

POLICY BEST PRACTICES

Cambridge Getting to Net Zero Task Force

May 29, 2014

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1. EXECUTIVE SUMMARY

The purpose of this best practices review is to highlight initiatives from a number of leading jurisdictions, to generate ideas and stimulate discussion as to what suite of strategies would best support Cambridge's net zero emissions objective. This report identifies a variety of practices that are aimed at both significant building-related greenhouse gas reductions and renewable energy production. The examples from other jurisdictions offer a cross section of policies and programs, from large, mature cities such as San Francisco to young but highly engaged cities like Fort Collins, which is pursuing a net zero energy district.

In addition to Cambridge, seven cities are surveyed in this report: Fort Collins, Austin, Boston, New York, San Francisco, Seattle, and Vancouver. These cities were selected primarily because they demonstrate forward looking and innovative policy leadership, policy maturity, and are similar to Cambridge in terms of urban density and character. Thus, in aggregate, this series of case studies provides a foundation from which Cambridge can build. While these cities and their respective policies and programs are recognized far and wide for their innovation and ambitious approach, it is still early days in terms of being able to measure the impact of each city's suite of initiatives. Where information was available, this report provides a summary of progress to date for each initiative. It should be noted that this analysis is not comprehensive as much of the data and metrics are yet to be reported.

Another key consideration is that there is no formula or established set of initiatives that will enable a municipality to achieve a net zero emissions target. While other jurisdictions have adopted similar targets, there is little if any precedent to date for a community of this size that has set a target, implemented an action plan, and achieved its objectives. The net zero ambition positions Cambridge in the company of leading jurisdictions at various stages on the path to achieving similarly ambitious targets.

In terms of applicability of experiences in other jurisdictions to supporting Cambridge's efforts, it should be noted that each city has its own set of unique circumstances that impact its distinct trajectory toward meeting its target including climate, culture, fuel supply, building stock, demographics, urban form and complementary policies. There are however, a set of conditions and approaches that are common to many of these cities' strategies, and these commonalities offer important insight to Cambridge as the City paves a path to net zero emissions.

The following is a summary of trends revealed by way of the best practices review:

Target Setting

To stay on track it is important for a city to calculate a baseline to define the 'current state,' and from there develop a quantifiable target to define a 'desired future state.' In addition, cities must define the scope and specific parameters of their target. The following considerations should be addressed as a part of the target setting process:

- ◆ Determine whether the target applies to building operations, or a broader scope;
- ◆ Establish a clear definition of net zero energy;
- ◆ Determine whether emissions are measured at site or source;
- ◆ Understand the emissions factors associated with each fuel type;
- ◆ Assign boundaries around what is considered renewable or emission free;
- ◆ Establish an approach to offsets and RECs.

Once these key decisions are made and parameters set, a city can begin to develop a strategy toward GHG reductions and increasing renewable energy supply.

Holistic Approach

The most successful cities are those that take a comprehensive approach, coupling climate action plans, green building ordinances, municipal building and purchasing policy, state building codes, and utility and local incentive programs to reach energy and GHG reduction goals. Each of the policies and initiatives discussed in this report falls under one or more of the following categories: energy supply, policy and planning approaches, education and behavior change, and incentives and financing. Each of the cities included in this report have introduced a healthy mix of each.

Supportive State Policy

Municipalities' emission reduction objectives can be greatly aided by supportive state climate change policy. With State policy for greenhouse gas reduction, green building code, energy codes, utility incentives, cities are able to supplement and complement both State-supported and utility-led programs, thereby leveraging retrofit and program funds to the fullest. For example, California's Global Warming Solutions Act in 2006 established a GHG reduction target of 80% over 1990 levels by 2020. The California Public Utilities Commission Long Term Energy Efficiency Strategic Plan of 2008 established an energy code to achieve zero net energy for all new residential construction by 2020, and ZNE code for all new commercial construction and 50% of existing buildings by 2030. It includes action plans for codes and standards, industrial, local government, research and technology, and zero net energy buildings, all developed through a rigorous and ongoing stakeholder engagement process.

Innovative Land Use Policies

The municipal project planning and approvals process can be leveraged to achieve exemplary sustainability performance. There are innovative models emerging that leapfrog existing tools and strategies and result in greater impact in terms of energy savings and other performance criteria. Two examples summarized in this report are the Fort Collins Zero Energy District (Fort ZED) and Vancouver's District Energy Strategy:

At Fort ZED, the city, developers, design team, and the local municipal energy utility are together planning a two-block district to be Zero Energy (and water) as a district system, with integrated energy and water strategies. This project has stimulated a reinvestigation of the typical utility business model of centralized, grid-supplied energy distributed to buildings. Grid-supplied energy typically relies on a carbon intensive energy source, and there are inefficiencies associated with its transmission which can impede emission reduction efforts. In contrast, distributed generation (at building site) of energy eliminates the inefficiencies associated with transmission, and affords the opportunity to introduce a renewable supply. Fort Collins Utilities participation in planning of the customer (City of Fort Collins) owned energy system is unusual and forward looking and will necessarily cause a modified or new business model between utility and customer. We anticipate that this example will have far reaching implications for municipal and Investor Owned Utility business models. The utility business model is a barrier that most, if not all, net zero projects face. With Fort Collins Utilities at the table as an active and willing participant they are able to help guide the course of the project and develop the policy necessary to enable this district, rather than reacting to potentially unfavorable or limiting policy for either party after the fact.

The City of Vancouver uses various planning tools to promote the development of low carbon district energy systems. One such policy is applied to new developments that are two acres or larger. Any applicant proposing to rezone a property of this scale is required to undertake a feasibility study assessing the relative cost of constructing an onsite energy plant, based on a renewable or low carbon fuel source, such as solar, geothermal, and/or biomass. An additional policy requires new developments located in areas of high density growth to be built "district heating ready," meaning they should have hydronic heating systems and the potential to "plug in" to a future district heating network. This project supports Vancouver's target that all new construction should be carbon neutral beginning in 2020.

Committees and Task Forces

Another key characteristic is that the most leading cities engage internal and external stakeholder committees and/or task forces as the program policies are developed and implemented. The scope of these committees or task forces can adapt as the program evolves, but it is widely viewed as necessary to have a committed group of stakeholders to manage the process throughout the duration. It is also important to have internal staff support in key departments, such as city planning, building, engineering, public works, and department of environment (where applicable). Involving representatives from local utilities, whether municipal or investor-owned, is also recommended as many efficiency, renewables, and district-scale policies and strategies will impact utilities' business models. Involving utilities to the table to co-develop a positive business case for distributed generation, and to leverage any positive cases that do exist between cities, fuel sources (e.g. steam and gas or more commonly shared resources than electricity), and other shared resource strategies can thus be highly beneficial.

Pilot and Demonstration Projects

To support the introduction of innovative technologies, business models, retrofit programs or construction practices that lack precedent in a given jurisdiction, cities often 'test' new approaches by way of pilot or demonstration projects. These small scale projects can provide proof-of-concept to stakeholders and residents, and thus pave the way for large scale adoption or introduction of new regulations. Pilot and demonstration projects are a recommended first step in the face of structural barriers or stakeholder resistance. A key benefit of these projects is that they provide an opportunity for capacity building among industry, such as contractors, owners or building operators, who gain hands-on experience with a new approach or technology. Further, stakeholders and community members, once exposed to a new technology or business model for the first time, are more willing to

accept proliferation of the practice at a broader scale. Finally, the project lead, be it the municipality or design team, is able to test a new approach and refine practices for efficient roll-out.

Strong Leadership

Ambitious targets such as net zero require a high level of motivation both within and external to city hall. Making progress and affecting large-scale change throughout a given community requires creativity, perseverance and an appetite for risk. Further, a community wide net zero target requires a significant level of collaboration amongst the local government and the private sector. As such, strong alignment amongst municipal and private sector influencers and decision makers is essential to remaining on course toward a net zero target.

Issues and Challenges

Measuring and reporting continues to be a challenge. Most cities are able to report results across municipal and community-wide sectors; however, reporting typically has a 1-2 year time lag. This lag is typically attributed to the cumbersome process of data gathering across many departments, with a wide variety of data types and sources, and without an accessible, simple, secure data platform. Some cities, such as Boston and San Francisco, are starting to address this challenge by implementing a portfolio energy and sustainability indicator data platform. With better and timely reporting capabilities the effectiveness of implementation actions can be assessed and managed so that goals are met, or programs are adapted, improvement or abandoned if ineffective.

1.1 HOW TO USE THIS GUIDE

Each of the initiatives documented in this report comprises one component of an integrated approach to deep energy reductions and renewable energy production. The policies and initiatives listed for each city are a sampling of past and current initiatives, and it is likely that new policies and projects will evolve based on success rates and changing external conditions (e.g. economic, cost of energy, climate). Links are provided to further information available on the web about each initiative. The City of Cambridge can provide contacts at each of the seven municipalities upon request.

To support the Cambridge Net Zero Task Force's process of developing a path to net zero, four working groups were established, each exploring different components of a net zero action plan. They are:

1. Energy supply and offsets
2. Engagement and behavior change
3. Regulation and planning approaches
4. Incentives and financing tools

Experience shows that a comprehensive plan should incorporate aspects of each of these components, and there is a good deal of interplay between the four categories. For the purposes of this report, each of the initiatives is tagged with one or more of the four components, as a means of classification of each city's efforts. The following symbols are used to denote the four categories.

Energy supply & offsets	Engagement & behavior change	Regulation & planning approaches	Incentives & financing tools
			

2. METHODOLOGY

While there are a broad range of global examples of leadership and innovation in the net zero arena, this review opts, rather than to present an inventory of leading initiatives, to explore the comprehensive initiatives of a set of cities that have introduced ambitious targets with regard to building emissions. This approach, and the array of initiatives described in this report, demonstrates that cities need to develop a robust toolkit in order to make progress toward addressing emissions reductions across their building stock. Moreover, strategies should allow for error and unforeseen circumstances, as to a large extent, getting to net zero is a voyage into unforeseen territory.

The eight cities included in this report were selected for review for the following reasons:

- They are leaders addressing climate change and energy policy at the local level
- They each have mature policies and programs demonstrating both lessons learned and success in moving toward established goals
- They demonstrate innovative, progressive and diverse approaches to climate change policy that recognizes and leverages the benefits of coordinated state, local and public utility policy
- They are similar in nature to Cambridge as urban centers with single and multifamily residential, universities, commercial, mixed use, and transit oriented development. Some cities are clearly larger and more dense than Cambridge but policy approaches were deemed to be potential fits for Cambridge.

Not all leadership policies are appropriate for adoption by Cambridge without careful assessment and customization to local conditions. In all cases, each city has necessarily tailored policy and programs to suit the local market conditions, existing performance, building types and sector mix, and influential state policy. In addition, there are inherent differences in political structures, different sources of power with variations in emissions factors, and supportive energy policy which necessitates customization.

Summary of cities included in the report

City	Driving Policy or Plan	Policy Innovation	Urban Profile (2012)
Cambridge, MA	2014 Climate Protection Goals	Getting to Net Zero Task Force Community Compact Climate Change Vulnerability Assessment & Preparedness Plan	Population: 106,471 Area: 7 sq. mi. Density: 15,210/sq. mi.
Fort Collins, CO	Fort Collins Climate Action Plan 2011	Fort ZED Zero Energy District	Population: 148,621 Area: 47 sq. mi. Density: 3,155/sq. mi.
Austin, TX	Austin energy Resource, Generation, and Climate Protection Plan 2011	Open Govt, Open Data	Population: 842,592 Area: 272 sq. mi. Density: 3,097/sq. mi.
Boston, MA	City of Boston Climate Action Plan Update 2011	Resiliency Plan	Population: 636,479 Area: 90 sq. mi. Density: 7,071/sq. mi.
New York City, NY	PlaNYC April 2007	Greener, Greater Buildings Plan Resiliency Plan	Population: 8,405,837 Area: 305 sq. mi. Density: 27,560/sq. mi.
San Francisco, CA	San Francisco Climate Action Strategy 2013	LEED standard Benchmarking Climate Action Plan	Population: 825,863 Area: 232 sq. mi. Density: 3,559/sq. mi.
Vancouver, BC	Greenest City 2020 Action Plan	Green Rezoning Policy District Energy Strategy	Population: 603,502 Area: 44 sq. mi. Density: 13,590/sq. mi.
Seattle, WA	Seattle Climate Action Plan June 2013	Getting to Zero: A Pathway to a Carbon Neutral Seattle	Population: 634,535 Area: 143 sq. mi. Density: 4,437/sq. mi.

