

Meeting Bellingham's 100% Clean



Energy Goals

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Executive Summary

Our plan is to create a descriptive road map to help the City of Bellingham to reach 100% renewable energy by developing case studies on cities that have comprehensive climate action plans.

Since the industrial revolution, our society has depended on the extracting and burning of fossil fuels in order to power cities, economies, and transportations. The environmental and human health degrading qualities of fossil fuel usage is now unnecessary to continue thanks to the exponential technological growth of renewable energy systems. It is important for cities and local governments to take action against the anthropocentric greenhouse gas (GHG) emissions through divestment from fossil fuel dependencies and investing in more sustainable practices. We will be examining the steps that will help cities, such as Bellingham, to help mitigate GHG emission by eliminating the use of fossil fuels in the energy, heating and transportation. Given the overwhelming consensus of the scientific community that burning of fossil fuels is the largest contributor to GHG emission, we believe that 100% renewable energy is achievable and will make the largest impact in mitigating climate change. This research project will benefit the Whatcom County community as well as other cities that have committed to 100% renewable energy but have not yet fulfilled a comprehensive climate action plan.

Our group was task to assess the mechanism that will assist the City of Bellingham to reach 100 percent renewable energy as early as 2030. Our research relies on cities that have put forth a climate action plan that details their plan to convert over to sustainable and reliable forms of energies. The cities we chose to analyze are Aspen, Colorado; Edmonds, Washington; Portland, Oregon; Santa Monica, California; Cambridge, Massachusetts; Ann Arbor, Michigan; and Vancouver, British Columbia. Each city offers unique policies, methods, or goals that will provide a roadmap to achieve 100 percent renewable energy within the next thirty or forty years. The following case studies are set to follow a concise format that will highlight practical methods from each sector: electricity, heating (commercial/residential), and transportation. Next, we have included recommendations to assist the City in producing productive policies or incentives to motivate Bellingham residents to invest in 100 percent renewable sources. More specifically, we have focused on providing useful information on how the City of Bellingham can incentivize community members to reduce fossil fuel consumption and adopt renewable energy to heat/cool homes and adopt electric-power vehicles. Lastly, we end our report with methods on how the city can measure its own success over the years as it aims to convert to 100 percent renewable energy by 2030.

Introduction

The goal to reduce fossil fuel consumption and replace it with clean renewable energy to power cities is necessary for the longevity of all life on earth. Scientific evidence has concluded the Earth is experiencing global warming, mostly caused by human activity, of two-degree Fahrenheit since the 19th-century, according to NASA's climate change panel (NASA, 2018). This change is driven by the excessive amount of carbon dioxide and other human-made emissions into the atmosphere that have created a greenhouse effect thus warming the planet. The issue is global and at times difficult to know exactly what other factors may be involved in the acceleration of anthropocentric climate change, yet scientists have concluded that the major emitters are developed countries, such as China, United States, India, and Russia (UCS, 2017). Therefore, the first steps in mitigating the rapid change will be to address cultural norms and practices that have become unhinged, such as excessive consumerism, and major shifts or adaptation are needed in a decarbonized society. If we begin to address the problem today rather than tomorrow the consequences of rising sea levels, extreme weather, drought, and famine will be less severe to people who do not have the resources to adapt or move away from disastrous situations (NASA, 2018). With that being said, the harsh reality is that populations living in developing countries will be disproportionately affected more compared to someone living in the City of Bellingham; someone living in the U.S. has a carbon-footprint of 20-metric tons each year compared to the global average of 4-metric tons (MIT, 2008).

The overall goal to mitigate anthropocentric climate change will be for Governments to take dramatic steps that will cause people to change and adapt to a decarbonized society. As many may be familiar, it is easier said than done because of special interest groups that will lose their share of the economic pie. So, the most important measure will be for States, such as Washington, to take charge and promote the use and development of renewable energy in cities where local governments can implement mandates that are in the support of renewable energies. Bellingham has begun its commitment to aim for 100 percent renewable energy by 2030; not only will Bellingham no longer rely on fossil fuels for electricity, heating, and transportation, but will also grow its economy and create new jobs in the infrastructure and maintenance of these carbon-free technologies. Other cities, such as Santa Monica, CA. and Cambridge, MA., have also committed to a decarbonized future that not only will benefit their local economies and environment, but create a social movement around the nation that is so desperately needed.

