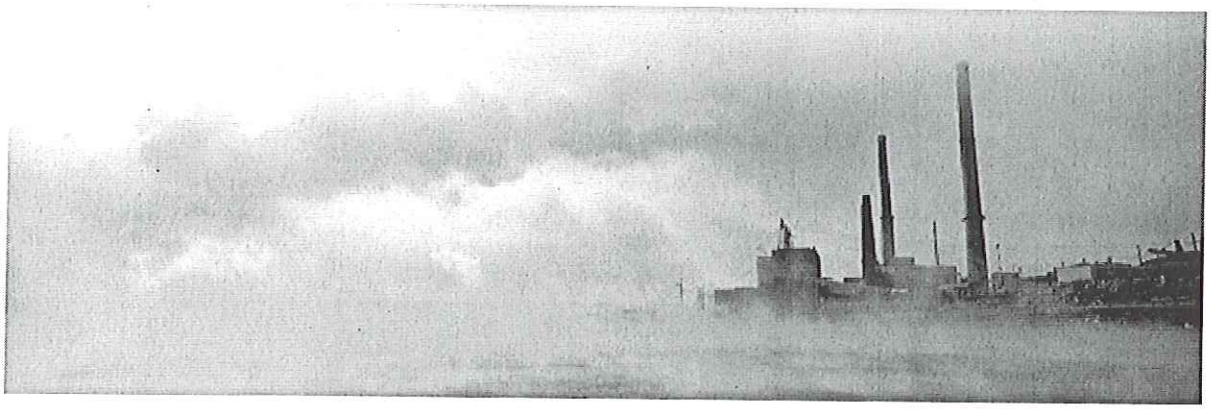
Assessment of Arcata's Community Greenhouse Gas Reduction Plan



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Environmental Science 411: Sustainable Campus

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I. PROBLEM STATEMENT

The City of Arcata has not met its greenhouse gas reduction targets, as outlined in the Community Greenhouse Gas Reduction Plan; we are assessing the plan to determine why goals weren't met and to develop recommendations for the City of Arcata to assist in future emission reductions.

II. GOAL AND OBJECTIVES

Goal

Identify why Arcata didn't meet their initial emission reduction targets and make suggestions to promote the city's ability to meet future reduction plans.

Objectives

- Determine why certain areas of the city's emission reduction plan were successful and why others were not.

- Develop a plan that:

(1) addresses energy uses
(2) considers funding sources for programs
(3) could be used to reduce greenhouse gas emissions

III. PROBLEM BACKGROUND

The City of Arcata prepared a Community Greenhouse Gas Reduction Plan in the year 2000 with the goal of reducing greenhouse gas emission rates 20% by 2010; the results show there has actually been an increase in emissions (City of Arcata). Arcata joined the International Council on Local Environmental Initiatives (ICLEI) Cities for Climate Protection (CCP) in 2000, which prompted the city to create a plan to reduce emissions. They conducted a baseline emissions inventory, updated in 2006, and established an emissions reductions target (City of Arcata). An action plan was developed, but implementation of the action plan has been a challenge for the small town. Arcata faces environmental, economic, legal and social/political barriers to implementing programs that will significantly reduce greenhouse gases to meet their stated goal.

A. Biophysical Environment

A recent report published by the Intergovernmental Panel on Climate Change or IPCC has shown that the average temperature of our planet was approximately 14 degrees Celsius in 1905. By 2005, Earth's average temperature had increased by 0.55 degrees. The rise in temperature cannot be attributed to solely any natural phenomenon like organic methane, volcanic venting, solar flares, or the decay of biomass. Human activities, such as the combustion of fossil fuels, contributes significantly to Global Climate Change (IPCC report overview).