3. CAMBRIDGE, MA

Population: 107,289

Area: 6.26 sq. mi.

Density: 17,139/sq. mi.

POLICY OVERVIEW & TARGETS

In 2007, Cambridge City Council adopted a goal to reduce community wide greenhouse gas emissions by 80% by 2050. In May 2014, new 2020 climate protection goals and objectives to provide a roadmap for the community and City government were presented to City Council. The City has set and achieved municipal energy reduction goals (20% reduction of 2008 baseline by 2013) under its participation in the Massachusetts Green Communities Program and is developing a new municipal energy reduction goal for 2020. The City has also set a goal to provide 5% of its municipal electric load from onsite renewable energy sources by 2020. Several major initiatives support these goals including the Getting to Net Zero Task Force, Kendall Square Ecodistrict, and Community Compact for a Sustainable Future.

SUPPORTIVE STRATEGIES OR PLANS

Climate Protection Goals & Objectives

The City Council approved a Climate Protection Plan in 2002 which had set goals and actions for 2010. Working with the Climate Protection Action Committee, a standing advisory committee to the City Manager, a new set of goals and objectives were developed to serve as a road map for climate change action in Cambridge. The new goals and objectives were approved by the City Council in May 2014. The new goals and objectives focus on both reducing greenhouse gas emissions from the community and municipal operations and preparing for climate change impacts. The goals and objectives cover building energy efficiency; renewable, other distributed and district energy; sustainable transportation; waste reduction; support for innovation and entrepreneurship; and capacity building.

<http://www.cambridgema.gov/CDD/climateandenergy/climatechangeplanning/climateactionplanreports.aspx>

SPECIFIC ACTIONS, POLICIES, INITIATIVES

Program	Description & Associated Impacts
<p>Cambridge Energy Alliance</p> <p>Lead: City Scope: Community</p> 	<p>The Cambridge Energy Alliance (CEA) is a program of the Community Development Department which focuses on residents and small businesses to facilitate their participation in utility efficiency programs and to support the installation of solar photovoltaic systems. CEA provides energy advisor services and information, organizes community outreach events, and supports community clean energy initiatives. Every year, CEA is present at over 40-50 community events like farmer's market's and community festivals. On average, CEA receives audit requests that equal about 20% of the residential and 40% of the small commercial MassSave audits performed in Cambridge. CEA maintains the Warm Home, Cool Planet blog which covers a broad spectrum of energy conservation and carbon reduction issues and has close to 2,000 subscribers. CEA also reaches the Cambridge community through its social media presence with close to 1,000 followers.</p>
<p>Community Compact for a Sustainable Future</p> <p>Lead: Partnership Scope: Community</p> 	<p>In 2013, an agreement was signed by the Presidents of Harvard University and MIT and the Mayor and City Manager of Cambridge that jointly recognizes climate change is a crisis for the planet and the community. The agreement commits signatories to work collaboratively toward addressing the crisis and making the city more sustainable. The Compact has since been joined by over a dozen businesses and organizations, including many of the largest employers. The Compact organization has been established and priorities have been set around building energy use, sustainable transportation, climate change preparedness, and waste reduction.</p>
<p>Kendall Square Ecodistrict</p> <p>Lead: Partnership Scope: District</p> 	<p>Based on the approach of Ecodistricts™, work is in progress to create an ecodistrict for the Kendall Square area of eastern Cambridge. This area encompasses much of the innovation economy of the city. Building energy performance and clean energy deployment will be important issues for the ecodistrict. Foundation funding has been secured to support the start up of the initiative and organizational capacity is being put in place to run the ecodistrict.</p>
<p>Stretch Energy Code</p> <p>Lead: State/City Scope: Community</p> 	<p>Cambridge was the second municipality in Massachusetts to adopt the Stretch Energy Code. In Massachusetts, the Commonwealth has purview over building energy codes. But they provide the Stretch Energy Code as an optional code that is 20% more efficient than the former base energy code. It applies to both residential and commercial construction. In 2014, the base state energy code is moving to IECC 2012, which is approximately equivalent to the Stretch Energy Code. The Department of Energy Resources is considering updating the Stretch Energy Code to keep pace with the increased standards of the base code. If this happens, the new standards would take automatic effect in Cambridge.</p>
<p>Massachusetts Renewable Portfolio Standard</p> <p>Lead: State Scope: Community</p>	<p>Investor-owned utilities in Massachusetts are required to include specific quantities of renewable energy production in their generation portfolios. In 2014, the minimum required amount is 9%. This requirement increases by 1% annually and will reach 15% in 2020 after which the Commonwealth has the option to continue increasing the required amount. In Cambridge, NSTAR and Harvard University must meet the Renewable Portfolio Standard (RPS). Within the RPS, the Commonwealth also includes a solar carve-out requirement. A portion of the RPS requirement must be met through solar photovoltaic systems. Phase II of the solar carve-out was launched in 2014 to support the installation of an additional 1,600 megawatts of solar PV. This requirement is met through the use of solar renewable energy certificates (SRECs) which provides an important revenue source for owners of PV systems and incentivizes the deployment of the technology.</p>

	
<p>Mass Save Lead: NSTAR Scope: Community</p>	<p>The Commonwealth requires investor owned utilities to provide energy efficiency services to residential, commercial and institutional building owners and tenants. Under a 3-year plan approved by the Commonwealth, NSTAR and its energy service providers incentivize energy efficiency in new and existing buildings with financing and services including energy audits, retro-commissioning, building envelope improvements, and equipment upgrades. The HEAT loan program also provides zero-percent interest financing for home energy efficiency improvements.</p>
	
<p>District Energy Lead: Veolia, Harvard, & MIT Scope: District</p> 	<p>Cambridge has four existing district steam systems: the Veolia system in eastern Cambridge, the campus systems operated by Harvard and MIT, and the co-generation system owned by Biogen which serves multiple buildings on their corporate campus in Kendall Square. The Veolia system is based on steam generated primarily from waste heat produced in the production of electricity at Kendall Station, which has a highly efficient combined cycle gas turbine system. Relatively new and efficient back up boilers also provide steam part of the time. Kendall Station is under a NPDES Permit condition to remove thermal loading on the Charles River, which is used for cooling water. This is done by using steam in buildings in Cambridge and Boston, although more demand is needed. The MIT system is based on a 20 MW cogeneration plant. Harvard has a 5 MW cogeneration system to provide electricity and steam. The Biogen system is also based on a 5 MW cogeneration system that provides power and heat.</p>
<p>Cambridge Solar Tool Lead: Mapdwell Scope: Community</p> 	<p>Mapdwell created a web-based solar photovoltaic potential tool that covers the roof top of virtually every building in Cambridge. The tool is based on modeling performed by MIT researchers. Smithsonian Magazine called the tool the most accurate solar map in the U.S. Mapdwell has since deployed the same platform to Washington, DC and Wellfleet, MA with further expansion coming soon. The tool uses modeled results of solar radiation falling on every square meter of roof space to estimate PV system sizes and annual electricity production and also provides financial and environmental analysis of the costs and benefits taking incentives in account.</p>
	
<p>Energy Sage Lead: Energy Sage Scope: Community</p> 	<p>Energy Sage is a web-based marketplace that enables consumers to obtain multiple quotes for solar energy and other clean energy installations and compare them. The company is supported by funding from the U.S. Department of Energy Sunshot program.</p>
<p>NSTAR Green Lead: NSTAR Scope: Community</p> 	<p>NSTAR provides a voluntary green power option to residential customers. For an incremental cost, customers can choose to purchase green power which is sourced from wind energy farms in New York and New Hampshire. NSTAR purchases both the power production and the RECs from the wind farms to provide a bundled green power product.</p>

<p>MIT Energy Initiative</p> <p>Lead: MIT Scope: R&D</p> 	<p>The MIT Energy Initiative was established to enable an inter-disciplinary and collaborative approach to clean energy research and development.</p>
<p>MIT Multifamily Housing Efficiency Pilot</p> <p>Lead: City, NSTAR and MIT Scope: Community</p> 	<p>The City, MIT and NSTAR are in the process of designing a Multifamily Housing Efficiency pilot to encourage multifamily building owners to more frequently pursue efficiency upgrades in the smaller 2-20 unit. Key strategies include a single contractor to oversee auditing and contractor arranging, deeper subsidies and 100% financing. City will lead an enhanced marketing campaign with community partners to encourage enrollment in program during a fixed time period of 9-12 months.</p>
<p>Municipal Operations</p> <p>Lead: City Scope: Municipal</p> 	<p>Cambridge was among the first participants in the Commonwealth's Green Communities Program administered by the Mass. Department of Energy Resources. Under the program, the City committed to reduce its 2008 energy consumption baseline by 20% by 2013. This goal was met through investments in equipment upgrades, retro-commissioning, and building envelope improvements. The City is developing a new goal for 2020. The City also has a policy to building all new construction and renovations to LEED standards. There are currently seven municipal buildings that are LEED certified. The King School project, which is a new school building replacing an old building on the same site, was designed along net zero principles. While it will not achieve net zero energy performance, it is expected to achieve a very low EUI and host about 700 kilowatts of solar PV. The project is currently in construction.</p>
<p>Sunshot II</p> <p>Lead: State Scope: Community</p> 	<p>The Mass. Department of Energy Resources was awarded a second phase of grant funding by the U.S. Department of Energy to reduce the soft costs of solar PV systems. Cambridge is a partner in the DOER Sunshot project. Under phase I, the City developed a solar PV guide for condominiums and rental properties and conducted a study on options to host community shared solar on municipal facilities. Under phase II, the City is working to facilitate the siting of a CSS installation.</p>
<p>Climate Change Vulnerability Assessment & Preparedness Plan</p> <p>Lead: City Scope: Community</p> 	<p>The City is conducting a climate change vulnerability assessment to develop a technical understanding of the community's vulnerabilities to increased heat, more intense precipitation, and storm surge flooding to serve as the foundation for a preparedness plan that will follow. The assessment is looking at the energy distribution and supply system in Cambridge among other issues. Energy efficiency, renewable energy, and district energy offer potential ways to make Cambridge more resilient.</p>

**Building Energy
Use Disclosure
Ordinance**

A building energy use disclosure ordinance is currently being considered by the City Council. The ordinance will cover municipal buildings over 10,000 square feet in size, non-residential buildings over 25,000 square feet and multi-family residential buildings with 50 and more units. Building owners will be required to track their energy use (i.e., electricity, natural gas, steam, and fuel oil) and report it to the Community Development Department annually through the U.S. EPA's Energy Star Portfolio Manager tool.

**Lead: City
Scope: Large
Commercial and
Multifamily**



4. FORT COLLINS, CO

Population: 148,621
 Area: 47 sq. mi.
 Density: 3,155/sq. mi.

POLICY OVERVIEW & TARGETS

In 2008, Fort Collins City Council adopted a goal to reduce community wide greenhouse gas emissions by 20% below 2005 levels by 2020 and 80% below 2005 levels by 2050. Several major initiatives support this goal including Fort Collins' Advanced Meter, FortZED projects and the Fort Collins Solar Power Purchase Program.

SUPPORTIVE STRATEGIES OR PLANS

Plan Fort Collins 2011

Plan Fort Collins (2011) establishes an action plan articulating how the City will achieve the greenhouse gas reduction goals adopted by its City Council in 2008. The plan was developed through an integrated community-based process and sets the vision for 25 years. The vision articulated in the plan is to "Innovate – Sustain – Connect." There is a strong focus on sustainability; the plan calls for a systems approach, triple bottom line analysis, and continuous improvement. Areas addressed in the plan include economic health, environmental health, community and neighborhood vitality, safety and wellness, culture, parks and recreation, high performing community, and transportation.