Bellingham's commitment to 100 percent renewable needs community support to pass legislation on renewable energy initiatives, as well as headstrong policy to stay on

track. Project goals include offering information on other cities environmental progress and offering Bellingham advice to more efficiently reduce dependency on fossil fuels.

Methodology

To present a rounded and realistic presentation we have extracted case studies from six cities that have committed to 100% renewable energy, analyzing general approaches, reduction goals, educational campaigns, progress tracking measures. and cost-benefits of emission reduction programs.

These emission reduction and energy development findings will be presented city by city, with sub-sections detailing which category (energy, heating, transportation) in the municipal and community sectors. Along with visuals taken from cities Climate Action Plans, paragraphs of analysis comparing and contrasting similarities and differences between cities and what strategies would be most feasible for Bellingham is also included. This includes considering the existing energy production/consumption levels, land usage, municipal utility usages, state and county regulations, which renewable energy options are available, prior/future plans, and community values. This presentation will be digital for easy access between stakeholders.

Moving towards 100% renewable energy will impact all facilities and operations that currently use any form fossil fuels. Public utilities, services and operations in the municipal, school, business and residential sectors will be influenced. To what degree is still to be determined.

Outcomes/Results

Aspen, Colorado

The City of Aspen's new Climate Action Plan (CAP) identifies 46 actions in six sectors and recommends implementation. The cities first objective is to decarbonize its energy supply by establishing a collective of local governments, large energy consumers, and power utilities to campaign for a regional renewable energy transition. Aspen plans to reduce 80 percent of carbon emission by 2050. They plan to enable regional production and consumption of more renewable energy through local and state legislation that supports clean energy, for example policies that will streamline and incentivizes rooftop solar installation process (Aspen's CAP, pg. 24).

Aspen will promote efficiency of space and water heating with transitions and retrofits to high efficiency electric appliances in commercial and residential homes;

implementation of energy efficient standards in building codes will increase reductions. Furthermore, building codes will include rental homes to meet energy standards to drive energy reduction while increasing demand for homes that are energy efficient. Commercial building will be held to higher energy standards by promoting energy benchmarking and reports that will ensure that incremental energy efficiency upgrades. This will further insure that all buildings will be required to receive proper evaluations in order to bring all commercial buildings to energy standards that will suffice the city's goal to reduce energy consumption and decrease carbon dioxide emissions (Aspen's CAP, pg.28).

The recommended action to reduce transportation emissions begins with reducing Vehicles Miles Traveled (VMT) from city employees and employers within the city. Subsidize public transit and transportation alternatives will encourage employees to reduce VMT. City's endorsement of electric vehicles and zero-emission vehicle with infrastructure to support energy demand will further decrease carbon emissions and reduce VMT. Other incentives to reduce VMT will require economic tools such as increase parking fees, congestion fees, tolls, and dynamic pricing (Aspen's CAP, pg.32-34).

Edmonds, Washington

The City of Edmonds has commenced action to reduce electricity consumption of commercial building by replacing fossil fuels with electricity produced by renewable energy. The city's support for Snohomish County's Public Utility District (PUD) has enabled Edmonds to increase the proportion of renewable energy being supplied, thus diversifying energy mix by promoting the purchasing of green power. Furthermore, Edmonds has promoted the installation of renewable energy projects around the city by updated zoning allowances, endorsing state legislation that support their CAP, and creating financial programs that grant loans to landowners with reasonable return interest rates (Edmonds' CAP, pg.10-11).

As for heating, Edmonds has promoted the improvement of energy efficiency within buildings in order to reduce energy for heating buildings. For a short period Edmonds managed the Energy Efficiency Conservation Block Grant and encouraged residents and business to apply for federal tax credit programs that were available during 2009 and 2010. The city also implemented energy audits at the time of sale for any residential and commercial buildings within the city to create demand for energy efficient homes and buildings. As well as, requiring new commercial buildings to have a Leadership in Energy and Environmental Design (LEED) certification. Lastly, the city developed a financial-assistance program to be administered by the city and with

utilities and energy companies to reduce the upfront cost and incentivize property owners to install energy efficient appliances and solar panels (Edmonds' CAP, pg 10-11).