The increase in greenhouse gasses has already affected our environment. Climate change has lead to a 75% increase in category four and five hurricanes and a three millimeter increase per year in sea level (IPCC report overview). Hurricane disasters are only one small aspect to consider when examining the far reaching impacts climate change may have on our world. The Environmental Protection Agency (EPA) concludes that a 1-3 degree Celsius increase in temperature could have the following environmental consequences; increase in salt water intrusion that could destroy fresh water supplies; rise in storm frequency and intensity causing faster erosion rates (EPA); a potential for ocean acidity levels to increase to levels that triggers extinction of keystone species, causing further fallout in major fisheries (NOAA); the melting of Arctic glaciers and ice caps, which are already rapidly disappearing, is theorized to slow or shift ocean currents, such occurrance would have grave effects on the earth's temperature and could plunge northern latitudinal countries in Europe into a new ice age (National Geographic).

B. Economic

Extracting energy-rich oil damages the earth's environment, yet the economic benefits that result from drilling, refining, distributing and selling oil are great. The electricity we depend on as a nation emits high levels of greenhouse gasses. Approximately 50% of our nation's electrical power comes from coal power plants, the most $C0_2$ intense form of power generation. A significant portion of our power also comes from natural gas, which is a major source in the generation of greenhouse gases Methane (CH4) and Carbon Dioxide ($C0_2$). In 2006, an Energy Information Administration report indicated that 86% of the world's primary energy comes from fossil fuels (Petroleum 36%, Coal 27%, and Natural Gas 23%). We are economically dependent on the established infrastructure, which runs almost exclusively on fossil fuels.

The Energy Information Administration splits American greenhouse gas emissions into the following categories: power stations (21.3%), industrial processes (16.8%), transportation fuels (14%), agricultural bi-products (12.5%), fossil fuel retrieval (11.3%), residential and commercial (10.3%), land use and biomass burning (10%), and waste disposal and treatment (3.4%). These emission sources are the backbone of our economy and enable our way of life. To stop anthropogenic emissions completely today would cause modern life to screech to a halt. So,

for the most part, emissions brought on by the modern world go unchecked. In spite of our tremendous dependency on fossil fuels, some policy makers have proposed a carbon tax, a tax by which the negative externalities of greenhouse gas emissions are internalized into the economy.

Professor Steve Hackett, of Humboldt State University, suggests taxing people and industries for their emissions, and he is not alone in this suggestion. Early calculations done by Richard Tol (Energy Policy, 2005), show that the mean external cost for anthropogenic greenhouse gas emissions is $50 per ton of carbon. Once in the Atmosphere, 1ton of Carbon amounts to 3.67 tons of C02. So, the appropriate external cost (tax) would be $183.50/tC02 emitted. Further, these rates can be broken down into tons/gallon of gasoline, which amounts to $0.485/gallon of gasoline. Monies generated from taxation could be used to further invest in development of renewable energy, energy efficiency, better filtration devices, and other potential solutions to the greenhouse gas problem. This would make the federal government the proprietor of our air, and enable economically viable solutions to curbing greenhouse gas emissions.

Clearly, our economy is currently dependent on actions that result in the production of greenhouse gas and their emissions. Our infrastructure is designed to create energy using fossil fuels, and our economy depends on it. New, clean means of energy procurement are often inefficient and costly; thus, taxation and government subsidies are necessary to further the development of new technologies. Sadly, without major legislation to effectuate a transition away from fossil fuel dependency, our economy demands continued greenhouse gas emissions.

C. History in Humboldt County:

Humboldt County has had a long history of environmentally un-friendly energy use. In recent years there has been more of a focus on renewable energy use in certain sections of the county. Since 1853 Humboldt County has been intensively harvesting its natural resources such as wood, gold, and fish just as the first settlers landed at Trinidad bay did. Although gold was not discovered in large quantities in Humboldt County, Eureka and many other coastal towns within the county played key roles in staging areas for the gold fields in the Trinity Mountains. (www.humboldthistory.org)

With the implementation of the Global Warming solution act of 2006 or "AB-32", Humboldt County will have to unify its efforts to meet the standards of greenhouse gas emissions to 1990 levels. Currently that requires a roughly 25% decrease from today's emission rates. The addition of groups such as Redwood Coast Energy Authority (RCEA) and North Coast Unified Air focus on energy use in the county, Green wheels a sustainable transportation group and others has shed some light on the problem at hand by trying to educate the public on alternatives to more energy consuming practices. Currently Humboldt County has taken some initiatives to further their plan of reducing green house gases (GHG). Joining the International

Council for local Environmental Initiatives (ICLEI), has given Humboldt county a specific protocol to follow to allow for further mapping of their carbon foot print and implementation strategies on how to change the current trajectory.