<http://www.fcgov.com/planfortcollins/pdf/pfc-summary.pdf>

SPECIFIC ACTIONS, POLICIES, INITIATIVES

Program	Description & Associated Impacts
Climate Wise Program Lead: City Scope: Businesses 	A free, voluntary program that assists local businesses through environmental technical assessments, employee engagement and education, networking opportunities and public recognition awards program. <u>Impact:</u> As of 2012, participation was high with 350 local companies enrolled. Between 2000-2012, program outcomes included 1 million tons of greenhouse gas savings, 10 billion gallons of water saved, and \$73M savings in energy, water and waste costs.
Colorado Clean Energy Cluster (CCEC) Lead: Third Party Scope: Community  	CCEC is an economic development organization with a mission to grow jobs in Colorado in clean energy through formal partnerships with clean energy companies, public sector and higher education. It is a statewide organization based in Fort Collins fostering market transformation for clean energy and focusing on actionable projects and initiatives, such as the following: <ul style="list-style-type: none"> • Fort Collins Zero Energy District (FortZED) - described in detail below • International Cleantech Network: A global network connecting the world's leading cleantech clusters, the International Cleantech Network (ICN) provides global access, information and innovation to Colorado clean energy businesses and research institutions. • C3E is a workforce development and networking program for advancing women in clean energy. It was established after the 2013 CCEC Net Zero Cities conference and has a steering committee of nine Colorado women including city officials, university representatives and workforce center leaders.
State of Colorado Renewable Energy Standard (RES) Lead: State Scope: Community  	Fort Collins is mandated to supply an increasing percentage of their electricity from renewable sources as follows: 1% through 2009, 3% in 2011, 6% in 2015 and 10% in 2020.

<p>Poudre School District</p> <p>Lead: School District Scope: School District</p> 	<p>Since 2001, the Poudre School District has deployed a sustainability management system (SMS) which is the first known SMS for a K-12 district.</p> <p><u>Impact:</u></p> <ul style="list-style-type: none"> • Reduced GHG by 12% district wide • 19 buildings Energy Star rated • Annual energy savings of \$50,000 per year district wide by way of automatic computer shutdowns
<p>Home Energy Efficiency Program</p> <p>Lead: Municipal Utility Scope: Single Family</p> 	<p>Fort Collins Utilities, a municipal utility, rolled out a comprehensive residential energy efficiency program targeting existing homes that includes incentives, best practice installation standards, training and mentoring for contractors, and quality assurance for installations.</p> <p><u>Impact:</u> Forty-five contractors participate in the program and provide 50-60 energy audits per month.</p>
<p>On-Bill Financing</p> <p>Lead: Municipal Utility Scope: Single Family</p> 	<p>Since 2012, Fort Collins Utilities has offered on-bill financing of up to \$15,000 for energy efficiency and solar installations for single family homes. The program is administered by a third-party organization, Energy Smart Partners.</p> <ul style="list-style-type: none"> • Up to \$2,500, 5 year term • \$2,500 – 7,500, 7 year term • \$7,500 – 15,000, 10 year term • Interest rates of 5 – 7% • Loan is recorded by Larimer County and remains with the home until paid off
<p>Home Energy Reports</p> <p>Lead: Municipal Utility Scope: Single Family</p> 	<p>Since 2009, Fort Collins Utilities has worked with OPower, a software company, to provide homeowners with home energy reports comparing energy usage with nearby similar homes in an effort to use peer pressure to induce behavioral change. The reports include energy savings tips. Following a 2009 pilot, the program was scaled up to serve all residential customers in 2013.</p> <p><u>Impact:</u> Participating homes are seeing, on average, 2.5% energy savings and uptake is higher than that of standard energy efficiency retrofit programs.</p>
<p>The Building Tune-up</p> <p>Lead: Municipal Utility Scope: Commercial and Industrial</p> 	<p>Retro-commissioning program offered jointly by Fort Collins Utilities and the Platte River Power Authority that supplies up to 75% of funding for cost-effective electricity, natural gas, and water savings in commercial and industrial facilities.</p> <p>Eligibility (must meet all requirements)</p> <ul style="list-style-type: none"> • Fort Collins Utilities business customer • Facility at least two years old • No planned major renovations or capital investments • Commitment to pay \$0.05/sq.ft. (typically 25% of cost)
<p>Integrated Design Assistance Program (IDAP)</p> <p>Lead: Municipal Utility Scope: Commercial or High-Rise Residential</p> 	<p>Design, construction, and performance incentives for building owners and design teams working on major renovation projects and new construction based on the Architecture 2030 Challenge®, which aims for zero net emissions by 2030. New construction and major renovation projects receive technical assistance in setting EUI (Energy Use Intensity) targets and incentives if they agree to participate in the Architecture 2030 Challenge. This program model is unique in that it uses Architecture 2030 as a basis for incentives. Incentives are as follows:</p> <ul style="list-style-type: none"> • Design: \$5,000 + \$0.10/sq. ft. incentive • Construction: incentive of 25% of kBtu/yr reduction goal x \$0.021) • Performance: incentive of actual kBtu/yr reduction x \$0.21 less construction incentive & PV

<p>Peak Demand Reduction Incentives</p> <p>Lead: Utility Scope: Commercial and Residential</p> 	<p>Fort Collins Utilities offers cash incentives for upgrades that reduce electric demand, based on the summer one-hour equipment peak demand savings. Commercial and residential customers have the option of receiving incentives from energy efficiency upgrades based either on efficiency savings or peak demand reductions. Ongoing business programs targeting peak load include LightenUP and the Electric Efficiency Program. Custom projects offer the option of calculating rebates based on peak demand reductions. Residential programs also contribute to peak load reductions.</p> <p><u>Impact:</u> Peak demand savings from 2012 efficiency programs was 2.1 MW.</p>
<p>Efficiency Works Program and Business Efficiency Grant</p> <p>Lead: Utility Scope: Businesses</p> 	<p>Offers free assessments of existing building systems and equipment to business customers of Fort Collins Utilities to identify opportunities to reduce energy operating costs.</p> <p>Fort Collins Utilities offers cash grants up to \$5000 per customer to help businesses and non-profits implement energy and water efficiency projects.</p>
<p>Platte River Power Authority (PRPA)</p> <p>Lead: Utility Scope: REC</p> 	<p>Supplies renewable energy and renewable energy credits to Fort Collins Utilities</p> <ul style="list-style-type: none"> • Renewable Energy: Wind turbines at Medicine Bow and Silver Sage Wind Projects • Renewable Energy Credits: Multiple sources
<p>Renewable Power Purchase Option</p> <p>Lead: Municipal Utility Scope: REC</p> 	<p>Fort Collins Utilities allows residents and businesses to purchase renewable energy certificates for an extra 2.4 cents per kWh for residential and commercial customers. Renewable energy purchased through this program is Green-e certified and supports renewable energy production in Wyoming, Colorado and Oklahoma. Customers may purchase up to the equivalent of electricity use, or in blocks of either 208 kWh/\$5 or 417 kWh/\$10 for residential customers, or 1,042 kWh/\$25 for commercial customers.</p>
<p>Utility Energy Policy</p> <p>Lead: Municipal Utility Scope: Fund/Community</p> 	<p>One percent of utility revenue is set aside for funding of renewable energy objectives of Fort Collins Utility Energy Policy, which is to support the community’s carbon emissions reduction goals (20% below 2005 levels by 2020 and 80% by 2050).</p>
<p>FortZED (Zero Emissions District)</p> <p>Lead: Partnership Scope: District-level</p> 	<p>FortZED is a 2.5 square mile downtown mixed used district that includes Colorado State University and represents about 0.5% of Fort Collins by area. The district is targeting net zero emissions and is an excellent case study for any city aspiring to do the same. The project is a partnership with local government, academia, and industry, FortZED’s key partners include the City of Fort Collins, Colorado State University, and the Colorado Clean Energy Cluster. FortZED is establishing high performance buildings, renewable energy, a microgrid and district energy strategies, and building catalyst projects that will be transferable to the city at large. FortZED includes 7,000 Fort Collins Utilities residential and commercial customers, on 8 distribution feeders, and is approximately 10-15% of FCU distribution system. Current peak load is approximately 45 MW and the Fort ZED goal is to reduce this demand by 20-30%. This initiative is made possible by extraordinary cooperation and stakeholder engagement since its inception.</p> <p>Smart Grid Infrastructure: Enables integration and coordination of a system of mixed and distributed resources. This includes renewable generation, rotary- and inverter-based generation, PHEV and V2G vehicles, and demand response methods.</p> <p>New Technologies: The Renewable and Distributed Systems Integration project (RDSI) jump started FortZED by testing out a number of technologies that reduce peak energy use and integrate renewable energy, such as solar panels, into the district’s electric energy system. The second phase of RDSI includes operation of a microgrid at CSU</p>

Engines and Energy Conservation Laboratory and the Northside Aztlan Center, and will also demonstrate cyber security protocols specific to the microgrid network.

Building Retrofits: Retrofit projects funded by New Energy Communities Grant via Colorado Department of Local Affairs have seen savings ranging from 9%-26% savings.

<http://fortzed.com/>

5. AUSTIN, TX

Population: 842,592

Area: 272 sq. mi.

Density: 3,097/sq. mi.

POLICY OVERVIEW & TARGETS

The City of Austin's Climate Protection Plan in 2007 set targets for municipal facilities and operations to become carbon neutral by 2020 by powering all City facilities with 100% renewable energy either through the Austin Energy GreenChoice program and/or adding solar PV on City facilities. The City also plans to make Austin Energy the leading utility in the nation for GHG reductions by saving 800 MW via energy efficiency and conservation efforts, meeting 35% of energy needs with renewables including at least 200 MW of PV, and reducing power plant CO₂ emissions to 20% below 2005 levels, all by 2020.

Energy efficient building codes requiring all new single-family homes to be zero net energy capable have already been implemented, and all new private and public sector buildings are targeting a 75% reduction by 2015 through adoption of the International Energy Conservation Code with local City of Austin Energy Code amendments. The U.S. Environmental Protection Agency awarded the City of Austin a national 2013 Climate Leadership Award in recognition of their efforts in the fight against climate change.

SUPPORTIVE STRATEGIES OR PLANS

Austin Climate Protection Plan

In 2007, the City Council adopted the Austin Climate Protection Plan to significantly reduce greenhouse gas emissions. Then, in 2011, the Council approved the Austin Energy Resource, Generation, and Climate Protection Plan, which included updates to more aggressively mitigate emissions through 2020 with the following goals:

- All City of Austin facilities, fleets and operations would be totally carbon neutral by 2020;
- Austin Energy to be the leading utility in the nation for greenhouse gas reductions;
- Implement the most energy efficient building codes in the nation and aggressively pursue energy efficient retrofits and upgrades to existing building stock;
- Establish an interdepartmental Climate Action Team responsible for creating an inventory of greenhouse gases generated from all sources community-wide, working with stakeholders and technical advisors, establishing short-term and long-term targets for reducing these emissions, and reporting back to the City Council in no more than one year with a comprehensive plan for meeting those targets;
- Develop and implement a program to assist all citizens, businesses, organizations and visitors in achieving carbon neutrality.