Transportation accounts for 53 percent of Edmonds GHG emissions therefore their main focus is to reduce Vehicle Miles Traveled (VMT) and to reduce gallons of fuel consumed when city employees traveled. Such action requires for public transportation to improve routes, encourage business to locate within the city, and encourage residents to buy local products and services. Edmonds has also made an effort to improve walking and biking routes to encourage residents to drive less. Other actions include car-sharing programs and carpooling by city employees and school faculty. Overall, the City of Edmonds has made most of their efforts to reduce vehicles from roads and encourage alternative forms of transportation. (Edmonds' CAP, pg. 6-7)

Portland, Oregon

Portland's energy supply is mainly dominated by coal and natural gas which puts it in a distinct situation between its coastal neighbors, California and Washington. Portland's effort to reduce carbon emission from its energy sector has place a price on carbon in order to reduce fossil fuel consumption and initiate renewable energy demand. Portland's objectives begins with reducing total energy use of all buildings made before 2010 by 25 percent, commercial building energy benchmarking, residential energy performance ratings and funding assistance are a few strategies put in place to reduce energy consumption. As well as, supplying 50 percent of all energy used in commercial building with renewable energy with 10 percent of that produce on-site by renewable energy (Portland's CAP, pg. 59-69).

Heating is closely related to building performance thus policies and strategies that will reduce energy consumption in commercial and residential buildings will include energy efficient heating systems. Passive buildings is a solution to reduce energy consumption by designing super-isolated buildings that are primarily heated by solar and minimal equipment. This requires a rigorous and quantifiable level of efficiency within each site in order to be certify by the Passive House Institute US (PHIUS). Along with LEED certified buildings these prestigious classification will enable more commercial developers to consider energy efficient buildings (Portland's CAP, pg 59-69)

Portland's approach to reduce carbon emissions from transportation begins with reducing VMT by connecting neighborhoods to improve equity and reduce emission from driving. Improved public transportation, biking and walking networks are the main sectors that will handle the bulk of commuters and pedestrians navigating through the city. The city will increase local and state funding to help pay for the improved network

that will connect individuals without the use of vehicles. Urban growth management will play a large factor as population growth continues and smart planning strategies are implemented to reduce sprawl. Overall, Portland's approach to reduce transportation emissions are to reduce VMT, improve public transportation, and plan neighborhoods that will connect residents in order to reduce vehicles on the road (Portland's CAP, pg. 73-87).

Santa Monica, California

Santa Monica's Climate Action Plan is titled 15x15 after goals to reduce greenhouse emissions 15% below 1990 by the end of 2015. Energy efficiency projects under the 15x15 CAP have reduced annual energy use by 1,398,896 kWh in electricity and 36,641 therms of natural gas.

A method the city used for increasing energy efficiency of new buildings by 10% was the land-use policy Land Use Circulation Element (LUCE) negotiating multiple development agreement projects to achieve high levels of sustainability. Over 700,000 sq. ft. was approved to meet LEED certification, maximize solar energy and electric vehicle charging stations, and significantly reduce water use.

The Property Assessed Clean Energy (PACE) program offers financing for implementing renewable energy projects, efficiency measures, and seismic retrofit projects with no money down and the savings pay for the initiatives over time, assessed by a bi-annual property tax bill. Home Energy Renovation Opportunity (HERO) is an element of PACE extended to residential customers. In 2016, the City updated the Green Building Ordinance (GBO) to mandate solar for all new construction. The update builds on the previous GBO, which required that newly constructed buildings reserve 15% of south and west rooftop space for future solar panel installation.

Due to the higher Californian temperatures, Santa Monica's sustainable cities plan and climate action plan do not have any sections detailing residential heating efficiency measures. With temperatures rising, efficient cooling measures like electric heat pumps should be considered by warming communities.