D. Legal

The City of Arcata must make calculated legal decisions when they decide on what programs to implement in order to reduce greenhouse gases. There are legally binding programs the city can use, but they must be backed by legal authority. Compared to State and Federal Government, local governments are limited to strategies that change individual behavior and affect individual actions, rather than broad programs that target emission sources. For example, the city cannot ban the sale of inefficient automobiles, but they can raise parking fees within the city to curb driving. The Federal government has the power and authority to pass broad environmental laws, as was done in the 1970s. These laws can be categorized as narrow issue laws, such as the Clean Air Act, information based regulation, such as NEPA, disclosure laws,such as community right to know laws, standard setting laws, such as the Toxic Substances Control Act, market enlisting laws, such as cap and trade, technology enforcing laws and road block strategies. Federal agencies have the authority, delegated from congress, to make legally binding rules and regulations to ensure that the purposes of the laws will be met. Typically, the Federal Government determines goals and Federal Agencies along with state and local governments, work together to implement, monitor and enforce new laws. (Kubasek)

There are several strategies that small municipalities like Arcata can use to accomplish their goals. Arcata can provide incentive based strategies that enable citizens to make energy efficient improvements, provided that the city has the political will to allocate funding to such endeavors. Arcata can also perform public outreach and implement demonstration programs to educate the public on its goals and strategies to reduce greenhouse gases. Outreach also requires funding, but much less than incentive programs. Arcata can implement new policies, but this would require CEQA compliance. Arcata would have to ensure that they have the resources to go through the CEQA process. Arcata can implement mandatory restrictive ordinances and codes on new buildings as well as old ones. This would likely have political backlash if legally binding, but the programs can be implemented with only voluntary compliance. Finally, Arcata could raise taxes and fees to provide funding for greenhouse reduction programs and discourage polluting behaviors. New taxes can only be passed through a ballot initiative; however fees can be raised by city council without a public vote. Ideally, a small municipality like Arcata would seek strategies that require little funding, have little political backlash, and encourage good behavior.

E. Socio-Political

The Community Greenhouse Gas Reduction Plan was passed in 2000, six years before Congress passed Assembly Bill No. 32. This demonstrates Arcata's political will to set progressive greenhouse gas standards and the social support to get them passed. Yet we are seeing that the city has not met its goals, in fact emissions are rising overall, and this is caused by a variety of reasons that must be further examined. The city has limited avenues to affect broad social change; this is due to its narrow scope of authority, the social backlash that would result from more regulations, and the relative lack of funding or expertise. The only substantial decrease in emissions was a result of PG&E's decision to provide a cleaner grid-mix. The city is subject to the whims of their energy providers. Secondly, the city failed to effectively implement the recommendations outlined in the Reduction Plan. Policy makers on the city level must walk a thin line between discouraging economic development and environmentally responsible policies. Although it is apparent by the widespread use of bikes, successful recycling program, and other public indicators that a majority of the population is sympathetic to the city's goal of reducing greenhouse gas emissions, there is just as much opposition to the types of reform that would bring about tangible reductions.

Ultimately the City of Arcata did not meet its goals for lack of implementation strategies. The recommendations outlined in the Community Greenhouse Gas Reduction Plan are adequate. The City struggles to reach its goals due to lack of resources for proper implementation, funding and otherwise; the City's limited power in making mandatory requirements; as well as the global scale of Global Climate Change.