SPECIFIC ACTIONS, POLICIES, INITIATIVES

Program	Description & Associated Impacts
Energy Conservation Audit and Disclosure Lead: City and Municipal Utility Scope: All buildings 	All homes and buildings served by Austin Energy within Austin City Limits required to disclose Energy Performance Rating (score of energy use compared to similar buildings) <ul style="list-style-type: none"> • <u>Commercial Buildings</u>: must calculate and submit an annual energy rating to Austin Energy • <u>Residential Homes</u>: houses 10 years or older must have an energy audit before selling home and provide results to prospective buyers • <u>Multifamily Properties</u>: must have an energy audit after property turns 10 years old
Energy Supply Lead: Municipal Utility Scope: Community 	Austin Energy has the goal of meeting 35% of energy needs through the use of renewable resources by 2020. Austin Energy is currently four years ahead of schedule to meet the 35% renewables target through purchase power agreements for 1350 MW of wind, 200MW of solar, and 112MW of biomass.
Green City Facilities Lead: City Scope: City Facilities 	In 2011, the City of Austin became the largest local government in the U.S. to subscribe to 100% renewable energy for powering all City-owned buildings and facilities, purchasing over 296 million kWh of GreenChoice power. In addition, as of 2013 the City of Austin owns 58 solar PV installations totaling over 1.5 megawatts, which will generate over 2.7 million kWh annually. This commitment continued to 2012 when the City was awarded the Green Power Partner of the Year award by the U.S. Environmental Protection Agency.
Austin Energy Efficiency Rebates Lead: Municipal Utility Scope: Single Family 	Building Systems <ul style="list-style-type: none"> • \$600 for air conditioning equipment • \$500-\$1,250 for Ground Source Heat Pumps • \$85 per approved Internet thermostat • \$800 for a heat pump water heater • \$0.20-\$0.35 / sq ft of conditioned living space for approved duct system improvements • Additional rebates for high efficiency lighting Solar Water Heating <ul style="list-style-type: none"> • \$1,500 for adding a solar water heater in a new home • \$2,000 to add a solar water heater in an existing home • Additional rebates for cycle saver water heater timers Envelope <ul style="list-style-type: none"> • \$0.15/sq ft of ceiling and roof insulation • \$1-\$1.25/sq ft of added solar screens or solar film • \$2.00/sq ft of low-e windows
Home ENERGY STAR Rebate + Loan Lead: Municipal Utility Scope: Single Family 	\$15,000 low-interest loans are available for improvements yielding 15% or more energy savings
Free Home Energy Improvements to	Free energy improvements to Austin Energy customers who meet the income requirements of 200% or less of the United States Department of Health and Human Services poverty guidelines for your household for the current

<p>Customers with Low-to-Moderate Incomes</p> <p>Lead: Utility Scope: Low-income Single Family</p> 	<p>year, improvements include:</p> <ul style="list-style-type: none"> • Attic insulation • Minor duct repair and sealing • Caulking around plumbing penetrations • Weather stripping on doors • Solar screens and shades • Carbon monoxide detectors and Smoke detectors • ENERGY STAR® compact fluorescent light bulbs • Minor plumbing improvements (ex: faucets, showerheads and aerators)
<p>LEED Silver Mandate</p> <p>Lead: City Scope: City facilities</p> 	<p>LEED Silver certification is required for:</p> <ul style="list-style-type: none"> • New commercial buildings with construction cost of at least \$2,000,000 • Building renovations, additions, and interior finish-out projects with construction cost of at least \$300,000
<p>New Construction Rebates</p> <p>Lead: Municipal Utility Scope: Large Commercial/Multifamily</p> 	<p>Austin Energy encourages investing in energy efficiency early in design process during new construction. Rebates are awarded by tier, based on the stage the applicant is at in the construction process. The program offers customer service for assistance with the application process, determining eligibility, and making recommendations. Technologies that qualify for this rebate include:</p> <ul style="list-style-type: none"> • Energy recovery ventilators • Guest room controllers • HVAC (chillers, cooling towers, direct expansion, remote terminal units, VRF, and PTAC units) • High Efficiency Lighting • Automatic lighting controls • Thermal energy storage • Transformers • Variable frequency drives • Heat pump water heaters
<p>Solar Photovoltaic Rebate</p> <p>Lead: Municipal Utility Scope: All buildings</p> 	<p>To subsidize the cost of purchase and installation of solar photovoltaic systems, Austin Energy offers:</p> <ul style="list-style-type: none"> • \$1.25 per watt or \$1,250 per kW • Annual rebate cap of 80% invoice total or \$15,000 • \$50,000 maximum lifetime rebate
<p>GreenChoice</p> <p>Lead: Municipal Utility Scope: Residential/Commercial</p> 	<p>Austin Energy's GreenChoice program offers customers the option to pay \$0.01 per kWh to purchase 100% renewable energy based on wind power.</p> <p><u>Impact:</u> Austin's GreenChoice energy purchases by year</p> <ul style="list-style-type: none"> • (2010) 75,000 MWh • (2011) 255,000 MWh • (2012) 400,000 MWh (projected as of 2011)
<p>Pecan Street Inc.</p> <p>Lead: Third Party Scope: R&D</p>	<p>Headquartered at The University of Texas at Austin, Pecan Street Inc. is a research and development organization focused on developing and testing advanced technology, business model and customer behavior surrounding advanced energy management systems. Their flagship effort is the Pecan Street Demonstration, a smart grid research project that began in Austin's Mueller community. The organization is comprised of two divisions, the first is the Pecan Street Research Institute, which focuses on advancing understanding and solutions addressing utility system reliability, climate change, renewable energy integration, and customer needs and</p>



preferences. The second is the Pike Powers Laboratory and Center for Commercialization, which offers specialized capabilities for developing, testing, and validating a wide range of smart grid, distributed energy and consumer electronics hardware and software.

Mueller Community

Lead: Partnership
Scope: District



Supported by a \$10.4 million smart grid demonstration grant from the Department of Energy (and more than \$14 million in matching funds from project partners), Pecan Street Inc. is leading a team of researchers from The University of Texas, National Renewable Energy Laboratory, and Environmental Defense Fund to develop and test an integrated clean energy smart grid of tomorrow in the homes of today. Over a five-year timeline, this team will test systems in up to 1,000 residences in an around the Mueller community, the world's first LEED-ND certified community, which will include: distributed clean energy, energy storage technologies, smart appliances, advanced meters and home energy management systems, green building and new electricity pricing models.

6. BOSTON, MA

Population: 636,479

Area: 90 sq. mi.

Density: 7,071/sq. mi.

POLICY OVERVIEW & TARGETS

The 2007 Executive Order on Climate Action establishes goals to reduce city-wide greenhouse gas emissions by 25% by 2020 and 80% by 2050. In addition, Boston has adopted a goal of reducing energy use in municipal buildings by 20% by 2015. The 2007 Executive Order on Climate Action calls for the City of Boston to have a climate action plan that is updated every three years.

Boston ranked Most Energy-Efficient City in the United States by the American Council for an Energy-Efficient Economy (ACEEE) according to the new [2013 City Energy Efficiency Scorecard](#).

SUPPORTIVE STRATEGIES OR PLANS

The Climate Action Plan serves as Boston's blueprint for reaching its goals of reducing greenhouse gas emissions 7% by 2012, 25% by 2020 and 80% by 2050 (1990 baseline), and making sure the city is prepared for the impacts of climate change. In December of 2010, the Commonwealth of Massachusetts, in accordance with requirement of the 2008 Global Warming Solutions Act, issued a report called the "Massachusetts Clean Energy and Climate Action Plan for 2020" which included both short-term and long term goals for the state that are identical to Boston.

<http://www.mass.gov/eea/docs/eea/energy/2020-clean-energy-plan.pdf>

<http://www.cityofboston.gov/climate/bostonsplan/>

The Boston Climate Action Leadership Committee and Community Advisory Committee were created together by the City of Boston to recommend climate action goals for the entire Boston community. "A Climate Progress: City of Boston Climate Action Plan Update 2011" was produced to document the major components and strategies on reaching reduction goals, incorporating climate change into all formal planning and project review processes, community engagement, and creating opportunities for development of workforce skills. Programs that have resulted from this working group include, but are not limited to: Renew Boston, Boston Bike Share, long-range planning with Boston Water and Sewer Commission, and Green Jobs Boston.

http://www.cityofboston.gov/images_documents/A%20Climate%20of%20Progress%20-%20CAP%20Update%202011_tcm3-25020.pdf

SPECIFIC ACTIONS, POLICIES, INITIATIVES

Program	Description & Associated Impacts
Article 37 Boston's Green Building Standard Lead: City Scope: Large Developments 	Boston was the first City in the US to set municipal code requirements for green buildings via Article 37, published in January 2007, which set all large-scale projects to meet LEED certification standards. Boston's 2011 Climate Action Plan Report estimated that approximately 70% of GHG emissions in the city come from building operations (both commercial and residential). http://www.cityofboston.gov/eeos/buildings/
Building Energy Reporting and Disclosure Ordinance Lead: City Scope: Large Commercial and Residential  	The City of Boston enacted the Building Energy Reporting and Disclosure Ordinance (BERDO) in 2013, which requires large-medium sized buildings to report their annual energy and water consumption which will be made publicly available. Buildings are also required to complete an energy assessment or energy action every 5 years. Energy reporting and disclosure is intended to provide data for evaluation and encourage owners/tenants to reduce energy costs, increase efficiency, and utilize incentives such as Renew Boston. At full implementation, Boston's ordinance requires all buildings over 35,000 square feet to report their annual energy and water performance to the City, which will then make the information publicly available. Different classes of buildings are required to start reporting in different years: <ul style="list-style-type: none"> • 2013: Municipal buildings • 2014: Non-residential buildings greater than 50,000 square feet • 2015: Residential buildings greater than 50,000 square feet or 50 units • 2016: Non-residential buildings greater than 35,000 square feet • 2017: Residential buildings greater than 35,000 square feet or 35 units http://www.cityofboston.gov/eeos/reporting/
Municipal Operations Lead: City Scope: City Buildings 	In 2009, Boston's municipal operations accounted for approximately 2% of the city's total GHG emissions. Of the City's GHG emissions, buildings and street lighting accounted for 80%. Some examples of implemented municipal measures include: <ul style="list-style-type: none"> • Replacement of oil boilers that ran on fuel oil with more energy-efficient combined heat-and-power (CHP) units that runs on natural gas. • Hiring two full-time energy managers funded by the federal Energy Efficiency and Conservation Block Grant for tracking energy use and implementing efficiency measures throughout the municipal operations and capital expenditures. • Using MassEnergyInsight – an inventory and tracking tool to assist green communities, and energy use consumption in each of its buildings.
Renewable Electricity Lead: City Scope: City Buildings 	The City of Boston has a goal of obtaining 20% of municipal electricity needs from renewable sources by 2020. In 2010, in addition to wind and PV energy generation the City purchased renewable energy credits to offset 11%.
Renew Boston Lead: Partnership Scope: residential and commercial  	Boston's lead municipal program for catalyzing energy efficiency in Boston buildings, this program is serving 150,000 households (2-3 family size homes), and thousands of small to medium businesses, with the goal of saving 2 million MWh of electricity annually by 2020. An innovative public-private partnership that includes NSTAR, National Grid, community-based non-profits like Mass Energy, and contractors like Next Step Living who implement energy efficiency measures through the MassSave program and assist qualified Boston tenants, homeowners, and landlords in making energy improvements to their homes and properties. https://www.cityofboston.gov/news/Default.aspx?id=6159

Boston 500: Challenge to Save Energy

Lead: Partnership
Scope: Single Family



Renew Boston created the “Boston 500: Challenge to Save Energy” – a day of action with goal of signing up 500 Bostonians for a Renew Boston no-cost home energy assessment. The challenge launched on June 1, 2013 with support from over 25 community organizations that successfully signed up over 500 Bostonians, over 370 homes into the program – and an additional 500 locals signed-up by start of September of the same year.

Impact: By signing up 1,000 residents to weatherize their homes, the program collectively is able to achieve: 448 metric tons of greenhouse gas emissions (equivalent to more than 50,000 gallons of gasoline); savings of \$100,000; prevention of noxious asthma-inducing emissions; green job creation

<http://www.renewboston.org/boston500/>

Boston Green Ribbon Commission

Lead: Task Force
Scope: Climate Change mitigation



A group of business, institutional and civic leaders in Boston collaborating to develop shared strategies for fighting climate change in coordination with the city’s Climate Action Plan. The idea was planted through Amos Hostetter of the Barr Foundation and Mayor Thomas Menino. Participants include a broad range of business, institutional, and civic leadership in the for-profit and non-profit sectors, with expertise in energy, health care, real estate, construction, biotech, tourism, financial services, philanthropy, government and more. The group is tasked with providing advice and counsel to the City on planning, design, implementation, aligning resources, serving as advocates, and promoting deep efficiencies, clean technology, and best practices.

