs for most jurisdictions. For years after the final state economic forecast year, we use the Pacific region reference case forecast from the *Annual Energy Outlook 2011* for real income and non-farm payroll growth rates through 2020. Precluding detailed analysis on the existing and planned actions in each jurisdiction, we estimate that the clean economy will grow by nearly 30% through 2020 (or slightly less than 3% per year). Given the strong clean economy and progressive policies in the PCC region, these estimates should be on the low side.

Clean Economy Policy-Driven Scenario – The second source of market growth in the clean economy arise from policy actions that create demand for clean economy goods and services, as well as reducing market barriers and failures to growth. At the PCC meeting in September 2010 at Skamania Lodge in Washington State, a list of potential policy actions that could help facilitate the transition to a regional clean economy was presented using CCS analysis. Additional policy actions were added to the Skamania list for this analysis, including natural gas vehicles, anti-idling policies, vehicle purchase incentives, as well as industrial energy efficiency programs. The list of these policy actions are presented in Table 1 at the end of this Methodology Document and were used as the basis for the 2020 policy-driven employment projections presented in this report.

While the list of policy options presented is not uniform across the entire clean economy, it is representative of the types of actions that jurisdictions could take to foster economic development. The job estimates in the list were updated based on the revised BAU 2020 job forecasts discussed above. Since policy options were not considered for some of the clean economy segments presented in this study, these estimates should be viewed as conservative for the 2020 market opportunities.

Furthermore, the goals for policy options typically do not explicitly attempt to increase exports of clean economy goods and services. Future modeling work can include export driven growth opportunities into economic impact analysis.

Macroeconomic Policy Impact Analysis – Previous work by CCS has utilized the Regional Economic Models, Inc. (REMI) model to estimate macroeconomic impacts of the list of policy actions in Table 1.[4] CCS utilized REMI to predict macroeconomic results of state and regional greenhouse gas mitigation options from stakeholder-based recommendations from comprehensive policy development processes.

The employment impacts for the list of Skamania policy options were developed from economic modeling for the states of Michigan and Pennsylvania, as well as for the US as a whole, performed by the CCS over the last several years. These results are used in this report to provide a rough estimate of the macroeconomic impacts that may be expected in the PCC region as a result of the implementation of the aforementioned clean economy policy measures, and will be supplemented with more detailed modeling.

Estimates of Regional Investment Dollars – Using a sample of nearly 90 policy options developed for four US states (MI, PA, NY, FL) developed over the last several years by CCS and state stakeholders, estimates of direct investment potential as a function of the clean economy jobs created were developed using bivariate regression techniques.

---

4 Regional Economic Models, Inc. www.REMI.com The REMI model is the most widely used economic modeling software package in the U.S. and has been heavily peer reviewed. The model is used extensively to measure proposed legislative and other program and policy economic impacts across the private and public sectors by government agencies in nearly every state of the U.S. In addition, it is often the tool of choice to measure these impacts by a number of university researchers and private research groups that evaluate economic impacts across a state and nation. REMI divides the economy into 169 sectors, thereby allowing important differentials between them. The macroeconomic character of the model is able to analyze the interactions between sectors (ordinary multiplier effects) but with some refinement for price changes not found in input-output models. The REMI PI+ model also brings into play features of labor and capital markets, as well as trade with other states or countries, including changes in competitiveness.

The use of the REMI PI+ model involves the generation of a baseline forecast of the economy through 2020. Then simulations are run of the changes brought about through the implementation of the various clean economy policy actions. Again, this includes the direct effects in the sectors in which the options are implemented, and then the combination of multiplier (purely quantitative interactions) general equilibrium (price-quantity interactions) and macroeconomic (aggregate interactions) impacts. The differences between the baseline and the "counter-factual" simulation represent the total regional economic impacts of these policy options.