F. Success Stories: Case studies Corvallis and Portland

Corvallis:

The city of Corvallis, Oregon successfully crafted and implemented an energy usage reduction plan. Corvallis Oregon currently is the largest purchaser of renewable energy in the country. Presently Corvallis purchases enough green energy to power 9000 homes or 100,418,950 KWh, 13 % of their total energy consumption. Oregon State University is the largest purchaser in Corvallis making up 66% of all green energy purchased. Corvallis stands as a role model for other towns in America. There understanding of the greater problem that exists in the world should be the standard we all must follow.

Corvallis has successfully reduced energy consumption and emissions in all sectors including residential. Their goal was to reduce per-capita energy consumption 50% by 2020, and

much of this was to take place in the residential sector. City officials attribute success in the residential sector to having citizen volunteers who arrange energy audits and for 100% of homes and businesses. During energy audits, Volunteers serve as partners/advisors, assist in implementing audit suggestions, assist in contractor selection, carry out technical advising for self –installers, and writing grant proposals or setting up tax credit paperwork.(Corvallis Sustainability Coalition)

Corvallis had a specific target to get funding for improved energy efficiencies in 1 and 10 homes and 50 businesses. Considering Corvallis is a small town, making 50 businesses more energy efficient is having a significant effect. The home energy reviews are free and participants learn how to use less energy, save money, create a more comfortable living environment. Those who partake receive free CFL's, info on solar, efficient faucet aerators, and shower heads. (EPA.gov)

Portland:

Portland Oregon has successfully lowered their greenhouse gas emissions to below 1990 levels by implementation of strategies across all sectors of greenhouse gas emissions. Successsful strategies include:

- Energy-efficiency initiatives will reduce emissions by decreasing energy use in residential, commercial, industrial, and government buildings and facilities by 10 percent
- Transportation reductions will be achieved by reducing per capita vehicle miles traveled to 10 percent below 1995 levels by 2010 and by improving the average fuel efficiency of vehicles in Multnomah County from 18.5 to 26 mpg.
- Meeting all growth in local electricity load since 1990 with renewable energy resources will reduce greenhouse gas emissions by 0.54 million metric tons.
- Reducing solid waste and improving recycling and recovery rates and practices will reduce methane emissions from landfills and the energy required in manufacturing processes.
- Promoting expanded and improved forestry and seeking other carbon offsets will acquire just over 0.3 million metric tons of emission reductions.
- Providing policy, research, and community-wide education will enhance all of these efforts.

IV. WEIGHING ALTERNATIVES

A. Transportation

B. Green Power

C. Residential and Commercial

A. Transportation:

The transportation sector (autos, public transport, trains, airplanes, etc) is the second largest source nationally of greenhouse gas emissions. Transportation is the second biggest contributor of carbon dioxide for the city of Arcata as well, contributing 34,465 tons (Updated Greenhouse Gas Inventory) . The City of Arcata can make policy decisions to reduce greenhouse gas emissions by encouraging modes of alternative transportation, encourage reduced automobile travel, more efficient vehicles and cleaner transportation fuels. The City should support cleaner and alternative transportation to lower emissions and energy costs, to create energy independence, and to improve citizen health.

The energy committee made several recommendations to reduce emissions due to transportation, and they were generally very good, including such measures as improving bicycle infrastructure with extended or improved bike lanes and bike lockers/station/stands, car free paths, car free zones, and incentives for reduced car use. Many existing programs were expanded and many new additions were made in the greenhouse gas reduction plan. Reduction targets were not met due to lack of implementation. If implemented to their maximum potential these measures could reduce greenhouse gas emissions.