E+ Green Building Program

Lead: Partnership
Scope: Challenge/ Demonstration



Mayor Menino’s E+ Green Building Program challenges leading architects, builders, and developers to work together to design and construct high performance, green, urban homes and to demonstrate the feasibility of regenerative buildings in Boston. The program’s goal is to promote net-positive energy buildings with beyond LEED Homes Platinum certifications, and demonstrate the feasibility of high-arching goals. The initiative was launched by the Boston Environment Department, the Department of Neighborhood Development and the Boston Redevelopment Authority – with support by NSTAR Electric and National Grid, in partnership with the USGBC, the Boston Society of Architects and the Boston Architectural College. To date (April 2014), three projects were recognized in the program: Catherine Street (construction completed in January 2014), Highland Street (in planning), and Marcella Street (construction completed in August 2013).

www.epositiveboston.org

Allston Green District

Lead: Private
Scope: District



The Allston Green District represents one of the largest private rental housing initiatives in Boston designed to meet the standards of a new generation of residents and small businesses committed to sustainable living. The Green Tenant Declaration details what is expected of the tenant including minimizing energy and water use, separating waste into recyclables, organics and electronics and using alternative transportation. For its part, The Mount Vernon Company, an award-winning real-estate firm, has committed to providing the infrastructure for tenants to meet these expectations, report annually on building wide energy use, and incentivize tenants to reduce their energy by sharing the savings.

https://www.cityofboston.gov/images_documents/Allston%20Green%20District%20PR%20NER_EJ_tcm3-34776.pdf

<http://mvernon.com/green-district>

Old Colony Public Housing Redevelopment

Lead: Partnership

Expected to be the most advanced “green” residential affordable housing project constructed in the Commonwealth, the project aims to meet both the Enterprise Green Community Criteria and LEED ND certification. The public/private partnership to redevelop the site includes funding from a combination of a \$22 million federal HOPE VI grant from the US Department of Housing and Urban Development, \$1 million investment from the City of Boston Neighborhood Housing

Scope: Residential
Affordable



Trust, \$3.5 million in State bond funds and an allocation of low income housing tax credits from the Commonwealth, construction financing provided by MassHousing and state and federal Low-Income Housing Tax Credit equity provided by U.S. Bank through their community investment subsidiary. The site comprises over 16 acres, 873 apartments in 22 three-story brick walk up buildings.

<https://www.cityofboston.gov/news/Default.aspx?id=5849>

Wind Energy

Lead: Partnership
Scope: Community



As one of the windiest cities in the nation, the Office of Environmental and Energy services is aggressively looking at ways to implement small and large scale wind turbines where possible. The Boston Redevelopment Authority has established zoning regulations related to the erection and operations of wind technology through Article 88 Wind Energy Zoning. Current local wind projects include:

- The Massachusetts Water Resources Authority (MWRA) developed a series of wind projects including a 1.5 MW turbine at their Charlestown facility; and two 190-foot, 600 kW turbines at Deer Island. These turbines combined generate over 5 million kW hours per year, which saves MWRA ratepayers \$600,000 a year in energy costs.
- Logan Airport Wind Turbines installed by the Massachusetts Port Authority in May 2008 boast a fleet of 20 roof-mounted turbines, each with the capacity to generate 1 kW of clean energy.

http://www.cityofboston.gov/images_documents/Article88%20Wind%20Energy%20Zoning_tcm3-28589.pdf

7. NEW YORK, NY

Population: 8,405,837
Area: 305 sq. mi.
Density: 27,560/sq. mi.

POLICY OVERVIEW & TARGETS

New York City's PlaNYC was introduced in 2007 and updated in 2011, addressing how to accommodate population growth, strengthen the economy, combat climate change, and enhance the quality of life for all New Yorkers. The plan details comprehensive actions to meet a 30%% emission reduction goal by 2030. In New York City, 80% of citywide emissions are generated by building operations.

<http://www.nyc.gov/html/planyc2030/html/theplan/the-plan.shtml>

SUPPORTIVE STRATEGIES OR PLANS

Greener Greater Buildings Plan (GGBP)

Part of the overarching PlaNYC, the GGBP introduced a set of energy efficiency laws targeting New York City's largest existing buildings which constitute half its built square footage and 45% of city wide carbon emissions. These regulations include:

- Local Law 84 – Benchmarking & Disclosure: Requires owners of large buildings to annually measure their energy and water consumption and submit usage data online annually to the City.
- Local Law 85 – NYC Energy Conservation Code: City's local energy code
- Local Law 87 – Energy Audits and Retro-commissioning: Mandates that buildings over 50,000 gross square feet undergo periodic energy audit and retro-commissioning measures. The intent of this law is to inform building owners of their energy consumption.
- Local Law 88 - Lighting and Sub-metering: Requires large non-residential buildings to upgrade lighting to meet current NYCECC standards and to install electrical sub-meters for each non-residential tenant space and provide monthly energy statements

<http://www.nyc.gov/html/qbee/html/home/home.shtml>

Municipal GHG Emissions Reduction (30x17)

This is the City of New York's energy efficiency and greenhouse gas reduction plan to reduce municipal GHG emissions 30% by 2017. A majority of emission reductions will come from improvements to the City's existing building stock through the retrofitting of inefficient building systems and the implementation of best practices around operations and maintenance

<http://www.nyc.gov/html/dem/html/conservation/conservation.shtml>

SPECIFIC ACTIONS, POLICIES, INITIATIVES

Program	Description & Associated Impacts
Energy Benchmarking Program Lead: City Scope: Large Commercial and Residential  	<p>Since 2011, New York City has required annual reporting of energy and water use, using Energy Star Portfolio Manager. The reporting requirement applies to all private sector buildings that are larger than 50,000 square feet, and two or more private sector buildings on a single lot that are larger than 100,000 square feet. The City publically discloses performance information on the City of New York website, and publishes an annual report summarizing aggregate findings and tracking trends in energy savings.</p> <p><u>Impact:</u> The compliance rate for the first two years of the benchmarking ordinance was 75%. http://www.nyc.gov/html/gbee/html/plan/l184_about.shtml</p>
New York City Energy Efficiency Corporation Lead: 3 rd Party Scope: Large Buildings 	<p>The NYC Energy Efficiency Corporation is a not-for-profit corporation that offers financing to support energy efficiency measures, bridging the gap where financial institutions do not serve building owners. Sources of funding include federal stimulus funds as well as commercial lending industry and philanthropic sources. Product offerings include direct loans and energy service agreements, which allow a building owner to retrofit a building with limited upfront capital exposure. Financing is available for the following:</p> <ul style="list-style-type: none"> • Installation of energy efficiency measures in existing buildings • Inclusion of energy efficiency measures in building rehabs or tenant fit-outs • Fuel conversions, under the City's Clean Heat Initiative, from #6 or #4 heating oil to ultra-low sulfur diesel or natural gas • Building-sited combined heat and power systems that are part of an energy efficiency retrofit <p>http://www.nyceec.com/</p>
Green Codes Task Force Lead: Task Force Scope: Building Codes 	<p>The City assembled a Green Codes Task Force to produce 111 recommendations for green building codes, policies, and best practices. Some of the current codes and regulations promoting sustainability through green buildings and energy efficiency that resulted from this process include:</p> <ul style="list-style-type: none"> • In 2009, New York's state energy code only applied when at least 50% of an existing building's system is replaced, which meant most renovations in NYC were not covered. New York City Energy Conservation Code (NYCECC), New York City's energy code, was adopted in 2009 to remove this loophole and ensure NYC's building garner the energy benefits at the time of renovation. • Zone Green is a citywide initiative that provides opportunities for building owners to make sustainable investments in new and existing buildings. Zone Green is a set of amendments to zoning regulations to remove impediments to the construction and retrofitting of green buildings and promotes green features such as energy-efficient building walls, sun control devices and rooftop features (solar hot water systems, green roofs, cogeneration systems, etc.). <p>http://www.nyc.gov/html/gbee/html/codes/codes.shtml</p>
Centralized Fossil Fuel and Renewable Power Generation Lead: Partnerships Scope: Community 	<p>The City is exploring:</p> <ul style="list-style-type: none"> • Improve Existing Power Generation by repowering existing fossil fuel based power plants (replace with more efficient generation units). • Build cogeneration power plants to be city-owned through public private partnership • Public private partnerships to develop large renewable energy plants • Establish utility option for customers to purchase clean energy at a premium cost
Green City Facilities Lead: City	<p>LEED Law (Local Law 86) requires most new City government building projects and renovations to achieve a LEED rating level of Certified or Silver, depending on building type. http://www.nyc.gov/html/oec/html/green/l186_basics.shtml</p>

Scope: City Facilities



Distributed Generation

Lead: Utility
Scope: Community

Con Edison permits any customer to operate generating equipment in parallel with the company's electric system, provided there is no adverse effect on the company's other customers, equipment, or personnel, or the quality of service. They offer a number of incentives to support the installation of solar and wind power generation systems. In addition they offer assistance to ease PV permitting, through simplified and streamlining permitting for PV installations.



The New York City Carbon Challenge

Lead: City
Scope: Community Challenge

Since 2007, 17 of New York City's leading universities, the 11 largest hospital organizations, 12 global companies and 10 residential management firms have accepted the Carbon Challenge. The Carbon Challenge requires participants to pledge to match City government's 30x17 Goal and reduce building-based emissions by 30% or more in just ten years. So far, participants have reduced their emissions by an average of 17%. Six universities and hospitals have already met New York City's Carbon Challenge goal, cutting emissions by 90,000 metric tons per year.

<http://www.nyc.gov/html/gbee/html/challenge/mayor-carbon-challenge.shtml>



Building Resiliency Task Force

Lead: Task Force
Scope: Community

Comprised of more than 200 volunteers, this task force studied how to improve citywide infrastructure and building resiliency, focusing on New York City and its specific environment and building codes. Technical experts were divided into three working groups: Structure, Façade and Interiors; Electrical and IT; and HVAC, Plumbing and Fire Protection. Industry stakeholders represented building sectors on four Committees: Commercial buildings, multifamily Residential Building, Critical Buildings and 1-3 Family Homes. The outcome of these efforts is 33 proposals addressing resiliency in a wide range of buildings. The proposals can be divided into the following categories:

- Stronger Buildings: proposals fall into three groups – managing flooding, resisting wind, and preventing emergencies
- Backup Power: proposals in this category fall into three groups – installation recommendations for building owners who voluntarily add backup power, proposed changes to laws and incentives to allow owners to choose the right backup power source for their building, and power for two essential needs during blackouts (egress lighting in buildings and pumps at gas stations)
- Essential Safety: these proposals focus on protecting lives by ensuring drinking water, sanitation and habitable interior temperatures
- Better Planning: proposals fall into three groups: emergency planning, removing barriers to assisting those in need of help after disasters, and speeding up recovery

<http://www.nyc.gov/html/sirr/html/report/report.shtml>



8. SAN FRANCISCO, CA

Population: 825,863
Area: 232 sq. mi.
Density: 3,559/sq. mi.

POLICY OVERVIEW & TARGETS

The majority (52%) of San Francisco's greenhouse gas emissions come from energy used in the city's 197,000 residential and commercial buildings. San Francisco is implementing a comprehensive suite of policy initiatives and incentive programs to improve the performance of new and existing buildings. These policies and programs are regarded as among the most forward-thinking and effective policies in the nation. San Francisco's climate action plan in 2004, green building ordinance in 2010, and renewable energy policy goals have built on each other since the late 1990s. San Francisco's most recent 2013 Climate Action Strategy Update included the following targets, as a means of simultaneously reducing emissions while maintaining quality of life:

- 1) Move 100% of residential buildings and 80% of commercial electricity consumption to 100% renewable electricity
- 2) Achieve 2.5% annual increase in energy efficiency in the commercial and residential building sectors through efficiency measures and behavior change

SUPPORTIVE STRATEGIES OR PLANS

Climate Action Strategy Update 2013

The most ambitious target in San Francisco's Climate Action Strategy 2013 update is to shift to 100% renewable electricity. The strategy cites this as the "single biggest step the City can take to reduce GHG emissions." The City projects to reduce 941,000 metric tons of CO₂e annually by 2030. Key supporting policies include enforcement of the Commercial Building Ordinance for energy benchmarking and auditing, driving new investments in energy efficiency. This policy, together with other energy efficiency actions are projected to, in aggregate, achieve an annual GHG emissions reduction of 302,000 metric tons.

http://www.sfenvironment.org/sites/default/files/engagement_files/sfe_cc_ClimateActionStrategyUpdate2013.pdf

Climate Action Plan

San Francisco adopted its Climate Action Plan calling for GHG emissions target of a minimum of 20% below 1990 levels by 2012 in 2004. Many departments aim to exceed or extend these goals, such as the airport (SFO) aiming for 25% by 2017, 40% by 2025, and 80% by 2050, which meets State goals. The plan requires city departments to track and report greenhouse gas emissions annually. Thirty-nine of 54 city departments (small departments report together) reported for fiscal year 2011-2012. Departments track vehicle fuel, building energy usage, water usage, and employee practices related to waste, transportation and purchasing. The City has a green vehicle fleet, established a zero waste policy, a green building program, renewable energy programs, and many other programs that support these goals.