The modeling results were very satisfactory, as clean economy employment explained 46% to 60% of the variation in direct investment depending on the modeling specification. The basic data utilized were obtained from a set of REMI analyses of employment impacts from a comprehensive set of mitigation options and their critical features, specified in the Climate Action Plans for the four states cited above.

The quantification of the investment requirement was undertaken by various technical working groups comprised of a broad set of stakeholders in each state.

In applying the investment results to the PCC region, the Smart Growth policy option was assumed to have no up-front capital investments associated with it and was excluded from the aggregate investment estimates. To estimate cumulative investment impacts, policy-driven job growth was assumed to occur linearly between 2012 and 2020.

New (incremental) investment is estimated at $29,000-$38,000 per clean economy job per year ($2010). This includes capital investment in new plant and equipment, as well as program implementation costs, but excludes fuel, operating, and maintenance costs. Preliminary estimates of the cumulative direct investment opportunities to 2020 range between $147 and $192 billion (in $2010) associated with clean economy job growth.

These estimates stem from "bottom-up" microeconomic data which is fed into the REMI macroeconomic model that estimates the net effects of the policy actions on energy intensive sectors. While the investment estimates are derived from four other states data and applied to West Coast region, the results are an empirical assessment of what is and what could be as we progress forward to a cleaner, lower-carbon economic future. Furthermore, our investment estimates are consistent with experience in the Pacific Northwest.

As one example of investment potential, SolarWorld, a German solar PV manufacturing company, expanded its business to the US with a $500 million investment in a new North American Headquarters in Hillsboro, Oregon, which opened in 2008.[5] Five months after the opening of the original building in Hillsboro, SolarWorld announced a $400 million expansion, increasing its production capacity by 44%.[6] In total, it is expected that these investments will create 1,000 permanent new jobs by 2011, in addition to the approximately 150 full time construction jobs generated over the 2.25 years of construction.[7] All told, the investments in SolarWorld's Hillsboro, Oregon, facility will have created about 30,338 job-years by 2040, for an investment ratio of about $30,000/job-year.

Sectors with large regional manufacturing supply chains show even larger per job investment opportunities. Per job capital investments in Australian wind energy have been estimated to be as high as $350,000.[8]

Uncertainties – The policy-driven impacts on clean economy employment for the West Coast region are based roughly on the results of modeling studies of the potential impact of similar policies on a limited number of other regions. As such, the 2020 policy-driven clean job projections should be taken as broadly indicative only; especially as each jurisdiction's economic structure is different. As a result of these uncertainties, the clean economy job projections presented in this report are presented as ranges and are simply best estimates of growth potential given the parameters of the current analysis.

In addition, the macroeconomic impacts of a given policy action are highly dependent on how the action is designed and implemented. CCS research indicates that policies can be designed to maximize employment through a variety of means, including importing capital into the region, increasing the regional share of the supply chain for the policy, as well as investment in labor intensive sectors.

5 http://www.solarworld-usa.com/news-and-resources/news/solarworld-opens-north-americas-largest-solar-cell-manufacturing-facility.aspx

6 http://www.solarworld-usa.com/news-and-resources/news/solarworld-to-expand-largest-solar-manufacturing-site-in-north-america.aspx

7 http://www.solarworld-usa.com/about-solarworld/locations/hillsboro-oregon.aspx

8 Jobs and Investment Potential of Renewable Energy: Australian Wind Industry Scenarios Table 5, low scenario. http://seg.fsu.edu/Library/job%20creation.pdf

Table 1: List of Policy Actions in Policy Driven Clean Economy Market Opportunities