The city seeks to promote car sharing and carpool/carshare programs. Zipcar is a car sharing program that is growing in popularity nationwide. Members pay an annual fee in addition to an hourly rate while driving. Car reservations can be made minutes or months in advance and include gas, insurance, and 180 miles of driving. Each zipcar has reduced the number of individually owned cars by twenty. Arcata could greatly benefit from a program such as this because a significant portion of its population is university students and because the size and layout of the city already encourages alternative transportation. The City, in collaboration with Humboldt State University should encourage the implementation of a car share station by a company such as zipcar or develop a program of their own. A program like this could provide an alternative to individually owned vehicles and discourage incoming students from bring a vehicle, addressing parking, congestion, and pollution. This idea can be similarly expanded to bikes.

B. Purchasing Green Power (Co-op):

Local government for the city of Arcata has the most control in purchasing green power for the municipal sector. The municipal sector has the only increase in CO_2 emissions of all sectors from electricity consumption. This is because of a dissolved purchasing agreement through Association of Bay Area Governments, (ABAG) which guaranteed a minimum a 20% renewable energy in the grid mix. PG&E only guarantees 13% renewable energy. Also, the city saw significant increases in electricity consumption from water consumption and pumping demands at the waste water treatment plant (Inventory 2006). CO_2 emissions from 2000 to 2006 went up 55% from the municipal sector. All other sectors had a decrease in CO_2 emissions (table 1).

increased ? water use.

Arcata

Table 1: Inventory of Electricity of consumption and CO_2 Emission for City of Arcata

SECTOR	UNIT	2000 PURCHASED	2000 CO_2 (tons)	2006 PURCHASED	2006 CO_2 (tons)	%CHANGE PURCHASED	%CHANGE CO_2 (tons)
RESIDENTIAL	KWh	30,922,368	11,272	40,159,265	9,839	30%	-13%
COMMERCIAL	KWh	64,391,506	23,472	58,176,605	14,253	-10%	-39%
HSU	KWh	10,621,040	3,872	8,171,079	3,138	-23%	-19%
INDUSTRIAL	KWh	47,075,722	17,160	50,590,852	12,395	7%	-28%
MUNICIPAL	KWh	2,049,015	431	2,725,751	668	33%	55%

Source: City of Arcata Updated Greenhouse Gas Inventory 2006

Another option for Arcata to purchase green power is to enter into a green power purchasing agreement with PG&E. This was done initially through the ABAG agreement. A purchasing agreement could lock in renewable price guarantees that can offset price fluctuations in nonrenewable power generation. Under this type of agreement, PG&E would be responsible for guaranteeing a green grid mix. This would be done through the purchase of green power products such as RECs or through generation of renewable power. This is not the preferred option because PG&E is obligated to provide a greener electrical grid pursuant to California's Global Warming Solutions Act 2006, AB 32.

Arcata could offset CO_2 emissions with the purchase of on-site renewable generation such as photo-voltaic cells. This may be a viable option for the waste water treatment plant, but this does require a significant upfront capital investment by the city. Funding would have to be approved of through a new tax or fee, or borrowed from some other city program. In our current political and economic climate, this may not be the best option; however federal funding through the stimulus plan may be available and should be pursued. On-site renewable generation can

reduce the amount of electricity purchased from the grid, resulting is a long term economical benefit despite the initial capital investment.

The residential sector is limited to the grid mix that PG&E provides, but homeowners can purchase on-site renewable generation sources that will reduce their greenhouse gas emissions and save money on their electrical bills. Incentives are available to offset the initial costs of installing equipment. Net metering allows the homeowners to sell electricity they don't use to the power company. The residential sector can also reduce greenhouse gas emissions by reducing the amount of electricity they use. Simple conservation tactics, such as unplugging idle appliances can save a significant amount of electricity. The city can partner with green power and climate change organizations to provide public awareness of the need to reduce energy consumption and ways to save electricity. Adopting public awareness measures requires little capital, financial or political.

Overall, reducing CO_2 emissions through the purchase of green power in the municipal sector represents a very small portion of the city's overall CO_2 emissions reduction goal; however Arcata should pursue purchasing green power as a symbolic nature of good government in pursuant to the Community Greenhouse Gas Reduction Plan. Arcata, through example, can then encourage other organizations in the commercial and industrial sectors to seek options that will further reduce their CO_2 emissions generated from electricity consumption. Arcata should strengthen its role in providing public awareness about energy conservation and efficiency.