<http://www.sfenvironment.org/sites/default/files/fliers/files/climateactionplan.pdf>

SPECIFIC ACTIONS, POLICIES, INITIATIVES

Program	Description & Associated Impacts
<p>EcoDistrict</p> <p>Lead: City Scope: Partnership</p> 	<p>Through a private and public sector task force led by the Planning Department Sustainable Development program, and with strong support from EcoDistricts, San Francisco developed an EcoDistrict framework that includes four types of EcoDistricts within the city. Specific to district energy, a concept that is being considered is use of an existing fire protection loop to also provide ambient thermal loop for residential and commercial projects in the area.</p> <p>http://www.sf-planning.org/ftp/files/plans-and-programs/emerging_issues/sustainable-development/Central_Corridor_EcoDistrict_Program_Framework_10-23-2012.pdf</p>
<p>2030 District</p> <p>Lead: Partnership Scope: District</p> 	<p>San Francisco is establishing a 2030 District in the downtown area. This initiative is led by the private sector AEC community and will have support and coordination from the City, but not direct investment. In San Francisco, 2030 Districts are comprised of three stakeholder groups: 1) Owners/managers; 2) Service providers (A&E firms, ESCO's, technology providers); and 3) Community Stakeholders (nonprofits, government, etc.). Progress is tracked in aggregate (not building-by-building) but as individual buildings improve, it helps the entire District meet the goals. San Francisco sees this as an engagement strategy and platform to increase transparency, create community around energy and water conservation goals, and channel services (City, private, and otherwise) through the network this creates. It also creates a new platform to deliver education about the benchmarking and audit ordinance for commercial buildings, as well as the City's EE incentives and financing program. The broad goals for the three primary metrics (energy, water, CO2 from commuting) for the District are set by Architecture 2030 are:</p> <ol style="list-style-type: none"> Goals for Existing Buildings and Infrastructure Operations <ul style="list-style-type: none"> <u>Energy Use</u>: A minimum 10 percent reduction below the national average by 2015 with incremental targets, reaching a 50 percent reduction by 2030. <u>Water Use</u>: A minimum 10 percent reduction below the national average by 2015, with incremental targets, reaching a 50 percent reduction by 2030. <u>Carbon dioxide of auto and freight</u>: A minimum 10 percent reduction below the current District average by 2015 with incremental targets, reaching a 50 percent reduction by 2030. Goals for New Buildings, Major Renovations, and New Infrastructure <ul style="list-style-type: none"> <u>Energy Use</u>: An immediate 60 percent reduction below the national average, with incremental targets, reaching carbon neutral by 2030. <u>Water Use</u>: An immediate 50 percent reduction below the current national average. <u>CO2e of auto and freight</u>: An immediate 50 percent reduction below the current District average.
<p>Energy Supply</p> <p>Lead: Utility Scope: Community</p> 	<p>Electricity supply from California's investor-owned utilities (IOUs) is becoming increasingly renewable due to the state RPS, but it will not be 100% renewable within the next 10 years. California IOU renewable power is currently 20% with goal of 33% RPS by 2020. Renewable power purchasing options at the utility-scale is needed to meet SF's 100% renewable goal.</p>
<p>SFPUCs Power Supply</p> <p>Lead: Utility Scope: Community</p> 	<p>San Francisco Public Utilities Commission currently supplies 17% of the city's energy through solar, hydro electric and other zero emission sources. Customers can opt in to "CleanPowerSF" and purchase 100% zero emission energy. Municipal facilities are currently supplied by 100% renewable, and tenants of municipal facilities (e.g. Port and public transit providers are transitioning to 100% renewable).</p> <p>http://www.sfwater.org/index.aspx?page=576</p>

<p>Community Choice Aggregation (CCA)</p> <p>Lead: State/Utility Scope: Community wide</p> 	<p>Through CCA, customers have the choice of purchasing 100% renewable power from CleanPower SF or Pacific Gas and Electric (PG&E), which will be roughly 33% renewable by 2020.</p> <ul style="list-style-type: none"> • State enabled, but delivered through CleanPowerSF • Power will be provided at a price premium initially • New-built sources (25% initially) and certified RECs • San Francisco is working internally (SFPUC) and with PG&E to come to a pricing agreement, opt-in vs. opt-out, local vs. statewide sources <p>SF might join Marin County's CCA, Marin Clean Energy, established in 2010 as California's first CCA, which serves 125,000 people from Marin County and nearby Richmond.</p>
<p>Expedited Permitting Incentive</p> <p>Lead: City Scope: All residential</p>  	<p>Through the San Francisco Building Code 13C, the <u>Green Building Ordinance</u> was created which included requirements and incentives such as opportunity for expedited permitting. All projects required to meet the Green Building Ordinance, are given the opportunity to expedite their permitting process by showing a pathway to meet the 15% better than next level of LEED certification beyond current requirement at time of submitting the permit. The following is a more detailed look at the current code requirements for the city of SF:</p> <ul style="list-style-type: none"> • New low-rise residential buildings - minimum of 75 GreenPoints from the GreenPoints Single Family New Construction Checklist or the GreenPoints Multifamily New Construction Checklist; or obtaining LEED Silver certification. Expedited permitting would require LEED Gold with minimum of 69 points. • New High-rise residential building - achieve LEED® "Silver" certification; or minimum of 75 GreenPoints from the GreenPoint Rated Multifamily New Construction checklist will be achieved. Expedited permitting would require LEED Gold with minimum of 69 points. • New Non-Residential Buildings – LEED Gold Certification minimum. Expedited permitting would require LEED Platinum with minimum of 92 points.
<p>Green City Facilities</p> <p>Lead: City Scope: City Facilities</p> 	<p>San Francisco's Green Building Ordinance includes the following requirements for municipal projects:</p> <ul style="list-style-type: none"> • LEED Gold minimum certification • Minimum C&D diversion of 75% • No PVC in building materials • No tropical hardwood and virgin redwood • Integrated Pest Management • Renewable Energy Credits (offsets) is NOT an option
<p>Energy Upgrade California in San Francisco</p> <p>Lead: State/City Scope: All residential</p>  	<p><u>Single Family Home Owners</u></p> <ul style="list-style-type: none"> • Support, advice, and technical assistance for upgrades • Incentives are based on modeled performance: ranging from \$1000 for 10% modeled energy savings to \$4500 for 45% modeled energy savings <p><u>Multifamily Property Owners</u></p> <ul style="list-style-type: none"> • \$750 per unit rebate for multifamily property owners • Support, advice, and technical assistance for upgrades • Program initially funded by ARRA, and continued by PG&E and SFPUC energy program.
<p>Residential Energy Conservation Ordinance</p> <p>Lead: City Scope: Residential Single family</p> 	<p>When selling a single family home in San Francisco, this ordinance requires seller to undergo a valid inspection, install basic energy and water conservation devices or materials and then obtain a certificate of compliance. Such water conservation devices include, when applicable: low flow shower heads, efficient faucets and faucet aerators, efficient toilets, and leak repair. Energy conservation devices and measures include, when applicable: insulating attic space, weather stripping doors, insulating hot water heaters, caulking and sealing openings in building exteriors and insulating accessible heating and cooling ducts.</p> <p>http://www.sfenvironment.org/article/existing-buildings-other-than-major-renovations/residential-energy-conservation-ordinance</p>

SF Existing Commercial Buildings Energy Performance Ordinance

Large buildings are required to benchmark energy performance annually using ENERGY STAR Portfolio Manager and report to the City. In addition, buildings are required to undertake an energy audit every five years as follows:

- 50,000 GSF+, ASHRAE Level II, intermediate survey and energy analysis
- 10,000 – 49,999 GSF, ASHRAE Level I, base energy analysis
- Free Energy Audits from PG&E (local utility)

Lead: City

Scope: Commercial



<http://www.sfenvironment.org/energy/energy-efficiency/commercial-and-multifamily-properties/existing-commercial-buildings-energy-performance-ordinance/benchmarking>

GreenFinanceSF

Property Assessed Clean Energy, or PACE, helps property owners fund energy efficiency upgrades, on-site clean power generation projects, and water conservation retrofits. The PACE program is enabled through California state but requires adoption at the local city or county level. Currently 14 counties have adopted PACE in California.

Lead: City

Scope: Single Family



Under GreenFinanceSF's owner-arranged financing model, commercial property owners and multifamily with 5 or more units can negotiate project-specific low cost financing terms with the investor(s) of their choice, and repay the cost of the upgrade over time through their property tax bill. GreenFinanceSF can be used to fund a range of building performance upgrades, from high-efficiency lighting and HVAC retrofits, to solar photovoltaic systems and electric vehicle charging infrastructure. The combination of lower rates (rates vary, but are lower than other products on the market) and longer terms greatly improves the economics of deeper energy efficiency upgrades and on-site power generation projects, and allows for positive cash-flow from day one.

www.greenfinancesf.org

San Francisco Green Building Ordinance (GBO)

San Francisco Green Building Ordinance (GBO), codified as SF Building Code 13C, is the City's Green Building Ordinance and it is designed to be used in conjunction with the California Building Code with San Francisco Amendments, and the California Green Building Standards (CALGreen), which together form the San Francisco Green Building Code. Thus, there are mandatory green building measures per CA Building Code with additional SF Green Building requirements, which are as follows.

Lead: City
Scope: All



- Residential Construction: New low-rise residential (3 stories or less) must be GreenPoint Rated (California based green building standard for single and multifamily residential) with minimum of 75 GreenPoints
- Commercial Construction: Require LEED Gold standard equivalence with selected auditing or GBCI certification
- Labs: Specifically excluded from ordinance

In addition to LEED Gold standard, the GBO also requires: Commissioning, Light Pollution Reduction per LEED SSc8, Renewable Energy, either on-site generation or purchase of green energy credits per LEED EA2, EA6 OR 10% compliance margin over Title 24 California Energy Standard (10% better energy performance than required by code)

<http://www.sfenvironment.org/article/new-construction-and-major-renovations/green-building-ordinance-san-francisco-building-code>

9. VANCOUVER, BC

Population: 603,502
 Area: 44.4 sq.mi.
 Density: 13,590/sq. mi.

POLICY OVERVIEW & TARGETS

1. New construction: All buildings constructed from 2020 should be carbon neutral in operations.
2. Existing buildings: Reduce energy use and GHG emissions in existing buildings by 20% over 2007 levels by 2020.
3. 33% citywide emission reduction over 2007 by 2020

SUPPORTIVE STRATEGIES OR PLANS

Greenest City Action Plan

To support the vision of becoming the Greenest City in the World by 2020, in 2009 Vancouver's Mayor Gregor Robertson assembled a team of experts – the "Greenest City Action Team" – to articulate Vancouver's Greenest City Vision. The Greenest City Action Team developed a framework to address the city's environmental challenges in 10 key areas which together address carbon, waste and ecosystems. Using this framework, City of Vancouver staff developed the Greenest City 2020 Action Plan, which includes specific goals under the 10 areas, and a series of targets to be achieved by 2020. The plan was approved by Vancouver's city council in 2012.

<https://vancouver.ca/green-vancouver/greenest-city-2020-action-plan.aspx>

Neighborhood Energy Strategy

Vancouver recognizes that neighborhood energy strategies using low-carbon and renewable energy support both significant emissions and affordability benefits. To support the City's GHG reduction targets, the City is exploring opportunities for renewable energy based district heating systems in neighborhoods that have a mix of single-family homes, townhouses and apartments, and are built with moderate density. The approach is based on the idea that grouping buildings together under one heating system and having a neighborhood-scale operator—whether it's a utility, a business, the City, or a co-op—helps overcome the barriers of high construction costs and the historic low energy prices of individual, non-renewable systems.

