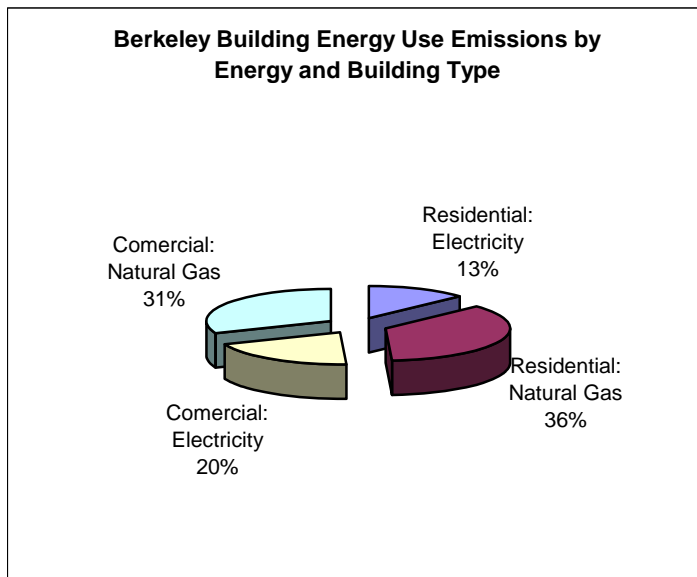


CHAPTER 4: **BUILDING ENERGY USE STRATEGIES**

A. BUILDING ENERGY USE IN BERKELEY: AN OVERVIEW

Electricity and natural gas consumption in our homes, businesses, industries and public institutions (including the City government) results in over 310,000 metric tons CO₂e (MTCO₂e) per year emitted into the atmosphere – about 53 percent of Berkeley’s total GHG emissions. The energy we consume in our homes contributes about half of the total emissions from building energy use while energy consumption in non-residential buildings contributes the other half. Natural gas consumption, mostly for space and water heating, is by far the largest source of emissions related to building energy use.



To stay on track to achieve the community’s interim emissions reduction target,³⁶ the community must reduce the emissions that result from building energy use by 35 percent by 2020.

This is no easy undertaking. In simple terms, the community’s task is to *reduce conventional energy use in every existing Berkeley home, business and institution* through high-quality energy efficiency retrofits and a greater reliance on renewable energy such as solar. It also requires ensuring that any new construction meets high standards of energy performance.

The goals outlined in this chapter are designed to serve as a guide for meeting the task before us. They are the following:

- **Green New Construction and Remodels:** The City’s goal is for new construction to meet “zero net energy” (ZNE) performance by 2020. A ZNE building combines energy efficient building design and systems with on-site renewable energy generation (e.g., solar) to result in zero net energy purchases from the grid. To achieve this goal the City will set minimum standards for how energy is used in buildings; encourage innovative strategies that minimize energy and water consumption, maximize the recycling of construction debris, and make for a more comfortable indoor environment; and assist property owners to lower the upfront cost of applicable energy saving solutions.
- **Energy Efficient Homes:** Vast amounts of potential energy and cost savings are locked up in Berkeley’s existing residential building stock. The plan lays out strategies for enhancing and lowering the cost of energy efficiency services and standards for existing residential properties in order to make those properties as energy efficient as possible. Because more than half of Berkeley’s housing units are rental properties, special programs must be developed to enable energy upgrades in this sector.

³⁶ Berkeley’s GHG reduction targets are explained in more detail in Chapter 2. The interim, year 2020 target for community-wide emissions is a 33 percent reduction below year 2000 emissions levels.

- **Energy Efficient Businesses and Institutions:** The efficient use of energy saves businesses money and minimizes GHG emissions. The plan makes recommendations for enhancing energy efficiency services and standards for existing commercial and industrial properties, both large and small. Like in the residential sector, the City’s goal is to enhance demand for energy upgrade services while at the same time helping to lower the cost of employing those services.
- **Renewable Energy:** Efficiency alone will not achieve the Measure G targets. The community is also tasked with developing a local, clean, decentralized renewable energy supply to meet a portion of our energy needs. The City’s goal is to eliminate at least 11,600 MTCO₂e per year by 2020 through decentralized solar installations on residential and nonresidential buildings. The City is developing several strategies to address the main barrier to going solar: the upfront cost.
- **Green Public Buildings:** Institutions such as the City government and School District demonstrate important leadership by improving building energy efficiency and utilizing renewable sources of energy such as solar and wind. The solar installation on Washington Elementary School and the combination of solar and wind energy systems on the City’s Shorebird Park Nature Center are just two of several examples of the City and School District taking a leadership path.
- **Community Education, Outreach, and Marketing:** Behavior change underlies the success of each of the components outlined above. The City of Berkeley and its partners must combine efforts in the policy arena with targeted education and social marketing for residents, businesses and institutions.
- **Local Green Jobs:** Enhancing local demand for services such as energy retrofits and solar installations not only reduces energy consumption and GHG emissions, but it also results in increased demand for skilled labor that can do the work. Through youth development and job training and placement programs, the City and its community partners will match local residents with quality jobs in the emerging green economy.

As is described in more detail below, developing and implementing actions to achieve these goals entails *continuous improvement* in building energy use services offered to the community.

This means that minimum standards for energy efficiency in the residential and commercial sectors should *continuously be ratcheted up* and become more aggressive and effective at saving energy and money over time. Likewise, voluntary energy service programs offered in the community should be *continuously expanded and integrated* to become more effective and cutting edge over time.

Successfully implementing these actions also requires sustained collaboration across all sectors, including homeowners; tenants and landlords; business owners; real estate professionals; builders, architects, engineers, and contractors; city staff persons and elected officials; students, educators and school administrators; and others. Such collaboration has the potential to result not only in reduced GHG emissions, but also in an improved Berkeley building stock, reduced energy costs, and increased demand for “green jobs” in the building and energy service industries.

B. BUILDING ENERGY USE ACTIONS

The goals, policies and actions outlined in this section build on energy-related programs and services currently implemented by the City government and partner agencies in Berkeley. Though progressive when compared to many communities, we cannot count on the portfolio of energy-related services and mandates currently offered to achieve the scale of emissions reductions required to meet Berkeley’s GHG reduction target. The measures described below represent a more aggressive, integrated approach

to improving building energy efficiency, shifting toward decentralized sources of renewable energy, and connecting local residents to jobs in the energy services sector.

BERKELEY ENERGY INITIATIVE

Taken together, the measures in this chapter comprise the Berkeley Energy Initiative (BEI). More than just a list of isolated policies and programs, the BEI is an integrated set of energy reduction strategies designed to:

- ❖ Improve energy use standards for residential and nonresidential buildings
- ❖ Stimulate demand for energy upgrades such as energy audits, energy retrofits, and solar energy systems by providing enhanced services, incentives, and financing to enable building owners to meet local energy standards
- ❖ Keep money and generate green jobs in the local economy by shifting demand from resource consumption to resource conservation and by preparing local workers for emerging jobs in the energy services sector

See the table in Appendix A for a consolidated list of goals, policies and implementing actions related to building energy use. The table also includes an implementation timeline and funding sources.

1. Goal: Make green building business as usual in the new construction & remodel market

The green building movement is about building better buildings and more livable communities, not just protecting the environment. Green buildings conserve resources, save money on energy and water bills, provide a more comfortable and healthy environment for building occupants, and are proving to be more valuable than conventional buildings. Rapidly increasing numbers of government agencies, utilities, builders, architects, designers, contractors, developers and building material suppliers are embracing green building ideals and transforming the market place in the process. Many of the green building movement's ideas have come from the building industry itself because they make good business sense for the industry.