C. Residential & Commercial

Energy use from the residential sector ~~only~~ makes up 21% of energy used in Arcata, so encouraging the population to conserve within the residential, commercial and industrial would be wise and potentially successful. Education of residents throughout the city should be the top priority for Arcata. There are various reasons Arcata made no gains in reducing greenhouse gas emissions, including poor incentive or rebate programs to encourage the purchasing of energy efficient appliances. Also homeowners see no incentive to renovate or upgrade energy efficiencies, especially when they are renting to someone else. The electrical savings are passed on to the renters rather than the homeowners.

PG&E has these programs

landlords

We have come up with some suggestions through research and extrapolation from other plans to reduce residential, commercial and industrial greenhouse gas emissions in Arcata. We suggest the following:

A. Arcata City Council should adopt a new, long range goal, for the development of sustainable infrastructure throughout the city and its neighborhoods.

B. Explore incentive or rebate plan for residents and business owners to invest in energy efficient appliances.

C. Promote weatherization of residential dwellings, such steps have proved highly successful in other cities.

D. Emphasize the weatherization of old apartment complexes.

E. Follow through with comprehensive energy analysis in residential neighborhoods and make recommendations (residential audits)

F. Involve citizens. Facilitation of audits would be most effectively implemented by employing volunteer citizens to spread the word.

G. Incorporate sustainable design into any new building developments immediately.

H. Encourage any and all home renovations that reduce greenhouse gas emissions. Also, request the permitting process be simple and fast, so as to not hinder any potential renovation.

I. Encourage the installation of PV cells

J. Address indoor marijuana grow operations

V. PREFERRED ALTERNATIVE

Although there are and needs to be a variety of alternatives employable reduce greenhouse gas emissions, we have chosen to make recommendations in the residential and commercial sector. The commercial and residential sections combined accounted for over 50% of all emissions in the Arcata community in 2000 and was met with only a modest reduction between 2000 and 2006. After thorough consideration of all previously mentioned alternatives, we determined that this arena had a large potential for reductions and we could make meaningful suggestions. The following section offers strategies to assist in reducing residential and commercial greenhouse gas emissions most effectively, in ways that have not already been addressed by the Energy Committee.

Residential and Commercial Implementation and Evaluation Strategies

A. Public Education and Outreach

B. Weatherization of residential and commercial buildings

C. Incentives for energy efficient house hold appliances

D. Energy Efficient Building Design

A. Public Education and Outreach

The City of Arcata has a population of 19,585 people. The residential sector contributes 21% of the carbon dioxide emissions in the city. While this sector was one of the biggest contributors, between 2000- 2006, it had only 1% reduction or only 394 tons of carbon dioxide. For this reason remediation in Public Education needs to take effect.

One of the goals of the Arcata Greenhouse Gas Reduction Plan was to *increase public awareness of energy issues* and *encourage an energy conservation ethic*. The City of Arcata has already created a number of informational pamphlets and displays that are available for viewing at City Hall to meet this end. The problem lies in the fact that there is not an active outreach component of this educational campaign. This information is only available to those who visit City Hall, yet it could benefit the larger population, creating broader energy savings.

The City would benefit from fostering an Energy Education Outreach Group, made up of volunteers under the supervision of an Arcata City staff person; Humboldt State University as well as the Redwood Coast Energy Authority may serve as potential volunteer pools. The goal of this group is to speak to community members, providing them with educational pamphlets, information on the various funding sources available to them at the city, state, and national level for energy efficiency purchases, and most importantly to aid the public in signing up for various state, local, and private weatherization programs. In addition they may promote workshops put on by the Redwood Coast Energy Authority. The Energy Education Outreach Group would table at various public events, such as the Farmer's market. The group will seek to target 100% of the population by tabling at public events and door-to-door energy audits, and measure their success by the number of people they speak to.