<http://former.vancouver.ca/ctyclerk/cclerk/20121003/documents/ptec1.pdf>

Building Retrofit Strategy

Vancouver's Building Retrofit Strategy is pending council approval (as of April 2014). The strategy articulates an action plan toward achieving 20% reduction in energy use and GHG emissions from existing buildings by 2020. The strategy is broken down by building sector, each of which contributes about ¼ of Vancouver's total building related GHGs: single family residential, multifamily, commercial, industrial. Vancouver's strategy takes a 'surgical' approach, wherein proposed policies and programs are focused on areas of greatest opportunity for deep emission reductions, and thus enables the City and partners to expend limited resources to derive the greatest return in terms of energy and emission reductions. As such, in order to identify the poorest performing buildings, the first action proposed in the strategy is to introduce an energy benchmarking program.

Climate Change Adaptation Strategy

In November 2012 Vancouver adopted a Climate Change Adaptation Strategy with goals of:

- increasing the resilience of City infrastructure, programs and services to anticipated local climate change impacts
- promoting and facilitating incorporation of climate change information into City business
- improving awareness, knowledge, skills and resources of City staff
- enhancing opportunities for coordination and cooperation through the development of networks and partnerships

<http://vancouver.ca/green-vancouver/climate-change-adaptation-strategy.aspx>

SPECIFIC ACTIONS, POLICIES, INITIATIVES

Program	Description & Associated Impacts
Neighborhood Energy Utility (NEU) Lead: City Scope: District 	To supply heat to Vancouver's Olympic Village, in 2009 the City of Vancouver built a district heating system on the site of a sewage pump station adjacent to the Village. The system uses heat-capturing technology to gather wasted thermal energy from municipal sewage to supply residential space heating and hot water to the surrounding neighborhood. This scale makes NEUs more cost-effective than stand-alone options and allows for many "waste energy" options. The underground piping system that conveys the heated water from the NEU to the buildings also has the capacity to accept heat energy from other sources, including building-mounted solar thermal systems. http://vancouver.ca/home-property-development/neighbourhood-energy-utility.aspx
Green City Facilities Lead: City Scope: City Facilities 	<ul style="list-style-type: none"> • New Construction: Since 2004 all new municipal facilities are required to certify LEED Gold minimum • Retrofit: The City has invested in energy efficiency upgrades to existing municipal facilities, resulting in 22% reduction from 1990 levels • Performance tracking: Vancouver is benchmarking all eligible facilities using Energy Star Portfolio Manager (2013-2014) https://vancouver.ca/green-vancouver/green-city-facilities.aspx
Vancouver Building Bylaw Lead: City Scope: All buildings 	Vancouver's local building code, the Vancouver Building Bylaw, requires the following: <ul style="list-style-type: none"> ○ New construction must meet ASHRAE 90.1 2010 or National Energy Code for Buildings 2011 baseline and completion of energy checklist, and must use 3rd party Certified Professionals to validate • Effective July 1, 2014 all renovation projects over a certain size are required to undertake an energy assessment and implement energy upgrades or retro-commissioning. • All new one- and two-family homes must comply with Vancouver's green building requirements, including prescribed R-values, efficient heating appliances, and must be solar- and electric vehicle-ready. • All new homes must submit benchmarked score (using third-party modeling software) as condition of building permit. https://vancouver.ca/home-property-development/green-home-building-policies.aspx
Energy Conservation Assistance Program Lead: Utilities Scope: Low-income residential 	<ul style="list-style-type: none"> • Low Income Residential <ul style="list-style-type: none"> ○ Energy Savings Kit Program through utilities ○ Energy Conservation Assistance Program through utilities to perform energy evaluations and installation of energy saving products
Green Building Policy for Rezoning Lead: City Scope: Commercial and Multifamily 	<ul style="list-style-type: none"> • All rezoning projects must certify LEED Gold plus prescribed energy performance (currently 6 EAC1 points under LEED NC 2009), and mandatory stormwater and water efficiency credits. • Rezoning projects on sites over 2 acres are required to certify LEED Gold, and implement a number of additional sustainability provisions. With regard to energy, applicants are required to undertake a feasibility study to determine the economic viability of construction of an on-site low carbon district heating system. Where viable, projects are required to develop the system. https://vancouver.ca/home-property-development/sustainable-zoning-landing.aspx
LiveSmart BC Advisor Program	Former provincial program in coordination with local utilities BC Hydro, Fortis BC, offering information and rebates to improve energy efficiency for small businesses.

Lead: Province/Utilities
Scope: Businesses



- Free energy advice and energy audit
 - Insulation, air sealing, qualified bathroom fans, plus \$150 subsidy for pre-retrofit assessment
 - Eligible for additional benefits from BC Hydro and Fortis BC
- <http://www.livesmartbc.ca/>

Home Energy Loan Program

Lead: City
Scope: Single Family



Vancouver introduced a one year pilot program in 2012 offering 'low-interest' financing to support upgrades to single family homes. The program was aligned with the federal ecoENERGY assessment program, and covered half of the cost of the before and after energy audit. The loans covered costs associated with weatherization, insulation, and heating equipment upgrades. The program was designed such that the energy savings would be equal to or exceed the amount of quarterly loan repayments. Loans were intended to be attached to the property rather than the individual, however the program was cancelled prior to Vancouver receiving the authority to attach the loan to the property.

10. SEATTLE, WA

Population: 634,535
 Area: 143 sq. mi.
 Density: 4,437/sq. mi.

POLICY OVERVIEW & TARGETS

Seattle was the first city in the nation to create a green building goal in 2000 for new municipal projects, which upgraded in 2001 to a LEED incentive program for private projects. In 2006, Seattle first adopted a Climate Action Plan (CAP) which laid out strategies to meet Kyoto targets and identified short-term goals. On June 17, 2013, Seattle City Council adopted Resolution 31447, formally adopting Seattle's 2013 Climate Action Plan. The Climate Action Plan is composed of recommended actions to be taken to meet Seattle's goal of becoming carbon neutral by 2050. In October 2013, city staff released the Climate Action Plan's Implementation Strategy. All development on Seattle's progress towards their Climate Action Plan is posted on the city's Climate Change website.

<http://www.seattle.gov/environment/climate-change/climate-action-plan>

In May 2011, the City of Seattle Office of Sustainability and Environment (OSE) released the "Getting to Zero: A Pathway to a Carbon Neutral Seattle." This study demonstrates that by implementing an aggressive suite of strategies that the city could cut per capita GHG emissions by 30% by 2020, 60% by 2030, and 90% by 2050, relative to 2008 levels. With regard to buildings, the report proposed the following high-level strategies:

- Dramatic increases in energy efficiency of buildings in both design & operations;
- Homes, and businesses shift to low carbon energy sources via working with the utility provider on clean and reliable resourcing such as biofuels, and biomass sources for district energy systems.

http://www.seattle.gov/Documents/Departments/OSE/CN_Seattle_Report_May_2011.pdf

SUPPORTIVE STRATEGIES OR PLANS

The Seattle Climate Action Plan Implementation Strategy spells out a series of actions related to building energy consumption. This includes, among other initiatives: smart-metering, energy benchmarking and disclosure, energy audit requirements, retro commissioning incentives, tax exemptions, permit fast tracking, partnerships and regulations.

<http://www.seattle.gov/Documents/Departments/OSE/FinalCAPImplementationStrategy.pdf>

SPECIFIC ACTIONS, POLICIES, INITIATIVES

Program	Description & Associated Impacts
Climate Action Plan: Carbon Neutral Scenario	<p>The Climate Action Plan report from 2013 states that the 2030 Vision for homeowners is to create incentives, financing options, and support services that serve over 12,000 homes to conduct home energy upgrades. The Carbon Neutral scenario considers two broad categories for consideration in Seattle Homes:</p> <ul style="list-style-type: none"> • Lowering building energy use through deep efficiency design and retrofits, by requiring all new buildings to make aggressive (50%) or even deeper (75%) energy use reductions using green building rating systems like LEED and Living Building Challenge. Additionally, existing building retrofits are shooting to reduce energy intensity by 40-77% by 2030. By 2050, the city assumes the program will reach 90% of all existing building stock, leaving only about 10% of the existing building stock untouched. • The second path is by providing homeowners with cleaner fuel sources, by switching from fossil fuel use (natural gas) to electric heat pumps and district energy for heat and hot water needs. By supporting their retrofits to electric heat pump systems, each home can then switch to a cleaner fuel source providing by the utility.
Lead: City Scope: Single Family Homes	<p>http://www.seattle.gov/environment/climate-change/climate-action-plan</p>



Mayor's Climate Protection Initiative

Lead: City
Scope: Challenge



Mayor Nickels in 2005 launched the Climate Protection Initiative which challenged other US mayors to meet GHG emission reduction targets set by the Kyoto Protocol even though the federal government did not sign on. This would require cities to meet 7 below 1990 levels by 2012. More than 1,000 mayors covering 89 million Americans signed on with Seattle to make the pledge.

Energy Smart Services

Lead: Public utility
Scope: Industrial



Seattle City Light is a publicly owned utility with a mission to deliver environmentally responsible, safe, low cost and reliable power. Energy Smart Services program was created by Seattle City Light to provide financial incentives and technical assistance to industrial customers. This program can subsidize up to 70% of energy efficiency project costs. A recent success story was a contract with their largest customer, Nucor Steel – which turns Nucor's waste heat from manufacturing processes into energy, thus recovering 5,000 MWh – enough to heat 540 Seattle homes for a year.

http://www.seattle.gov/light/Conserve/Business/cv4_ess.asp

The Bullitt Center

Lead: 3rd Party
Scope: Demonstration



This class-A office building on Capitol Hill is a testament of how buildings of the future can be designed and operated. Achieving net zero energy, net zero water, net zero carbon, composting toilets, toxic-free materials, an enticing stairway, 80% daylighting using high-performance windows on an urban infill project site in a dense neighborhood – it goes above and beyond LEED Platinum certifications, shooting to achieve the Living Building certification. Funded by The Bullitt Foundation – a foundation created to seek out and support the Cascadia region's green building vision – looking for high risk, high potential payoff opportunities.

<http://www.bullittcenter.org/>

Capitol Hill EcoDistrict

Lead: Partnership
Scope: District



In March 2011, the Bullitt Foundation awarded Capitol Hill Housing a grant to launch the creation of the city's first EcoDistrict, working with GGLO Architects. The approach to the project is broken up into 6 phases: Research, Outreach, Vision, Strategies, Implementation, and Measurement. Goals, metrics and strategies for the project have been organized around the following environmental performance areas: Community, Transportation, Energy, Water, Habitat, and Materials. The project includes the Capitol Hill Urban Village, Pike/Pine Urban Village, and the Sound Transit owned properties on and around the planned LINK light rail station. Related to energy reductions – the project will include the following strategies:

- Energy-Efficient Building Design with target for the highest emitters
- Energy Retrofits on Existing Buildings with target for the Big Users
- Integrate with External District Energy System
- Building Integrated Renewable Energy Generation
- Certify All New Development to LEED Gold Minimum
- Renewable Energy Purchase Agreement
- Small-Scale Hydropower
- Participate in the Seattle 2030 District
- Advanced Metering

<http://ecodistricts.org/projects/profiles/>

<http://capitolhillhousing.org/inthecommunity/ecodistrict.php>

Homewise Program

Lead: City
Scope: Low Income Residential



Seattle homeowners and rental property owners can receive free weatherization services if they meet income qualifications.