Green building encompasses:

- **Sustainable Sites:** Appropriate project locations reduce vehicle miles traveled and protect agriculture, open space and other environmentally sensitive areas. This results in development that is oriented towards pedestrians, cyclists and public transit, as well as reduces urban sprawl. Green buildings maximize the site's unique properties, including solar orientation, wind direction, and slope.
- **Passive Design:** Green buildings reduce the need for artificial lighting, heating, cooling and ventilation by incorporating these components as "passive" systems. This means that the buildings require very little external energy because they take advantage of the site for daylight and natural ventilation and are constructed or remodeled to reduce unwanted air infiltration and heat loss.
- **Water Efficiency:** Green buildings conserve water both inside and outside and often integrate innovative wastewater technologies such as gray water for irrigation. These measures often result in cost savings and pay for themselves many times over during the life of the building.

- **Materials & Resources:** Green buildings re-use existing materials to the fullest extent possible, use new materials that minimize impacts on the environment, and minimize construction debris by recycling construction materials.
- **Indoor Environmental Quality:** Green buildings provide optimal air quality for building occupants over the lifetime of the building by eliminating materials that release volatile organic compounds and other toxic contaminants, and by providing proper ventilation. Enhancing the indoor environment for building occupants includes considering lighting and air quality, thermal comfort and access to daylight and views.

In putting green building for new construction and remodels into practice, it is important to have a standard by which to rate and compare the relative “greenness” of projects. The standard commonly used throughout the U.S. for new nonresidential projects is Leadership in Energy and Environmental Design (LEED). The U.S. Green Building Council provides the LEED standard. The City’s current green building policy requires LEED silver certification for new City buildings.

A standard commonly used in California for new residential projects is GreenPoint Rated (GPR). StopWaste.Org and the Berkeley-based non-profit Build It Green (BIG) developed the GPR standard and BIG now administers the program statewide. Both the GPR and LEED standards are important tools for helping Berkeley to promote and track local green building efforts.

One important way that the City is working to promote green building practices is through the Berkeley’s Best Builders program. As part of the program, applicable residential and commercial projects must adhere to the following requirements:

- ❖ **Green Building Consultation:** Applicants for discretionary projects must consult with a green building expert where green building practices can be explained and encouraged.
- ❖ **Green Building Checklist:** Large-scale development projects and new buildings with one or more dwelling units are required to complete a “green building checklist” (either LEED or GreenPoint Rated) and update it throughout the project.
- ❖ **Energy Conservation Analysis:** Projects with over 10,000 square feet of new nonresidential floor area are required to submit an “energy conservation analysis” (provided at no-cost by PG&E).

These requirements serve our community well and have done much to set the stage for a surge of green building projects in Berkeley. But given the increasing clarity around the multiple benefits of green building, the City’s goal for new construction to achieve zero net energy by 2020, and the community’s aggressive GHG emissions reduction target, the City and its partners need to do more to enhance existing green building services and standards. Specific policies and implementing actions include:

a. Policy: Improve local energy and green building standards

In an effort to reduce energy usage in California, in 1978 the California Energy Commission (CEC) adopted part 6 of Title 24 of the California Code of Regulations: Energy Efficiency Standards for Residential and Nonresidential Buildings. The Title 24 energy standards are updated on a triennial basis and the most recent standards become effective in 2009.

The City of Berkeley is evaluating establishing local minimum energy and building performance standards that are more aggressive than Title 24. New standards for Berkeley buildings would be linked to nationally recognized green building standards such as, ENERGY STAR for New Homes, ENERGY STAR for Affordable Homes, LEED, and GreenPoint Rated.

Implementing Actions:

- *Establish and continually ratchet up minimum energy standards that exceed the current Title 24 energy code for various building types specific to Berkeley's climate zone. An example of a minimum standard for a specific building type would be a requirement that all new multifamily buildings meet federal ENERGY STAR standards for new construction. ENERGY STAR standards exceed Title 24.*
- *Require that new projects achieve a minimum point level on an appropriate green building checklist (e.g., GreenPoint Rated Checklist for residential buildings or LEED checklist for nonresidential) and report projected GHG emissions.*
- *Expand and eventually require the monitoring, testing and commissioning of residential and non-residential building systems to ensure that buildings in Berkeley are performing as intended. It is important to verify and document that buildings are performing as intended by the design. This process is known as commissioning for commercial buildings and performance testing for residential buildings.*
- *Require that all new multi-unit buildings be "sub-metered" to enable monitoring of energy and water consumption on a unit-by-unit basis.*

b. Policy: Simplify project review and permit approval process to encourage innovative green building measures

The City strives to continually improve the service it provides to those seeking building permits. Planned service improvements include dedicating a building inspector to assist with green building questions, providing education materials related to green building, and ensuring that Planning & Development Department staff is up to date on the latest green building technologies.

Implementing Actions:

- *Dedicate a Senior Green Building Inspector to make it easier to use green building technologies under the building code and provide upfront coordination and assistance for builders committed to achieving a high level of green building.*
- *Identify funding sources and other incentives that can subsidize City permit fees for innovative or pilot green building projects.*
- *Adopt a green building curriculum and provide ongoing training for zoning and building permit plan-checkers in the City's Planning Department to enable them to be knowledgeable about the latest green building techniques. The training curriculum should be updated regularly to reflect changes in building technologies and techniques.*
- *Increase green building throughout the region by sharing best practices with other area cities through such entities as the Green Building Public Agency Council (PAC). The PAC is a unique collaborative effort of over 100 participating public agencies that meet quarterly to share information, create consistent green building standards in their regions, and support each other's programs and initiatives.*

- c. **Policy: Identify and develop financial incentives and low-cost financing tools to enable increased green building in the private sector**

Implementing Actions:

- *Develop and catalogue financing options for consumers.* The City and partnering organizations such as the East Bay Energy Watch, Build It Green, and StopWaste.Org should provide such resources in a coordinated way.
- d. **Policy: Enhance outreach to encourage developers to adopt national green building and energy performance standards, such as ENERGY STAR, GreenPoint Rated and LEED.**

Implementing Actions:

- *Highlight existing green buildings and cutting edge green technologies through green building tours.* Build It Green currently offers self-guided tours that showcase single and multi-family buildings that were built or remodeled using green materials and practices.
- *Highlight existing green buildings in Berkeley through case studies made available at the City's Permit Service Center and on City and partnering agency websites.*
- *Working with partner organizations and nearby jurisdictions, identify a sponsor and launch a green building awards competition.* Residential and commercial building projects would receive recognition and awards based on metrics related to energy and water consumption, accessibility to alternative forms of transportation, and others and be showcased at the City's Permit Service Center.
- *Expand the green building display in the City's Permit Service Center and utilize it to showcase innovative green build materials and practices.*

2. **Goal: Enhance energy services and standards and reduce costs of energy upgrades for existing residential properties**

Electricity and natural gas consumption in residential buildings accounts for 26 percent of Berkeley's GHG emissions. The bulk of residential emissions – 76 percent – are from natural gas, which is used primarily for space and water heating.

The vast majority of Berkeley's residential structures were built before State-mandated energy standards for new construction were put into place. Many homes are drafty and have poor insulation and inefficient heating systems. While some homes have since been retrofitted with insulation, high-efficiency windows, new major appliances and systems, and other improvements, most existing homes have significant room for additional enhancements to reduce energy consumption. Indeed, the vast majority of GHG reductions from buildings to be gained over the next 30 years will be from energy-efficiency improvements to existing buildings, both residential and nonresidential.

Achieving a 35 percent reduction in residential sector GHG emissions requires substantial public and private investment, but will also result in substantial cost savings (and job opportunities) over time. According to estimates conducted by the California Building Performance Contractor Association (CBPCA), a typical pre-war 1,500 square foot home in Berkeley could reduce its overall energy consumption by 35 – 45 percent with a \$5,000 - \$10,000 investment in energy efficiency improvements. Cost effective energy improvements include sealing air leaks, insulating the attic and walls, upgrading lighting and appliances, and reducing losses from phantom energy loads (i.e., appliances and electronic devices that consume energy even when turned off). Each home and occupant is unique, but one could

expect a typical payback period for an investment similar to the one outlined above to be less than 10 years. Collectively, a 35 percent reduction in total residential energy use would reduce Berkeley residents' cumulative energy costs by approximately \$300 million by 2020.