Transportation efficiency measures in Santa Monica took shape through alternative transportation rentals and renewable natural gas sourcing for their bus fleet. In 2016, Zipcar started a two-year pilot car-sharing service program at public on- and off-street parking spaces in Santa Monica, building off of the existing system of three private venues at the Seychelle and Waverly condominium complexes, and the

Colorado Center. In 2015, Santa Monica became the first city in Southern California to launch a bike-sharing program. The Breeze Bike Share debuted 500 eight-speed bicycles at 75 stations throughout Santa Monica and Venice. Riders use a mobile app to reserve and unlock the bicycles for short trips. After 100 days of operation, 8,529 users logged a collective 86,180 miles traveled and 81,371 lbs. of carbon dioxide emissions avoided. In 2015, Big Blue Bus announced that it is now fueling its fleet with renewable natural gas - becoming one of first municipal transit authorities in the country to do so - sourced from non-fracked methane gas captured from the decomposition of landfill waste. This bold achievement reduced the BBB fleet's carbon footprint by more than 60%.

Ann Arbor, Michigan

Ann Arbor's climate action plan details dozens of recommended actions for Energy and Building Actions, Land use, Resource Management, and Community Health options on page 39 of its CAP. The City reached its original 20 percent renewable energy goal for municipal operations in 2010 primarily based on municipal generation of electricity from hydropower and landfill gas. Work with Michigan Public Service Commission and DTE Energy to allow direct purchase of renewable energy by residential electricity customers provides more incentive for green power.

The energy used in buildings contributes significantly to GHG emissions in the City of Ann Arbor and makes up 77 percent of the City's total emissions. In order to reach the goal of 25 percent reduction by 2025 or substantial reductions in the future, the City of Ann Arbor and its residents need to reduce energy use in buildings through energy efficiency, and the use of renewable and low-carbon energy sources must increase dramatically. Initiatives for heating and cooling include creating a geothermal utility where each downtown building on the route serviced by the loop would need to install a ground source heat pump driven for that building's systems. More information on this project is on page 67 of the Ann Arbor CAP.

21 actions on transportation are recommended, covering the usual reduction strategies mentioned in other cities. A citywide Go!Pass program combines bus incentives with walking and biking incentives, pushing for higher alternative transportation participation among residents. More information on transportation options can be found on page 85.

Vancouver, British Columbia,

With Canadian's spending roughly 90% of their time indoors, focus on improving energy and heating efficiency within building's is a primary concern for their CAP.

Highest priority actions for green buildings are to update the Vancouver Building Bylaw, develop finance tools such as PACE and to reward energy efficient and emission reducing buildings through price signals in their permitting fees (Vancouver CAP, pg24). In 2010, a new and affordable housing development for seniors in Southeast False Creek became the first multi-unit residential building in Canada to generate as much energy as it uses. They did this through techniques such as solar access and shading, natural cross-ventilation, tripleglazed windows, renewable energy sources, and visual feedback tools in each unit that encourage residents to reduce their energy use. The building is powered by a district energy heat-recovery system and rooftop solar technology that provides hot water to the building.

Using the False Creek Neighborhood Energy Utility as an effective model, Vancouver aims to build new neighborhood scale renewable energy systems, grouping multiple buildings under a single system. (Vancouver CAP, pg 18,19). Vancouver also aims to convert large scale steam systems to alternative fuels to heat their water supply, reducing emissions and increasing efficiency. All new building rezonings in Vancouver are required to meet the building industry's LEEd Gold standard for environmental performance. Lastly they need to further develop a policy framework that clearly articulates when the city will or will not consider different renewable energy sources for district energy systems.

Vancouver has ambitious goals to make the majority of trips be taken by foot, bicycle and public transit along with reducing average distance driven per resident by 20% from 2007 levels. The five priority actions for greener transportation boil down to updating their master plan, improve pedestrian safety, encourage mobility enabling land use policies, higher capacity rapid transit and bike share programs (Vancouver CAP, pg 34).

Recommendations

Electricity: Outlined in the previous case studies the PACE program seems most effective for implementing energy efficient initiatives to residents and commercial business owners. Allow room for community solar panels on the roofs of new developments is an action taken by Santa Monica that guarantees future efficiency progress, Bellingham could do something similar. A more drastic recommendation is finding another energy supplier that provides renewable energy or to also create a Public Utility District that services the city .

Heating: PACE is again recommended for financing heating conservation measures and initiatives. Community solar panels to power upgraded electric HVAC systems will also

help decrease natural gas dependency for heating. Increase insulation efficiency (double pane/triple glazed windows) has been effective for other cities and would be useful for Bellingham as many of the homes have single pane glass windows.