What about the use of notification of energy use compared to neighbors?

Educational Resources:

1. Local Conservation Flyers produced by Schatz Energy for the Humboldt Energy Task Force, available at The City of Arcata website:
(http://www.cityofarcata.org/index.php?option=com_content&task=view&id=24&Itemid=51)

2. Funding Options

- Arcata's low-income Weatherization Program
- Amortizing Costs: city-backed loans to fund energy efficiency upgrades, residents and businesses pay back the loans through property tax assessments.
- School Energy Efficiency (SEE) Program
- Funding from the American Recovery and Reinvestment Act:
  The California State Energy Program (SEP)
- Funding for efficiency through the California Energy Commission Emerging Renewables Program
- Funding through the Department of Energy
- ENERGY STAR financing- federal tax credit
- Pay-back period calculator
- Pay As You Save (PAYS) Program
- California Solar Initiative
- Flex Your Power
- Pacific Gas and Electric
- Pacific Gas and Electric Solar Rebates
- The Redwood Coast Energy Authority

Monitoring and Evaluation of Public Education and Outreach:

To monitor the success of outreach, the Energy Education Outreach Group must keep track of the number of people that they talk to. There should be a tally of how many people visit the booth held at such events public events like the farmers market, taken by volunteers. The tally should include these three distinct questions: first time contact, repeat visits, and resident/non-resident of Arcata. If the participants have been to the booth before they will not be tallied, first time contact with Arcata residents will be tallied. The tallied participants will be kept on record so that the goal of reaching 100% of Arcata residents (or 19,585 people) can be evaluated. This tally would be effective in making the people of Arcata informed about energy saving tips and technology.

B. Weatherization (Insulation based):

Assumptions and costs:

1) We will assume that the average size of an Arcata attic is **1200 ft^2**.

2) There are **three types of insulation**: foam, cellulose, and fiberglass. Fiber glass requires the most energy to produce, followed by foam, and the least energyy is used to produce cellulose insulation. Therefore, in accordance with the city's plan to reduce greenhouse gas emissions, using the cellulose form of insulation seems appropriate. Each is equally effective given the mild climate in Humboldt County. To have a 1200 ft^2 attic done with fiberglass insulation would cost roughly $1000. The more environementally friendly, foam product would also cost roughly $1000. Both price quotes are according to Dave Grow, a leading local, Humboldt County insulation installer.

Programs:

3) To have a **window replaced professionally** will cost between $250-$350 depending on the size. If there is significant additionally framing needed to make the window fit, it can be much more expensive. Replacing windows is expensive. Cheaper fixes include insulating windows and or replacing the weather stripping. Insulation kits are $6 a piece and can be installed by homeowners.

4) Replacing old, torn **weather stripping** and seals can be very effective in keeping cold air out. It's also affordable. To replace the weather stripping around a door one could pay a professional $50-80. The stripping itself for one door costs roughly $25 dollars. Window stripping or insulation kits cost $6 apiece.

5) Programs and incentives: There are four different tax credits available to encourage home owners to weatherize their homes. First is the **Home Improvement Tax Credit**, by which home owners can qualify for up to 30% of costs for a tax credit. Second, the **Tax Credit for Homebuilders** is available. This tax credit is for up to 50% of costs. If commercial buildings reduce energy consumption over a time period by 50%, they qualify for the **Tax Deduction for Commercial Buildings** fund. The deduction is $1.80 ft^2 if they reduce emissions accordingly. **Qualifying insulation and window improvement** projects can receive rebates from PG&E to offset up to 50 % of costs.