Capturing these opportunities to save energy and money, as well as to garner valuable co-benefits such as job creation and improved building comfort, requires making existing services and standards more aggressive, providing a suite of energy saving tools and resources to residents, and finding ways to remove barriers to action. Important pieces of the puzzle include:

- *Aggressive local standards for energy use in existing buildings:* The City seeks to adopt local energy efficiency standards for existing residential buildings in order to create a consistent, thorough approach for achieving increased energy efficiency through energy retrofits. Berkeley's standard will be linked to existing accepted standards such as HERS II (recently adopted by the State of California).
- *Education and marketing:* Many property owners are aware of "low-hanging-fruit" energy saving measures such as utilizing ENERGY STAR appliances and compact-fluorescent light bulbs (CFLs). Fewer are aware of a deeper, more integrated, performance-based approach to maximizing energy efficiency and cost savings in a home. This approach starts with a robust analysis of where energy is being wasted and how that waste can be eliminated in a cost-effective manner. Once a home energy analysis is conducted, the next step is connecting residents to a full suite of resources and trained service providers that can implement the energy upgrades. As this plan outlines, the City is developing programs and services that will help inform residents of their energy saving options and the multiple benefits of taking advantage of opportunities to improve their home's energy performance.
- *Financial incentives and financing assistance:* Though the return on investment of energy-saving measures is often quite good, the upfront cost remains the single largest barrier to making substantial energy efficiency improvements in one's residence. The City and a number of community agencies are working to provide various tools and incentives to address that barrier.

Outlined below are policies and implementing actions that will serve to make it easier and more cost effective for Berkeley residents to increase the energy efficiency of their homes.

a. Policy: Establish a standard for home energy audits and energy improvements that provides thorough guidance on achieving deep, sustained energy savings in existing residential buildings

Most existing residential buildings in Berkeley can be improved to use substantially less energy. Nevertheless, given the diversity of the building stock, the appropriate combination of integrated energy improvements is often specific to a building. By establishing a standard for energy audits and upgrades, the City will help to ensure that energy improvements are done in the most comprehensive and cost-effective manner.

The City can promote and eventually require compliance to local energy standards throughout the residential sector in different ways. One is to identify incentives and rebates for early compliance. Compliance could be one basis for eligibility for various energy-related incentives and financing provided by the City government. Another approach is to require improvements to a building's energy performance when a building undergoes a major renovation, is sold, or is converted to condominiums. These events are also a good opportunity to conduct targeted outreach and education to residents. Finally, the City could set a date by which all residential buildings must be in compliance with local energy standards.

The City has an existing standard, the Residential Energy Conservation Ordinance (RECO), which was adopted in 1980. RECO requires that every home or apartment building sold or transferred in Berkeley or undergoing renovations with a total value of \$50,000 or more must meet a prescriptive list of energy and water efficiency requirements for a range of building systems and features, including: toilets, showerheads, water heaters, attic insulation, exterior door weather stripping and common area lighting (for multi-unit buildings).

RECO has served Berkeley well and has been copied and implemented by other U.S. cities. As a vehicle for energy and water efficiency improvements it has a far reach because it is mandatory and is applied whenever a home or apartment building is being sold or renovated.

That being said, it is important to note that the impact of RECO is limited to the time of sale and major renovations. Also, because it is a minimum standard that will apply to all residential buildings, RECO does not require consideration of more comprehensive and expensive measures that might be pursued on a voluntary basis given the proper information and support infrastructure.

The average energy savings associated with RECO measures currently ranges from an estimated 10 - 20 percent per building.

Implementing Actions:

- *In collaboration with energy service providers, community stakeholders and local governments in the region, develop and phase in a local energy standard for existing residential buildings that is designed to facilitate deep, cost-effective reductions in energy use. The standard will ensure that existing residential buildings in Berkeley achieve aggressive, measurable energy efficiency improvements.*
- *Phase in energy standards for existing residential buildings by requiring compliance in order to take advantage of certain incentives and financing; by triggering a compliance requirement at certain events such as major renovations, point of sale, and condo conversions; and by establishing a date certain by which all residential units must adhere to the standard.*
- *Consider requiring that a “cool roof” be installed anytime the roof of a single-family home or multi-family building is being built or re-roofed. A cool roof is a white roof that reflects solar radiation rather than absorbs it. Most roofs are dark and have a typical solar reflectance of 10 – 20 percent. Using white materials can increase reflectance to 70 – 80 percent, which has GHG reduction benefits. For a building with 1,000 square feet of roof area, researchers estimate an offset of 10 MTCO₂e.³⁷*
- *Engage and train energy service providers (e.g., organizations that can conduct comprehensive energy audits and upgrades) to become well versed in Berkeley’s energy standard so that they can serve the market.*
- *Provide a suite of energy-saving programs, resources, education, incentives, rebates and financing options (as described in more detail below under policies b - d) to assist property owners and tenants to comply with the local energy standard.*
- *Partner with the Berkeley Association of Realtors and other real estate professional groups in an effort to conduct targeted outreach and education to new Berkeley homeowners.*

³⁷ Akbari, H., S. Menon, and A. Rosenfeld. 2008. “Global Cooling: Increasing Solar Reflectance of Urban Areas to Offset CO₂.”

b. Policy: Develop and provide comprehensive energy services for local residents

Implementing Actions:

- *In collaboration with PG&E and state and federal government, provide financial incentives for compliance with local energy standards.* PG&E uses ratepayer money, collected through the public goods charge, to fund various incentives for energy improvements. The public goods charge is a surcharge placed on the bills of all PG&E (and other investor-owned utilities) customers. While helpful, the incentives funded through the public goods charge are generally not structured to achieve the scale of savings required under Berkeley's Climate Action Plan. The City seeks to work with relevant agencies to establish additional incentives geared toward Berkeley's local energy standards, i.e., designed to encourage a deeper, more comprehensive set of energy improvements. Such incentives could include providing property owners and tenants with rebates that could be applied to energy services provided by independent service providers.
- *Launch the Smart Solar Program.* The purpose of the program is to make it as easy and inexpensive as possible to make a home (or business) energy efficient and to utilize a solar photovoltaic (PV) and/or solar thermal system. The program achieves this purpose by removing market barriers that inhibit the widespread adoption of these technologies.

Through the Smart Solar program, community agencies will conduct marketing and outreach and offer personalized consultations for potential customers. The consultations will provide guidance and resources to help property owners navigate through the multitude of technology options and incentives that are available. Qualified energy service providers that have experience and in-depth knowledge of the solar and energy efficiency markets will conduct the consultations. Customers will take away from each consultation a better understanding of the cost and benefits associated with potential energy saving solutions.

Smart Solar is modeled after the highly successful Smart Lights Program, operated locally by the Community Energy Services Corporation. Smart Solar is being funded through the U.S. Department of Energy's Solar America Initiative.

The program is scheduled to launch in pilot mode in April 2009.

- *Provide Berkeley FIRST (Financing Initiative for Renewable and Solar Technology) financing for solar photovoltaic energy systems and if feasible, expand the program to include financing for other renewable energy systems and energy efficiency improvements.* Berkeley FIRST is designed to address the financial hurdles facing property owners that wish to "go solar" and make significant investments in energy efficiency. The program enables the City to provide financing for the upfront cost of major energy improvements in privately owned buildings and recoup that cost through a 20-year assessment on the building owner's tax bill. The City launched Berkeley FIRST as a pilot program in the fall 2008 for solar PV installations as a test of the concept. If successful, the goal is to expand the program to support solar thermal installations and energy efficiency measures.
- *Partner with Rising Sun Energy Center to implement its 3-tier energy efficiency and job-training program.* The program delivers energy efficiency services to residents and on-the-job training for youth and people with barriers to employment. Energy services are provided through three progressive tiers:
 - Tier I: California Youth Energy Services (CYES) – Upon appointment, CYES sends two Youth Energy Specialists to a given home to do a basic check of household electricity, natural gas and water consumption and to provide free energy, water and cost savings devices. CYES serves as an energy reduction program as well as a valuable source of training and employment for local high school, community college and trade school students.