Transportation. Reducing Vehicle Miles Traveled through electric-car/bike sharing programs would be most effective to keep individuals from purchasing new vehicles. Like Seattle's LimeBike, a car sharing program would be effectively utilized by varied demographics in the relatively small city. Investing in charging stations would be required to service an incoming electric vehicle fleet.

Conclusion

Overall, after analyzing multiple city's climate action plan we have found a common theme to reduce carbon emissions from electricity, heating, and transportation. Many cities have taken action to reduce energy consumption by retrofitting existing builds and requiring new buildings to meet efficiency standards set by the city. Strategies involve providing financial assistance, implementing new building codes, efficiency mandates, and replacing fossil fuel energy with renewable energy sources. Cities such as Edmonds have invested resources to improve local PUD that will supply renewable energy sources to their energy demands in order to diversify the energy-mix. Majority of the cities that have committed to 100 percent renewable energy by a certain date have all identified that fossil fuels must be replaced with zero-carbon solutions and energy sources must come from different sources, such as wind, solar, and hydro-electric. As for heating, any energy efficient improvements done to commercial and residential buildings will benefit the overall performance of the building and eventually save energy and money. Common strategies identified include LEED certification for new buildings, retrofitting older buildings, and providing incentives for residents to demand energy-saving methods.

Carbon emissions from transportation was the largest contributor for many of the cities and their main focus to reduce emissions. Cities, such as Portland, Oregon, focused on reducing the vehicles on the road by improving public transportation, walking and biking routes, and improved neighborhood connectivity. Actions that commonly appeared were increase funding, encourage policies that would support more infrastructure for pedestrians and transit, and manage urban growth responsibly. As well as, electric-car/bike sharing programs that can reduce vehicles on the road and encourage individuals to drive less. Public spaces are important to improve the walkability of communities because for too long city have been design to accommodate the vehicle rather than the pedestrian, which have resulted in dangerous walkways and unsafe bike routes that discourage individuals to drive less.

Resources

Vancouver, Canada <http://vancouver.ca/files/cov/Greenest-city-action-plan.pdf>

Ann Arbor, Michigan

https://www.a2cp.org/sites/default/files/CityofAnnArborClimateActionPlan_low%20res_12_17_12.pdf

Aspen, CO.: <https://www.cityofaspen.com/DocumentCenter/View/1893>

file:///C:/Temp/GHG-Toolkit_12-17_201712040909174339.pdf

Bellingham Climate Action Plan INFO

<https://www.cob.org/Documents/pw/environment/City%20of%20Bellingham%20Climate%20Protection%20Action%20Plan%20%20v1.3.pdf>

Edmonds, Washington <http://www.edmondswa.gov/climate-action-plan.html>

Portland, Oregon <https://www.portlandoregon.gov/bps/article/548588>

Santa Monica, CA.:

https://www.smgov.net/uploadedFiles/Departments/OSE/Climate/CSM_1515_CAP_FinalReport2016.pdf

Cambridge, Massachusetts

https://www.cambridgema.gov/~media/Files/CDD/Climate/climateplans/climate_plan.pdf?la=en

The Solutions Project

<http://thesolutionsproject.org>

Road map for 100% - <http://web.stanford.edu/group/efmh/jacobson/Articles/I/WWS-50-USState-plans.html>

Puget Sound Energy

Climate Action Plan:

<https://pse.com/aboutpse/Environment/Pages/Climate-Change-Archived.aspx>

Climate Change Fact Sheet:

https://pse.com/aboutpse/psenewsroom/MediaKit/027_Climate_Change.pdf

Georgetown, TX: 100% renewable energy

<https://the1a.org/shows/2018-04-16/running-on-renewables>

What is a Public Utility District?

<http://www.pud3.org/service/in-your-community/commissioners/what-is-a-public-utility-district-pud>

WA. Renewable Energy: <https://blog.arcadiapower.com/washington-renewable-energy/>

Energy Saving Incentives for Bellingham:

<https://www.cob.org/services/environment/climate/Pages/energy-incentives.aspx>

Washington's RPS:

<http://www.commerce.wa.gov/growing-the-economy/energy/energy-independence-act/>

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