- Insulation of the attic, walls, waterpipes, floors at crawlspace, and crawlspace (including ground cover)
- Venting of bathrooms/kitchens
- Pipe wrapping to avoid freezing
- Air sealing
- Weatherstripping of exterior doors
- Window caulking
- Duct insulation

- Furnace repair, tune-up/replacement
- Combustion appliance safety
- Energy conservation-related repairs
- Partial payment for other measures that add value by energy conservation benefit
- Electric (only) heated homes may receive upgrade to Ductless Heat Pump (heating & cooling system)

<http://www.seattle.gov/housing/homewise/default.htm>

Energy Benchmarking and Reporting Program

Seattle's benchmarking ordinance requires owners of non-residential and multifamily buildings (20,000 sf or larger) in City of Seattle to track energy performance annually using Energy Star Portfolio Manager and report to the City and disclose to current and prospective tenants, buyers and lenders upon request. This policy supports Seattle's 2030 goals in the Climate Action Plan to reduce energy use by 10% in commercial buildings and by 20% in residential building, by allowing the City to track energy reduction goals and target incentive dollars by market sector.

Lead: City
Scope: Large
Commercial + Multifamily



Impact: 99% compliance for 2012 energy performance reporting.

<http://www.seattle.gov/environment/buildings-and-energy/energy-benchmarking-and-reporting>

District Energy

Seattle is pursuing strategies to implement district energy solutions in key neighborhoods in support of the City's climate protection and energy conservation goals. In 2010, the City completed a study to identify the most promising areas of the city for district energy systems and to identify policies that could help advance district energy in Seattle. Based on the key findings and recommendations of the study, the City developed a strategy to expand district energy on First Hill and in the South Lake Union and Denny Triangle neighborhoods. These neighborhoods provide opportunities for district energy systems fueled primarily by waste heat from sewer lines, hospitals, and data centers. The City is working to develop these opportunities through a public-private partnership.

Lead: City
Scope: Citywide



<http://www.seattle.gov/environment/buildings-and-energy/district-energy>

Bertschi School

Located in Seattle's North Capitol Hill neighborhood is a private school for PreK-5 school supporting 240 students. The Bertschi Center building achieved LEED Gold certification and the Bertschi School Living Science Building achieved Living Building Challenge certification. Construction of the new Science Wing finished in February 2011, featuring FSC certified and R-52 wood-framed walls, structural insulated panel roof with insulating curtain walls, hydronic radiant floor heating, energy ventilator, natural ventilation, no toxic chemicals in building materials, and over 98% of construction waste diverted from landfills. The wing completed its operational performance period in November 2012 and achieved official Living Building certification in April 2013.

Lead: Private
Scope: Demonstration



http://www.wbdg.org/references/cs_bslsb.php



11. RESOURCES

11.1 CAMBRIDGE

- ◆ CPAC Goals and Objectives
<http://www.cambridgema.gov/CDD/climateandenergy/climatechangeplanning/climateactionplanreports.aspx>
- ◆ Cambridge Energy Alliance
<http://cambridgeenergyalliance.org/>
- ◆ Community Compact for a Sustainable Future
<http://www.icleiusa.org/news/city-of-cambridge-mit-harvard-launch-historic-community-compact-for-a-sustainable-future>
- ◆ Kendall Square Ecodistrict
<http://www.cambridgeredevelopment.org/ecodistrict/>
- ◆ Massachusetts Stretch Energy Code
<http://www.mass.gov/eopss/consumer-prot-and-bus-lic/license-type/csl/stretch-energy-code-information.html>
- ◆ Massachusetts Renewable Portfolio Standard
<http://www.mass.gov/eea/energy-utilities-clean-tech/renewable-energy/rps-aps/>
- ◆ Mass Save
<http://www.masssave.com/>
- ◆ Energy Sage
<https://www.energysage.com/>
- ◆ NSTAR Green
http://www.nstar.com/residential/customer_information/nstar_green/nstar_green.asp
- ◆ MIT Energy Initiative
<https://mitei.mit.edu/>
- ◆ Sunshot
<http://energy.gov/eere/sunshot/sunshot-initiative>
- ◆ Climate Change Vulnerability Assessment & Preparedness Plan
<http://www.cambridgema.gov/CDD/Projects/Climate/climatechangeresilienceandadaptation.aspx>

11.2 FORT COLLINS

- ◆ Plan Fort Collins 2011
<http://www.fcgov.com/planfortcollins/pdf/pfc-summary.pdf>
- ◆ City of Fort Collins 2012 Climate Status Report
<http://www.fcgov.com/airquality/pdf/FC2012ClimateStatusReportLowRes.pdf>
- ◆ Commercial Code Green Building Amendments (Prescriptive)



- http://www.fcgov.com/utilities/img/site_specific/uploads/Commercial_APAAG_2011-03-29.pdf
- ◆ Residential Code Green Building Amendments (Prescriptive)
http://www.fcgov.com/utilities/img/site_specific/uploads/Residential_APAAG_2011-03-29.pdf
- ◆ City of Fort Collins Utility Rebates and Incentives
<http://www.fcgov.com/utilities/business/improve-efficiency>
- ◆ Energy Efficiency at Fort Collins Utilities: A Role Model for Publicly Owned Utilities
http://swenergy.org/publications/documents/EE_at_Fort_Collins_Utilities_Feb_2013.pdf
- ◆ RMI: What's Old Is New: Reinventing a Community's Energy Future in Fort Collins
http://www.rmi.org/summer_2013_esj_whats_old_is_new_main
- ◆ FortZED (Zero Emissions District)
<http://fortzed.com/>

11.3 AUSTIN

- ◆ The City of Austin Office of Sustainability Climate Program
<http://austintexas.gov/department/austin-climate-protection-program>
- ◆ Climate Action 2013 Update
http://austintexas.gov/sites/default/files/files/Sustainability/Climate/2013_Climate_Protection_Resolution_Update.pdf
- ◆ Office of Sustainability: Austin Climate Protection Program FAQs
<http://austintexas.gov/sites/default/files/files/Sustainability/news/City%20of%20Austin%20Office%20of%20Sustainability%20Climate%20Program%20FAQs.pdf>
- ◆ Austin Energy GreenChoice 2014 Renewable Energy Program
<http://austinenergy.com/wps/portal/ae/Programs/GreenChoice>

11.4 BOSTON

- ◆ 2013 City Energy Efficiency City Scorecard
<http://www.cityofboston.gov/news/Default.aspx?id=6332>
- ◆ Massachusetts Clean Energy and Climate Action Plan for 2020
<http://www.mass.gov/eea/docs/eea/energy/2020-clean-energy-plan.pdf>
- ◆ Climate Action Plan
<http://www.cityofboston.gov/climate/bostonsplan/>
- ◆ Renew Boston Solar
<http://www.renewboston.org/>
- ◆ 2011 Boston Climate Action Plan Report
<http://www.cityofboston.gov/eeos/buildings/>
- ◆ Boston Building Energy Reporting and Disclosure Ordinance
<http://www.cityofboston.gov/eeos/reporting/>



- ◆ Article 88 Wind Energy Zoning
http://www.cityofboston.gov/images_documents/Article88%20Wind%20Energy%20Zoning_tcm3-28589.pdf
- ◆ Renew Boston Whole Building Incentive
<https://www.cityofboston.gov/news/Default.aspx?id=6159>
- ◆ Boston 500: Challenge to Save Energy
<http://www.renewboston.org/boston500/>
- ◆ Low Income Multi Family Energy Retrofit Program
https://www.cityofboston.gov/images_documents/ABCD_Powerpoint_LIMF_tcm3-38494.pdf
- ◆ E+ Green Building Program
www.epositiveboston.org
- ◆ Allston Green District
https://www.cityofboston.gov/images_documents/Allston%20Green%20District%20PR%20NEREJ_tcm3-34776.pdf
<http://mvernon.com/green-district>
- ◆ Old Colony Public Housing Redevelopment
<https://www.cityofboston.gov/news/Default.aspx?id=5849>

11.5 NEW YORK

- ◆ PlanNYC
<http://www.nyc.gov/html/planyc2030/html/theplan/the-plan.shtml>
- ◆ Greener Greater Buildings Plan (GGBP)
<http://www.nyc.gov/html/gbee/html/home/home.shtml>
- ◆ Municipal GHG Emissions Reduction (30x17)
<http://www.nyc.gov/html/dem/html/conservation/conservation.shtml>
- ◆ Energy Benchmarking Program
http://www.nyc.gov/html/gbee/html/plan/l184_about.shtml
- ◆ New York City Energy Efficiency Corporation
<http://www.nyceec.com/>
- ◆ Green Codes Task Force
<http://www.nyc.gov/html/gbee/html/codes/codes.shtml>
- ◆ Green City Facilities
http://www.nyc.gov/html/oec/html/green/l186_basics.shtml
- ◆ The New York City Carbon Challenge
<http://www.nyc.gov/html/gbee/html/challenge/mayor-carbon-challenge.shtml>
- ◆ Building Resiliency Task Force
<http://www.nyc.gov/html/sirr/html/report/report.shtml>



11.6 SAN FRANCISCO

- ◆ SF Environment Climate Action Strategy 2013 Update
http://www.sfenvironment.org/sites/default/files/engagement_files/sfe_cc_ClimateActionStrategyUpdate2013.pdf
- ◆ Climate Action Plan
<http://www.sfenvironment.org/sites/default/files/fliers/files/climateactionplan.pdf>
- ◆ EcoDistrict
http://www.sf-planning.org/ftp/files/plans-and-programs/emerging_issues/sustainable-development/Central_Corridor_EcoDistrict_Program_Framework_10-23-2012.pdf
- ◆ SFPUCs Power Supply
<http://www.sfwater.org/index.aspx?page=576>
- ◆ Residential Energy Conservation Ordinance
<http://www.sfenvironment.org/article/existing-buildings-other-than-major-renovations/residential-energy-conservation-ordinance>
- ◆ SF Existing Commercial Buildings Energy Performance Ordinance
<http://www.sfenvironment.org/energy/energy-efficiency/commercial-and-multifamily-properties/existing-commercial-buildings-energy-performance-ordinance/benchmarking>
- ◆ Group Purchasing of Solar
http://www.sfenvironment.org/sites/default/files/editor-uploads/energy_renewable/image/sfe_re_understandingsolarpurchasingoptions.pdf
- ◆ San Francisco Green Building Ordinance (GBO)
<http://www.sfenvironment.org/article/new-construction-and-major-renovations/green-building-ordinance-san-francisco-building-code>

11.7 VANCOUVER

- ◆ Greenest City 2020 Action Plan (GCAP)
<https://vancouver.ca/green-vancouver/greenest-city-2020-action-plan.aspx>
<https://vancouver.ca/files/cov/Greenest-city-action-plan.pdf>
- ◆ Climate Change Adaptation Strategy
<http://vancouver.ca/files/cov/Vancouver-Climate-Change-Adaptation-Strategy-2012-11-07.pdf>
- ◆ Green City Facilities
<https://vancouver.ca/green-vancouver/green-city-facilities.aspx>
- ◆ Neighbourhood Energy Utility
<http://vancouver.ca/home-property-development/neighbourhood-energy-utility.aspx>
- ◆ Green Homes Program
<https://vancouver.ca/home-property-development/green-home-building-policies.aspx>
- ◆ Green Building Policy for Rezoning



<https://vancouver.ca/home-property-development/sustainable-zoning-landing.aspx>

11.8 SEATTLE

- ◆ Office of Sustainability & Environment – Buildings & Energy
<http://www.seattle.gov/environment/buildings-and-energy>
- ◆ Seattle City Council Carbon Neutrality Resolution
https://www.seattle.gov/council/issues/carbon_neutrality.htm
- ◆ Seattle Climate Action Plan: Implementation Strategy
<http://www.seattle.gov/Documents/Departments/OSE/FinalCAPImplementationStrategy.pdf>
- ◆ Energy Smart Services
http://www.seattle.gov/light/Conserve/Business/cv4_ess.asp
- ◆ The Bullitt Centre
<http://www.bullittcenter.org/>
- ◆ Capitol Hill EcoDistrict
<http://capitolhillhousing.org/inthecommunity/ecodistrict.php>
- ◆ Homewise Program
<http://www.seattle.gov/housing/homewise/default.htm>
- ◆ Energy Benchmarking and Reporting Program
<http://www.seattle.gov/environment/buildings-and-energy/energy-benchmarking-and-reporting>
- ◆ District Energy
<http://www.seattle.gov/environment/buildings-and-energy/district-energy>
- ◆ Bertschi School
http://www.wbdg.org/references/cs_bslsb.php