Sector	Policy Action Title	Policy Action Description
Energy Efficiency & Green Buildings	Zero Emission New Buildings	Incentives and requirements across the region for zero-net energy (ZNE) building with the goal of eliminating future increases of energy consumption from residential and commercial buildings. The goal of this policy is to require all new residential buildings to be ZNE by 2020, and all new commercial buildings by 2030.
	Whole Building Retrofits	Incentives and targets to induce the owners of existing homes and commercial and industrial buildings to improve the efficiency of the use of energy and other resources, along with provisions for raising targets periodically. This policy targets the retrofit of 1% of the existing building stock in the Pacific region each year from 2012-2020.
	Expansion of Clean Energy Financing Opportunities	Introduce incentives, grants, or loan programs to promote expansion of clean energy and energy efficiency.
	Multistate Financing Policies	Promote cooperation between regional jurisdictions and utilities to provide public benefit funds, or other such mechanisms, that will allow for funding to be drawn from a larger resource base.
	White Tags Trading	White tags are energy savings credits represents one megawatt hour (MWh) of conserved energy from a verified and certified demand side management (DSM) measure, project or program.
	Appliance Standards	Appliance efficiency standards reduce the market cost of energy efficiency improvements by incorporating technological advances into base appliance models, thereby creating economies of scale.
	Industrial Energy Efficiency	This policy provides incentives and targets to induce the owners of existing buildings to improve the efficiency of their use of energy and other resources, along with provisions for raising targets periodically.
Clean Energy Supply	Distributed generation: Combined Heat and Power (CHP)	CHP systems reduce fossil fuel use and GHG emissions, both through their improved efficiency relative to separate heat and power technologies, and by avoiding transmission and distribution losses associated with moving power from central power stations located far from where the electricity is used.
	Distributed generation: Renewable Electricity (RE)	This policy includes small-scale distributed electricity generation at residences and commercial and industrial facilities, and powered by renewable energy sources (typically solar, but also wind, small hydroelectric power sources, or biomass or biomass-derived fuels).
	Feed-In Tariff/ Reverse Auction for Renewables	Feed-In Tariff/Reverse Auction for Renewables Under this policy feed-in tariffs are considered for small scale renewable projects (e.g. less than 3 MW), while reverse auctions are considered for larger generation facilities (up to 20 MW). The goal of this policy is to fund new small and medium scale renewable energy with funding equal to 1% of electricity sales through a combination feed in tariff and reverse auctions.
	Electricity Transmission and Grid Integration	This policy identifies two categories of actions; expansion of existing high voltage transmission lines, and the integration of intermittent resources to the grid.
	Biomass to Energy and Biogasification	This option would increase the amount of biomass available from forests and agricultural waste for generating electricity at a large scale and displacing the use of fossil energy sources.
	Smart Grid: Improved Distribution and Metering	Smart grid systems promote efficiency through improvements in system stability and better control technology and systems integration. Capabilities include enhanced utility and consumer feedback, improved control of electricity usage and enhanced integration of DG and intermittent renewable generation.
Clean Transportation	Electric/ Plug in Electric Vehicles	This policy expands the development and use of electric vehicles through infrastructure, charging stations, and equipment, and incentives to purchase light-, medium-, and heavy-duty advanced vehicle technologies. This includes natural gas, electric vehicles and plug-in electric hybrids. The goal of this policy is to target the penetration of .5% the vehicles each year for the five year period 2012-2016 for passenger cars and light trucks.
	Low Carbon Fuel Standard (LCFS)	This policy reduces the greenhouse gas (GHG) emissions from the use of transportation fuels through a package of incentives, education, and standards. The goal of this action is to develop the California LCFS into a region-wide standard that reduces carbon emissions from transportation fuels by 10% by 2020.