According to program staff, on average CYES serves about 325 Berkeley households per year and achieves collective reductions of 150,000 kWh and 1,600 therms annually. This equates to an annual greenhouse gas emissions reduction of 43 metric tons and cost savings exceeding \$21,000.

- Tier II: Green Energy Training Services (GETS) – GETS is an energy efficiency training program and internship geared toward young adults between the ages of 18-35 with barriers to employment. The GETS program will follow up where CYES leaves off by developing program participants’ analytical and installation skills, offering residents a comprehensive energy audit, and working with RSEC’s High Performance Homes (HPH) program to install advanced energy savings measures in homes.
- Tier III: High Performance Homes (HPH) – HPH provides residents with more comprehensive energy efficiency measures, including attic, wall and floor insulation, duct sealing and pipe wrapping. This is a professional level, subsidized service for residents who want to make their home as energy efficient as possible. Trainees from the GETS program will work closely with the HPH contractors as pre-apprentices. RSEC will actively engage contractors working in moderate-to-low income programs to leverage their work with low-income homeowners to provide additional energy efficiency measures.
- Tier IV: Pre-Apprenticeship Trades Training & Postsecondary Career Pathways – Tier IV provides postsecondary classroom training and on-the-job training in the building trades, in business development and marketing, and in green energy and green building careers.
- *Develop targeted energy services for home-based care facilities.* This program would fund performance-based audits and energy-saving measures for qualified childcare facilities, including home-based facilities that do not qualify for other energy programs offered for residential or commercial properties. The program would focus on energy saving measures (e.g., sealing air leaks) that provide several health-related co-benefits. Example co-benefits include elimination of moisture and mold, reduced pest infiltration and debris and other asthma triggers, reduced drafts and improved indoor air quality, reduced radon, and enhanced building durability and fire safety.
- *Partner with East Bay Municipal Utility District (EBMUD) to identify additional opportunities for distribution of free water saving devices and education.*

c. Policy: Expand and better integrate programs for low-income households

Climate protection strategies have both costs and benefits. It is important to ensure that the costs of reducing GHG emissions are not a burden on those who can least afford to pay them, and that everyone shares the benefits of the climate protection effort.

A number of programs currently offered in Berkeley are specifically designed to both reduce energy costs for low-income households and protect the environment at the same time. The programs include:

- City of Berkeley Weatherization Program: Created in 1982, the City’s weatherization program addresses health and safety issues in low-income homes and enables increased energy efficiency and conservation. The program is funded through federal grants and the City’s General Fund. Like the LIEE Energy Partners program mentioned below, the weatherization program offers numerous free services to low-income households, including new energy efficient appliances, water heaters and water heater blankets, attic insulation, door and window repair and replacement, low-flow showerheads, and more. Additional funds leveraged from Community Development Block Grants

are able to provide “Super Weatherization,” which includes a more sophisticated, in-depth energy audit and more comprehensive energy measures.

- Low-Income Energy Efficiency (LIEE) Program: Funded by the State of California, the LIEE program provides no-cost weatherization services and energy education to low-income households in Berkeley and other communities throughout the state. The services are administered in Berkeley through PG&E’s Energy Partners program. Energy services provided for free to low-income households include: attic insulation, energy efficient refrigerators, floor and wall repair, and more.

Together, the Energy Partners and City weatherization programs serve about 520 low-income households in Berkeley per year, or about four percent of all low-income households annually. Program staff estimates that on average each household served by these programs reduces annual energy consumption by 10 - 25 percent, saving residents over \$100,000 on collective energy costs every year.

Despite the success of these programs, the City, PG&E and the appropriate state and federal agencies can take steps to increase the effectiveness of services offered to low-income households. Better integrating existing programs and expanding the services provided to include additional energy saving measures and a more comprehensive home energy audit would result in increased energy efficiency and cost savings, and would eliminate the need to return to the property to capture additional energy savings later.

Implementing Actions:

- *Conduct a “gap analysis” or baseline study to determine how to effectively expand and enhance energy services for low-income clients.* The gap analysis will determine how to eliminate duplication in services, how to provide more efficient and integrated services and, when funding is available, how to expand services to clients who have not yet been served.
- *Combine the delivery of City and agency programs with other income-qualified assistance programs.* An integrated suite of low-income programs will provide increased potential for energy and cost savings and health-related benefits as well as more cost-effective program delivery. Existing programs to be incorporated include:
 - Community Development Block Grant (CDBG) funded programs: A program provided by the U.S. Department of Housing and Urban Development (HUD), CDBG funding supports the Home Safety & Repair program, administered locally by Community Energy Services Corporation (CESC). Eligible low-income homeowners are entitled to free home repair services such as plumbing, electrical and carpentry repairs; mobility and access installations (grab bars, hand rails, lifts, ramps, etc.); and fire and earthquake safety measures.
 - Senior and Disabled Home Rehabilitation Loan program: This program assists low-income senior and disabled homeowners in repairing their homes, to eliminate conditions that pose a threat to their health and safety, and to help preserve the City housing stock. Qualified borrowers can receive interest-free loans of up to \$35,000.
 - City of Berkeley Weatherization Program: As described above, this program offers energy services to low-income residents.
- *Develop and implement Green LEEP (Low-income Energy Efficiency Program).* Green LEEP would provide comprehensive, performance-based energy testing and installation of energy saving measures for qualified low-income residents.

- *Develop and implement the Rental Housing Energy Efficiency Loan (RHEEL) program.* The RHEEL program would provide up to \$10,000 per housing unit to reimburse landlords of low-income residents for comprehensive energy analyses and upgrades. The loan would be interest-free and repayable after either ten years or when the property is sold. The program would be implemented on a pilot basis for a relatively small number of rental properties for the first year and then, if successful, be expanded to include a larger number of buildings
- *Partner with GRID Alternatives.* GRID Alternatives provides low-cost solar electric systems to qualified low-income homeowners. By using utility rebates, grants and sweat equity, GRID Alternatives is able to offer substantially reduced cost systems sized and installed for low-income homeowners. This program can be leveraged for property owners receiving new roofs under Berkeley’s Senior and Disabled Home Loan program.

d. Policy: Identify and capture opportunities for energy and water savings in renter-occupied units

One significant barrier to achieving GHG reductions in residential buildings is what is referred to as the “owner/tenant split financial incentive.” Building owners have little incentive to invest in energy or water efficiency improvements since any gains will primarily flow to the tenants who often pay the utility bill. Conversely, tenants have little incentive to invest in structural efficiency improvements when they do not own the building and their tenure in a unit is generally of shorter duration relative to the “pay-back” on the investment.

Given the fundamental economic barrier to action that the split incentive represents, one plausible solution is to create a situation in which the landlord can more easily gain some financial benefit from her/his investments in building energy and water improvements so long as the tenants receive an overall reduction in expenses on their energy bill. This is much easier in theory than in practice.

In order to overcome the “split incentive” barrier, the Rent Board along with the appropriate City departments, community agencies and other stakeholders should begin a process to evaluate potential outreach efforts, incentive structures and mandatory requirements that enable both the landlord and the tenant to benefit from building energy and water efficiency improvements.

Implementing Actions:

- *Work with the Rent Board to streamline existing opportunities for landlords to pass through the cost of high quality energy and water efficiency measures to tenants when the measures result in a reduction in tenant energy and water bills.* The goal of this effort is to make energy and water improvements cost-neutral for landlords while improving tenant comfort and health and safety and while reducing costs associated with energy and water consumption.
- *Develop and implement an outreach strategy to encourage landlords to take advantage of opportunities to pass through the cost of energy saving measures to tenants.*
- *Work with community partners to design a program that would require that upon vacancy, an energy rating system be applied to rental units so as to inform future occupants of the costs and relative energy and water efficiency associated with the unit.*
- *Develop and market a green landlord database.* The database will include information about landlords that have implemented a defined set of energy and water saving measures. The database will help to inform potential tenants’ housing choices.

3. Goal: Enhance Energy Services and Standards for Existing Commercial Properties

Similar to the City's residential structures, most of Berkeley's commercial/industrial building stock predates the State's existing energy standards. Many Berkeley businesses have considerable potential for energy (and money) savings through lighting upgrades, efficiency improvements made to heating, ventilating and air conditioning (HVAC) systems, and other measures.

The actions outlined in this section seek to expand existing efforts in large part by establishing aggressive local energy standards and enhancing and increasing access to tools such as more comprehensive energy audits, increased energy-related services, and financing assistance.

a. Policy: Establish a standard for energy audits and energy improvements in nonresidential buildings that provides thorough guidance on achieving deep, sustained energy savings

The City will establish a standard for energy audits and upgrades to help ensure that energy improvements are done in the most comprehensive and cost-effective manner.

As with residential buildings, the City can promote and eventually require compliance to local energy standards throughout the commercial sector in a few different ways. One, identify incentives and rebates for early compliance. Two, compliance can form the basis of a given building owner's eligibility for various energy-related incentives and financing provided by the City government. Three, requirements for improving building energy performance can be triggered during certain events, such as building renovation or point of sale or lease. These events are also a good opportunity to conduct targeted outreach and education to building managers and owners. Finally, the City can set a date by which all nonresidential buildings must be in compliance with local energy standards.

The City has an existing standard, the Commercial Energy Conservation Ordinance (CECO), which was adopted in 1985. CECO requires that every commercial property owner that plans on selling a property, doing a major renovation (costing \$50,000 or more), or building additions that will increase the "conditioned" area of the commercial property by more than 10 percent must initiate CECO compliance. Its intent is to help protect commercial property owners and tenants from energy price increases by reducing the amount of energy used for space ventilation, heating and cooling, hot water, and lighting.

Like its counterpart in the residential sector, CECO is an effective vehicle for energy and water efficiency improvements and has a far reach because it is mandatory whenever a commercial building is sold or substantially renovated. The average energy savings associated with the current CECO are about 10 - 15 percent per commercial building. Like the residential standard, the City will develop a new set of standards to be more broadly applied to the existing commercial stock.

Implementing Actions:

- *In collaboration with energy service providers, community stakeholders and local governments in the region, develop and phase in a local energy standard for existing nonresidential buildings that is designed to facilitate deep, cost-effective reductions in energy use. The standard will ensure that existing nonresidential buildings in Berkeley achieve aggressive, measurable energy efficiency improvements.*
- *Phase in energy standards for existing nonresidential buildings by requiring compliance in order to take advantage of certain incentives and financing; by triggering a compliance requirement at*

certain events such as major renovations and point of sale or lease; and by establishing a date certain by which all units must adhere to the standard.

- *Consider requiring that a “cool roof” be installed anytime the roof of a building is being built or re-roofed. A cool roof is a white roof that reflects solar radiation rather than absorbs it. Most roofs are dark and have a typical solar reflectance of 10 – 20 percent. Using white materials can increase reflectance to 70 – 80 percent, which has GHG reduction benefits. For a building with 1,000 square feet of roof area, researchers estimate an offset of 10 MTCO₂e.³⁸*
- *Require all fluorescent lamps, magnetic ballasts, and incandescent lamps be retrofitted for higher efficiency technology for commercial building permits to be issued.*
- *Engage and train energy service providers (e.g., organizations that can conduct comprehensive energy audits and upgrades) to become well versed in Berkeley’s energy standard so that they can serve the market.*
- *Provide a suite of energy-saving programs, resources, education, incentives, rebates and financing options (as described in more detail below under policies b - d) to assist property owners and tenants to comply with the local energy standard.*
- *Partner with property management firms and real estate professional groups in an effort to conduct targeted outreach and education to building owners.*

b. Policy: Develop and provide comprehensive energy services for local businesses and commercial property owners

Implementing Actions:

- *In collaboration with PG&E and state and federal government agencies, provide financial incentives for compliance with local energy standards. PG&E uses ratepayer money, collected through the public goods charge, to fund various incentives for energy improvements. The public goods charge is a surcharge placed on the bills of all PG&E (and other investor-owned utilities) customers. While helpful, the incentives funded through the public goods charge are generally not structured to achieve the scale of savings required under Berkeley’s Climate Action Plan. The City seeks to work with relevant agencies to establish additional incentives geared toward Berkeley’s local energy standards, i.e., designed to encourage a deeper, more comprehensive set of energy improvements. Such incentives could include providing property owners and tenants with rebates or mini-grants that could be applied to energy services provided by independent service providers.*
- *Launch the Smart Solar program. As is described above under Goal #2, the purpose of the program is to make it as easy and inexpensive as possible to make one’s home or business energy efficient and to utilize a solar photovoltaic (PV) and/or solar thermal system. See additional detail in previous section.*
- *Provide Berkeley FIRST (Financing Initiative for Renewable and Solar Technology) financing for solar photovoltaic energy systems and if feasible, expand the program to include financing for other renewable energy systems and energy efficiency improvements. As is described above under Goal #2, the program enables the City to provide financing for the upfront cost of major energy improvements in privately owned buildings and recoup that cost through a 20-year assessment on the building owner’s property tax bill. See additional detail in previous section.*

³⁸ Akbari, H., S. Menon, and A. Rosenfeld. 2008. “Global Cooling: Increasing Solar Reflectance of Urban Areas to Offset CO₂.”

- *Enhance the Smart Lights program energy audit process to make it more comprehensive.* The Smart Lights program provides businesses with hands-on assistance in assessing specific lighting needs and delivering significant discounts on the installation of high-quality, energy efficient lighting and refrigeration improvements. Based on the program's records, Smart Lights has conducted lighting system audits and retrofits in about 700 small businesses since 2002. The program has enabled energy savings approaching five million kWh in that same timeframe. The result is a reduction in Berkeley's greenhouse gas emissions of approximately 1,400 metric tons over the past six years. There is potential to further leverage the program's existing outreach and operations by expanding its services to include a more comprehensive energy audit for small businesses that would identify additional energy and cost saving measures.
- *Develop and implement the Berkeley Cleaner Solar program.* This grant program of up to \$2,000 in direct subsidies for solar thermal projects would assist laundry facilities to offset natural gas consumption. Laundromats provide either heat or heated water for laundry and are therefore particularly vulnerable to natural gas price fluctuations. This subsidy would be leveraged with utility incentives, state and federal tax deductions, and assistance provided through the Berkeley Smart Solar program.
- *Improve marketing of energy-related rebates for small businesses.* Rebates from entities such as PG&E and the California Energy Commission should be better marketed through City and partner agency websites and outreach.
- *Market Demand Response Programs where appropriate.* Such programs offer incentives for business owners who curtail their facilities' energy use during times of peak demand.

c. Policy: Identify opportunities for energy savings in renter-occupied/leased commercial buildings

Similar to the residential market, there is an owner/tenant split incentive in the commercial market: commercial renters usually pay the utility bill and have little incentive to invest in building improvements related to energy; the owner does not pay utilities and therefore has little incentive to invest in improvements that would reduce energy consumption and costs. Unlike the residential rental market however, commercial property owners are not subject to rent control and can therefore pass through the costs of improvements without going through the procedures mandated for rented residential properties.

CECO (described above) increases the implementation of energy saving measures in buildings being sold or undergoing major renovations. However, that is a relatively small number of buildings. To address buildings that are not being sold or renovated, it will be worthwhile to establish standards, incentives and programs to make it easier for property owners to make energy upgrades.

In addition, the City and its partners must do more to educate commercial entities on state law (AB 1103, 2007) requiring energy consumption disclosure at the point of lease and point of sale in nonresidential buildings

Implementing Actions:

- *Develop model lease provisions that would encourage landlords and tenants to share the liability and benefit of energy saving measures.*
- *Develop and market a green landlord database.* The database would include information about building owners that have implemented a defined set of energy and water saving measures.