Sector	Policy Action Title	Policy Action Description
Clean Transportation	Intercity transportation Initiatives to Reduce Vehicle Miles Traveled including Truck-to-Rail Mode Shifts	This option would provide financing, regulatory relief, and the use of eminent domain to develop, publicly or privately, intercity passenger rail system serving major urban areas. It would also provide additional financial assistance to improve services already provided by the rail system, including Amtrak, on other routes. This would allow for the more energy-efficient movement of people, reducing GHG emissions associated with aircraft activity and highway travel, while eliminating highway congestion.
	Smart Growth Policies including Transit Oriented Development (TOD)	This option would provide economic incentives, liberalized zoning, land-use restrictions, and permit streamlining to encourage dense mixed-use development of properties in proximity to transit stations or facilities. Transit-oriented development (TOD) is the creation of compact, mixed-use commercial or residential communities, designed to maximize access to public transit and create a community attractive to pedestrians and bicyclists.
	Co-Locating Housing Near Jobs to Reduce Gridlock and Improve Productivity	This option would promote development of housing near employment centers. This option could also provide economic development (e.g., tax-based) incentives, and liberalize zoning and permitting processes (parking requirements, density and mixed-use restrictions, etc.) to encourage investment in downtowns and central business districts.
	Natural Gas Vehicles	This option would promote the expansion of the natural gas vehicle market through government fleet purchases, financial incentives for producers and customers, and expansion of re-fueling infrastructure.
	Vehicle Purchase Incentives	This option would increase and/or extend financial incentives to purchase energy efficient vehicles, increasing market share for LEVs and ZEVs.
	Anti-idling	This option would set a stringent region-wide anti-idling standard preventing unnecessary idling of motor vehicles consistent with the most aggressive policies in North America. This option would also recommend development of technology to reduce the need for idling, especially in extreme weather and traffic conditions.
Environmental Protection & Resource Management	Promote Consumption of Locally and Regionally Produced Goods and Services	This option would promote the production and consumption of locally-produced goods and services, including agricultural goods, which displace the consumption of goods transported from other states or countries.
	Crop Production Practices: Soil Carbon Management	The amount of carbon stored in the soil can be increased by the adoption of such practices as conservation, no-till cultivation, and crop rotation. This option could also encourage the planting of perennial crops, which reduces tillage, reduces planting costs and related equipment use and soil compaction, and typically reduces water consumption.
	Source (Waste Generation) Reduction	This option would reduce the volume of waste from residential, commercial, and government sectors through programs that reduce the generation of waste. Reducing waste generation at the source reduces both landfill emissions and upstream production emissions.
	Industrial Waste Recycling for Jobs and the Environment	This option would increase reuse, recycling, and composting programs to limit GHG emissions associated with the production of raw materials and products. It would increase reuse and recycling programs for industrial waste and its components, create new recycling programs, develop markets for reused and recycled materials, and increase average participation and recovery rates for all existing recycling programs.
	MSW Landfill Gas Management	This option captures the renewable energy in landfill gas. Methane can be captured and used to generate electric power, provide space or water heating, or to produce gas products similar compressed or pipeline natural gas for transport to and use at other locations.
	Conserve Open Space, Agricultural Land and Wetlands	This option would reduce the rate at which open space, including agricultural lands, forests and wetlands, are converted to developed uses, while protecting private property rights and responsibilities, with goals including increasing biodiversity and improving carbon sequestration, and could include the conversion of reclaimed lands to higher quality habitat or agricultural land.
	Forest Protection—Reduced Clearing and Conversion to Non-forest Cover	This option would reduce the rate at which existing forests are cleared. Easements, conservation programs, improved markets for timber and non-timber forest products, and payment for ecosystem services are some mechanisms that may be used.
	Urban Forestry	This option would maintain and improve the health and longevity of trees in urban and residential areas to protect and enhance the carbon stored in tree biomass. Indirect emission reductions may also occur by reducing heating and cooling needs as a result of planting shade trees near buildings.
Knowledge & Support	Growth in Associated Training and Regulation	Growth of the clean economy will lead to an increase in jobs associated with job training, regulatory processes, and compliance. Likely segments of the economy to see an increase in clean jobs are education, public service, and consulting.

www.pacificcoastcollaborative.org

GLOBE
ADVISORS
A division of the GLOBE Foundation

www.globeadvisors.ca

THE CENTER FOR
CLIMATE STRATEGIES

www.climatestrategies.us