- *Encourage commercial building owners to use Portfolio Manager for energy tracking.* Portfolio manager is a free, web-based database operated by the EPA for commercial buildings and their energy consumption. Building owners only need to fill in basic information on the building, upload the information, and Pacific Gas and Electric energy information will automatically be uploaded every month for easy tracking and monitoring. Energy information can easily be downloaded for new tenants, or at time of sale.

d. Policy: Expand energy saving opportunities for large commercial properties

With energy prices turning increasingly volatile, forward-thinking large commercial and industrial building owners and operators are already looking for ways to reduce energy consumption and cut costs. It helps that large commercial/industrial properties generally have an account manager at PG&E who can provide up-to-date rebate and resource information. In collaboration with PG&E and relevant state agencies, the City can play a role to identify additional services and resources that make it easier for large commercial properties to save energy and money.

Implementing Actions:

- *Partner with local community agencies to encourage large commercial businesses to retire old HVAC systems.* The success of this effort depends on access to state-level subsidies and incentives.
- *Partner with local community agencies to implement commissioning and re-commissioning for new development, major renovations, and existing buildings.*
- *Improve marketing of rebates.* Rebates from entities such as PG&E and the California Energy Commission should be better marketed through City and partner agency websites and outreach.
- *Market Demand Response programs to large businesses in order to reduce high-carbon peak load.* Demand Response programs are designed to encourage and assist consumers to reduce electricity demand during times when demand for electricity is at its peak. During times of peak electricity demand, utilities often must utilize “dirtier” sources of energy in order to meet consumer demand.
- *Encourage local large businesses to track the energy consumption in their facilities through ENERGY STAR Portfolio Manager.* Portfolio Manager is a free, web-based energy management tool that enables businesses to track and assess energy and water consumption across a building portfolio.

4. Goal: Increase residential and commercial renewable energy use

The energy efficiency actions outlined above represent an irreplaceable step toward meeting the Measure G goals. It is also critical to “green” the energy supply we consume through increased utilization of renewable energy sources.

Essentially, the community has two main options for changing the composition of its energy supply:

- Develop a local, clean, decentralized, renewable energy supply, mostly in the form of residential and commercial solar PV and solar thermal installations. The City’s goal is to achieve an annual GHG reduction of 11,600 metric tons by 2020 as a result of local solar installations. This goal is based on a preliminary analysis of unshaded rooftops in Berkeley. The analysis indicates that there is more than two million square feet of roof space that is unshaded by adjacent structures. About 30 percent of this space is shaded by trees or otherwise unavailable for solar. The 2020 goal is to cover 70 percent of the available roof space with solar thermal or solar electric panels.

- Add more renewable energy sources to the electricity grid. This option can be accomplished by either working with PG&E and relevant State agencies to achieve a higher Renewable Portfolio Standard or through Community Choice Aggregation, also known as Community Choice Energy (CCE). Under CCE, the City government would be empowered to choose the community's energy provider and the source of electricity.

The City of Berkeley is committed to implementing the first option. It is not mutually exclusive with the second. The City must decide in the short term how best to implement the second option given existing and future policy priorities, market conditions, and risks to taxpayers and ratepayers.

Each of these options, along with policies and implementation actions for increased wind generation and other renewable technologies, is outlined in more detail below.

a. Policy: Implement targeted assistance and outreach to increase decentralized solar installations in homes and businesses

The first solar electric cell was created in 1954. Solar technology has come a long way since then. The basic principles of the technology have not changed, but the cost of installing a solar electric or solar thermal or hot water system has become increasingly competitive with conventional forms of energy. Globally, the use of solar electric systems has experienced growth rates of about 30 percent per year over the last decade and the cost of the technology has dropped at least three percent per year for the last 20 years.

Solar radiation can be captured to produce emissions-free electricity and heat for our homes, businesses and public institutions. Decentralized, solar generated power has a number of important advantages, including:

- It reduces our reliance on fossil fuels and the greenhouse gas emissions that result from fossil fuel consumption
- Decentralized energy production is less vulnerable than grid energy during natural disasters
- It reduces stress on our local electricity infrastructure by reducing peak load
- Local production reduces electricity distribution costs and increases distribution efficiency by being installed close to energy loads, such as on a roof (10 - 20 percent of energy can be lost in the transmission of grid energy)
- It eventually pays for itself and subsequent energy cost savings can go straight to one's bottom line

In Berkeley, a hundred square feet of solar photovoltaic panels can save about 1,500 pounds (680 kg) CO₂e per year. On a per capita basis, Berkeley has the highest number of solar photovoltaic (PV) installations of any large city in Northern California. According to the California Energy Commission (CEC), there is 2,070 kilowatts (DC kW) worth of solar PV systems installed or approved for installation at 527 different sites within the City of Berkeley, including 22 kW at two municipal sites. While these installations represent a good start, it is still only a start.

A hundred square feet of solar thermal panels for hot water can save about 3,000 pounds (1,360 kg) CO₂e per year. Increasing the number of solar thermal installations in Berkeley is a particularly effective GHG reduction measure since the emissions that result from natural gas consumption in Berkeley buildings are more than double the emissions that result from electricity consumption. Solar thermal installations on a home or business can eliminate or greatly reduce the natural gas consumed to

heat our water and our buildings. The cost for solar thermal installations is generally less than half the cost of a solar electric system for residential buildings; moreover, the technology is very simple, and long lasting. Many systems that were installed in Berkeley in the 1970s are still in operation today. Because of its low installation and operational costs, solar thermal is also an excellent choice for many small commercial applications that use significant amounts of hot water, such as laundromats, restaurants, hair salons, and fitness centers, as well as larger institutions, such as hospitals, schools, hotels and conference centers.

Implementing Actions:

- *Launch Smart Solar program.* As is described above under Goal #2, the purpose of the program is to make it as easy and inexpensive as possible to make one's home or business energy efficient and to utilize a solar photovoltaic (PV) and/or solar thermal system. See additional detail under Goal #2.
- *Provide Berkeley FIRST (Financing Initiative for Renewable and Solar Technology) financing for solar photovoltaic energy systems and if feasible, expand the program to include financing for other renewable energy systems and energy efficiency improvements.* As is described above under Goal #2, the program enables the City to provide financing for the upfront cost of major energy improvements in privately owned buildings and recoup that cost through a 20-year assessment on the building owner's property tax bill. See additional detail in previous section.
- *Launch an on-line Solar Map.* The application estimates the solar energy potential for commercial and residential structures and allows building owners to estimate the potential environmental benefits and monetary savings that would result from installing solar energy panels on their property. The user enters an address and sees a map view of that location.
- *Identify funding sources to subsidize and eliminate solar permit fees (including solar thermal) for residential dwellings and lower fees for solar permits for commercial buildings.*

b. Policy: Partner with the State government and utilities to green the energy mix that supplies the region's grid electricity

Should the City of Berkeley continue to rely on PG&E for its electricity supply, then that electricity supply will have to become significantly "greener." Achieving a green electricity supply relies heavily on the Renewable Portfolio Standard (RPS), a standard set at the state-level that is designed to gradually increase the portion of electricity produced or purchased by PG&E and other utilities from renewable energy sources such as solar, wind, geothermal and biomass.

The current RPS is 20 percent renewable energy by 2010. Governor Schwarzenegger set a goal of achieving 33 percent renewable sources by 2020 and the State Air Resources Board included that goal in its adopted Scoping Plan as part of implementation of AB 32 (Global Warming Solutions Act).

In 2007, PG&E received about 11.4 percent of its power supply from renewable sources.

Implementing Actions:

- *Support the California Air Resources Board recommendation to increase the Renewable Portfolio Standard to 33 percent by 2020. Urge PG&E to achieve that standard.*
- *Urge Congress to maintain tax credits for renewable power developers.* Such tax credits increase the supply of renewable energy sources, thereby making it easier for utilities such as PG&E to achieve the RPS.

- *Urge the State to revise net metering rules to enable residential and commercial customers to earn refunds for excess energy generated.*
- *Urge the State to allow utilities to count decentralized energy sources toward the RPS requirement and to raise the RPS a commensurate amount.*

c. Policy: Consider Community Choice Energy

Community Choice Energy (CCE) would involve the City of Berkeley partnering with other cities to form a joint powers authority to purchase electricity. CCE enables participating cities to choose the community's electric provider and source of electricity, including bulk purchases of renewable energy for residents and businesses. CCE involves the City in the purchase, sale, and possible generation of the energy commodity. Under CCE, Berkeley and its partner cities would enter into long-term agreements to purchase electricity, including renewable energy. PG&E would ultimately provide the electricity to residents using their transmission and delivery systems (i.e., the utility poles and wires).

CCE has potential benefits, including the increased use of renewable energy sources for electricity generation and local control of energy policy and electricity rates. CCE also has risks, such as costs to the City (particularly during start-up), potentially higher electricity rates and the potential that PG&E's electricity generation mix could emit fewer GHG emissions than what would be achieved by CCE in the short-term. Note that PG&E's 2007 power mix does include 23 percent nuclear and 13 percent large hydroelectric sources.

In the fall 2008, the cities of Berkeley, Oakland and Emeryville released a feasibility study (revised from an earlier draft) and business plan. At that time, staff recommended not to proceed with CCE due to risks and uncertainties associated with the program, including known and unknown financial and legal risks associated with creating and operating an enterprise with a \$230 million dollar annual budget. Emeryville has since decided not to proceed with CCE, and Oakland may consider the issue later in 2009. Several Marin cities are considering CCE under an effort sponsored by the County, as are several cities in the San Joaquin Valley, under an effort sponsored by King's River Conservation District (KRCD). Given the potential for CCE to contribute to the City's GHG reduction goals and motivations regarding local control of our energy supply, the City will monitor market conditions, the efforts of other jurisdictions, and PG&E's ability to comply with their renewable energy requirements. Based on this information, the City should consider whether or not to reexamine CCE in the future.

Implementing Actions:

- *Continue to consider CCE and to monitor the efforts of other jurisdictions and PG&E's ability to comply with their renewable energy requirements.*

d. Policy: Identify and implement opportunities for increased wind generation and the use of other renewable energy technologies

For centuries societies have harnessed the wind to generate clean, emissions-free power. Today the basic concept is the same though the technology is much improved. In fact, in the U.S. and other parts of the world we are beginning to see a resurgence of small wind turbines that can be used in the urban/suburban setting to generate electricity. Wind energy is now cost-competitive with grid energy and, like solar, small wind turbines can save customers money and protect us from rising energy costs.

In June 2007 the City of Berkeley became the first city in the nation to install a wind turbine for one of its buildings. The City's Shorebird Park Nature Center classroom utilizes a small, 1.8 kW wind turbine to offset some of its electricity needs. The wind turbine supplements the building's existing solar PV

and solar thermal systems. The clean electricity the turbine supplies will eliminate about 900 pounds (408 kg) of GHG emissions from entering the atmosphere every year. Further, the tower is expected to be safe for area birds. The Golden Gate Chapter of the Audubon Society wrote a letter in support of the project.

The City of Berkeley hopes that the Shorebird Park Nature Center's wind turbine will serve as a pilot for the installation and utilization of wind energy systems on a local scale. Lessons learned can be applied to any future efforts to install appropriately sited wind turbines in the community. The City will work with various partners to consider and evaluate the feasibility of additional turbines that can serve as sources of clean, renewable, decentralized energy.

Implementing Actions:

- *Conduct a study to identify the wind energy generation potential in various parts of Berkeley (taking into consideration potential impact on wildlife) and identify opportunity sites where wind energy can best be implemented.*
- *Based on the study above and working with stakeholders, evaluate modifications to the building code that may be necessary to facilitate the installation of wind turbines within city limits. Work with the State to modify the building code, if necessary.*
- *Investigate the potential and possible sites for combined heat and power (CHP) systems in Berkeley. Combined heat and power systems represent an efficient approach to generating power and thermal energy from a single fuel source such as natural gas. CHP systems provide onsite generation of electricity as well as waste-heat recovery that can be used for space conditioning (heating and cooling), hot water systems and other processes such as refrigeration and food processing. Such a system requires a large and steady demand for thermal energy in a central location. CHP systems usually have an "anchor site" such as a hotel or industrial operation, and "client sites" that can use the excess thermal energy. They are typically powered by natural gas but have much lower emissions than traditional separate systems because of the higher efficiencies.*
- *Research the potential for a grid-connected wave energy system in the San Francisco Bay. Wave energy systems utilize the motion of waves to drive turbines that generate electricity.*
- *Evaluate the effectiveness of a green waste anaerobic digester for collected waste. The methane captured by an anaerobic digester can be used to power vehicles, boilers, etc.*

5. Goal: Increase Energy Efficiency and Renewable Energy Use in Public Buildings

The GHG emissions that result from energy and water use in municipal buildings account for about one percent of Berkeley's total community-wide emissions. As such, actions to reduce energy use in City government buildings will have a relatively minor impact on our community's overall carbon footprint in the long run. However, climate action in municipal buildings and in schools demonstrates leadership that extends beyond the magnitude of the amount of greenhouse gases reduced.

Along with community partners such as KyotoUSA, the City and the Berkeley Unified School District (BUSD) are consistently investigating the potential for additional energy efficiency and renewable energy actions. Outlined below are some of the ways in which the City government and BUSD are already showing leadership:

- The City partnered with the Smart Lights program to conduct lighting upgrades in the City's building at 1947 Center Street. This lighting retrofit alone is expected to save the City about \$9,000 per year in energy costs and reduce electricity consumption by 64,000 kWh. The result is an annual reduction in greenhouse gas emissions of about 15 metric tons.
- The City's red and green traffic lights and orange pedestrian signal lights function with energy efficient LEDs (light-emitting diodes) at all of Berkeley's 127 intersections. LEDs emit a strong light but use far less energy than conventional incandescent bulbs. Making the switch to more energy efficient street signal lighting is saving the City \$143,000 per year in taxpayer money and reducing annual greenhouse gas emissions by approximately 225 metric tons.
- The City is also working to reduce the energy it takes to heat and distribute water by increasing water efficiency in all of its facilities. Measures include:
 - Conducting regular audits of indoor and outdoor water use
 - Installing low-flow toilets and faucet aerators
 - Minimizing water leaks in plumbing
 - Implementing smart landscaping that requires less irrigation
- A number of City buildings/structures already have solar installations, including:
 - The corporation yard has a 20 kW solar PV system. The installation offsets 31,000 kWh of electricity annually
 - The Berkeley West Campus Swimming Pool boasts a solar hot water system that offsets approximately 70 percent of the natural gas consumed to heat water for the showers
- The City's Shorebird Park Nature Center employs a combination of renewable energy technologies. The Nature Center is a straw-bale building that incorporates passive day lighting and thermal mass for heat retention, solar PV and solar hot water panels for domestic hot water and space heating and a 1.8 kW wind turbine to offset its conventional electricity load.
- The U.S. Green Building Council awarded LEED certification to the City's Shasta Hills Fire Station. Green design and construction elements featured in the project include landscaping that conserves water and reduces waste; diversion of more than 75 percent of the project's construction waste from the landfill; and reduced energy use through high-performance windows and efficient lighting, appliances and building systems.
- Washington Elementary recently became the first BUSD School to go solar. The school's 100 kW solar PV system will produce enough electricity to meet the needs of the main facility without increasing BUSD's energy costs. Conceived by the local volunteer group KyotoUSA, the initiative will not only reduce local GHG emissions, but also assist in educating students about renewable energy and its benefits.

a. **Policy: Continue to identify and implement opportunities for increased energy and water efficiency in public buildings**

Implementing Actions:

- *Maintain and continually update the City Capital Improvements Plan.* The plan serves as the City's performance-based guide for identifying and implementing energy and water saving measures in City buildings.
- *Ensure that the City and BUSD purchase high efficiency computer equipment and other office appliances and operate the equipment as energy efficiently as possible.* By activating sleep settings on employee computers the City's Department of Information Technology is reducing City

government energy consumption by 238,680 kWh per year. This results in an annual reduction of 116,950 pounds (53,000 kg) CO₂e and an annual cost savings of approximately \$32,500.

- *Benchmark and track public building energy performance through ENERGY STAR's Portfolio Manager.*
- *Launch an on-bill financing pilot program with PG&E.* On-bill financing would enable the City and BUSD to pay for the upfront cost of a given set of energy saving measures through the cost savings achieved by those measures.
- *Establish an annual energy reduction target for each City department.* Each department would be responsible for initiating programs to achieve its target.
- *Draft and implement an Administrative Regulation for energy and water efficiency in all City buildings.* An Administrative Regulation would provide formal guidance to City employees regarding how to use energy and water in an efficient manner.

b. Policy: Continue to identify and implement opportunities to utilize renewable energy systems in public buildings

Implementing Actions:

- *Require that re-roofing projects on City buildings evaluate the feasibility of incorporating "solar ready" features, including mounting posts for panels and roof penetrations for conduit and/or pipes.*
- *Install solar thermal systems on Berkeley Fire Stations to offset natural gas consumed for water heating.*
- *Identify potential sites for solar parking lot and solar bus stop canopies.*
- *Partner with KyotoUSA to identify additional solar opportunities on BUSD schools.*

6. Goal: Enhance and expand marketing, outreach and education regarding building energy use

Personal choice underlies many of the building energy use-related changes that will have to occur in order for the community to achieve its GHG-reduction goal. As such, enhancing and expanding current education and outreach efforts is fundamental to this plan. Such efforts are aimed at providing community members with access to information that enables them to make informed choices.

The actions outlined below represent a strategic start rather than a comprehensive list of the things our community can do to affect behavior change. New and innovative ideas for creating social change happen all the time. The City and its partners will continue to seek and harness such ideas. See the chapter on Community Outreach & Empowerment for more.

a. Policy: Work with regional and local community partners to provide sustained outreach and education to Berkeley citizens regarding energy efficiency and renewable energy use

Implementing Actions:

- *Include building energy use-related education materials in a welcome package for all new homebuyers/renters, including available rebates and incentives for energy measures.*

- *Partner with the Berkeley Board of Realtors on an outreach and education effort that targets new Berkeley homeowners.*
- *Coordinate outreach between City divisions that provide related services to the community, including energy services, child and low-income health programs, housing programs, and safety programs.*
- *The City’s Office of Energy & Sustainable Development should continue to produce and distribute information at community festivals and to offer free energy education events and presentations for the public.*
- *Identify and catalogue existing energy efficiency showcases within the community. Showcase innovative projects on City and partner agency websites.*
- *Design and implement a “Lights Out at Night” campaign to reduce the amount of energy being wasted by local institutions (including the City government) and businesses.*
- *Launch an annual “Get Off Your Gas” contest to encourage Berkeley residents to reduce natural gas consumption during the winter months. The Office of Energy and Sustainable Development is to manage the contest. Prizes will be awarded in several categories, including greatest amount of natural gas reduction from the previous year, lowest overall natural gas bill and most creative energy efficiency strategy.*
- *Initiate a voluntary home energy and water-monitoring program. Energy and water monitoring in commercial and residential buildings has the potential to enhance the long-term value of the energy audits and upgrades outlined in this chapter. The City should explore opportunities to work with PG&E, East Bay Municipal Utilities District and others to provide residents and business owners with personalized energy consumption reports. Such reports would not only help households and businesses to track consumption patterns over time, but could also be used to suggest targeted energy and water saving measures.*

7. Goal: Prepare local residents for green collar job opportunities

Step one toward creating green collar job opportunities is a commitment to enhance demand for energy services such as building retrofits and solar installations. These services not only reduce energy consumption and GHG emissions, but also create increased demand for people that can do the work. Importantly, this demand for labor is *local*, because it requires improving our *local* built environment. It cannot be outsourced. The City must work with neighboring cities and community agencies to connect local residents to emerging job opportunities. In doing so we will protect the environment and provide pathways to sustainable employment at the same time.

The City of Berkeley and several partners have already begun the task of preparing local residents for jobs in the emerging green economy. Together, through a cooperative effort called the *East Bay Green Corridor Partnership*, the Cities of Berkeley, Oakland, Richmond and Emeryville are joining with leaders from UC Berkeley and Lawrence Berkeley National Laboratory (LBNL) to design a regional program that supports green workforce development. The goal is to provide the training and education necessary to meet future workforce demand in the green economy and to continue to attract green energy investment in the region. The partnership works collaboratively to 1) identify regional employer demand, and 2) develop new technical and soft skills training and education programs to help meet the industry demand. The overarching vision is to develop Green Energy Education and Career Pathways that provide multiple entry points into the training and education system and that lead people into jobs with career ladders and benefits.

- a. **Policy: Prepare and promote our local workforce for local and regional green jobs that offer stable employment, career growth and living wages**³⁹

Implementing Actions:

- *Identify projected demand for skilled labor associated with implementation of the Climate Action Plan and other sustainability strategies through partnerships with economic development agencies, local universities, community colleges, certified apprenticeship programs, workforce development and training programs, businesses, and community agencies.*
- *Integrate energy and climate-related education into the public school curriculum and after school learning programs and explore development of a high school Green Career Technical Academy by partnering with the Berkeley Unified School District, Berkeley High School and the Berkeley Technical Academy (B-Tech). Berkeley High School's School of Justice and Ecology received funding to be a Community Partnership Academy incorporating career education and climate change education through their biology and environmental science courses. Students also take part in a range of hands-on activities and internships outside the classroom.*
- *Strengthen and expand job training partnerships and opportunities that prepare young adults, many with barriers to employment (e.g., lack of education, language/cultural barriers, etc.), to seize existing and future green collar job opportunities. The East Bay Green Corridor Partnership and other community partners such as Rising Sun Energy Center are actively developing training in life and job readiness skills, career counseling, specific skilled labor training, job placement assistance, assistance in meeting apprenticeship program requirements, and long-term follow-up support for participants.*
- *Assist Berkeley residents to enroll in pre-apprenticeship trades training programs, such as those that prepare students for jobs in green construction, energy retrofits, and solar photovoltaic installation. Work with Rubicon Workforce Services (the North County One-Stop Center), Berkeley Youth Alternative (the North County agency funded with Workforce Investment Act funds for youth), City of Berkeley Programs, and schools and community programs reaching out to South and West Berkeley youth to expose them to green job education and training opportunities.*
- *Provide ongoing support for local green businesses and industries that provide green collar jobs. The City can provide this support in several ways, including: utilizing procurement dollars and city contracts to support local green businesses; providing marketing assistance; and helping local green businesses access energy efficiency and renewable energy services.*
- *Stimulate demand for energy services and an energy service workforce by strengthening and improving the administration and performance of the City's First Source Employment Ordinance and by developing additional provisions and incentives to encourage green businesses and contractors to hire local and provide high-quality employment. The First Source Employment Ordinance will be strengthened to ensure that local workforce development efforts produce qualified candidates for jobs in the energy services sector. Berkeley's Department of Planning and Development and the Office of Economic Development will work together to explore incentives for businesses and contractors to hire local workers. Such incentives could include, but are not limited to, rebates on permits related to solar installation or energy efficiency improvements for contractors that hire local.*

³⁹ For an in depth analysis of green jobs potential and policies see: *Green Collar Jobs: An Analysis of the Capacity of Green Businesses to Provide High Quality Jobs for Men and Women with Barriers to Employment*. This report is a case study specific to Berkeley and was funded by the City's Office of Energy and Sustainable Development.