C. Energy Efficient Household Appliances

There are currently many incentives offered by the government and other agencies such as electric companies and water companies on switching old high energy use appliances to newer energy efficient ones. Currently Humboldt counties local electric and Gas Company PG&E offer some incentives on home appliances such as washing machines, dryers, dishwashers, air conditioners and water heaters. The current incentives offered by the local municipality consist of rebates on the initial cost of the item. The rebates range from 35$ to 1500$ depending on the item.(www.pge.com)

There are also incentives offered at the governmental level. These include tax credits for items approved under energy star ratings. Currently homeowners who update existing homes with energy efficient items such as heating and cooling equipment, energy-efficient windows, insulation, doors, and roofs can receive a tax credit of 30% of the cost of the upgrade up to $1500.

Evaluation

Currently it is unknown how many households have taken advantage of local and federal tax incentives in Arcata. With the implementation of educational programs offered by PG&E and other programs through the town there should be an increase in the amount of households taking advantage of these tax credits and incentives. Our projects current goals of setting up a time line of implementation and evaluating and monitoring these goals have been satisfied.

D. Encourage Energy Efficient Design in New Building Construction, Additions, and Renovations

The city of Arcata needs to encourage builders and developers to use energy efficient design elements in their projects. Efficient deign can reduce the amount of energy consumption of a home or commercial building, thereby reducing CO_2 emissions. Goal HE-5, Natural Resources and Energy Conservation, of the Arcata General Plan Housing Element requires energy efficient designs. Furthermore, Goal HE-5 also encourages the reduction of energy use and the conservation of natural resources in the development of housing through implementation of the State Energy Conservation Standards and promotes new housing construction that: conserves land and resources, is cost effective and has weatherproofing measures to reduce utility costs in new developments. Section D-1e of the Design Element in the General Plan promotes energy and efficiency and solar access as well.

Responsible Parties:

Community Development Department, Building Division, Planning Commission

Implementation measure HE-1 requires the city to develop an alternative building methods design manual and provide easy-to-read development information to the public. This is information should be easily found on the City's website. Furthermore, handouts should be available in local hardware stores and government offices. A search on the City's website did not yield the alternative building methods design manual which was to be completed in 2005.

Time Frame: If not complete, the alternative building methods design manual needs to be completed and made available on the City's website. A link should be made available on the Planning Department, Building Department, and Community Development Department's web pages. This should be done within 1 year.
Dissemination of handouts to the public in government offices and local hardware stores would be an ongoing process.

Design Review Committee

Inquire builders and developers about efficiency designs during design review hearings.

Time Frame: Ongoing process

City Council

Ensure City Departments are complying with the implementation measures outlined in the City's General Plan. Ensure City's website has the easy-to-read handouts and the alternative building methods design manual available and are easy to find. Ensure the General Plan is incorporated into new developments and projects.

Time Frame: The website should be reviewed immediately and recommendations be made to the applicable departments within 3 months. Ensuring new development and projects are consistent with the efficiency design elements of the General Plan is an ongoing process.

Builders and Developers

Builders and developers must review the design and housing elements of the General Plan and incorporate efficient design in their projects. They must educate the planning commission on their design elements and show that they are consistent with the General Plan.

Time Frame: There is no specific time frame; builders and developers must to this for each project.

General Public

The general public has unique responsibility. They are the eyes and ears of the city council. They must inform council members or the Planning Commission if they feel there are inadequacies in the availability of the easy-to-read handouts and the alternative building methods design manual. They should also inform council members or the Planning Commission if they feel a project has inadequate efficient design elements.

Time Frame: There is no specific time frame. This is case by case and a complaint driven process.

Evaluation

When evaluating performance of encouraging efficient design through the General Plan, the city of Arcata should consider:

1. The availability and ease of access to Arcata's design criteria outlined in the General Plan to builders, developers, home owners and contractors.

2. The actual performance of new buildings and renovated buildings that were that were built with efficient design elements.

The first consideration can be evaluated by performing a survey on building permit applicants. A member of city staff should develop a survey that asks applicants if they are aware of the publically available material provided by the City of Arcata in regards to energy efficient design and whether or not they read or understand the material. The survey should be anonymous. This survey can reveal how effective the city is in educating the public about its efficient design policies.

The second consideration can be more challenging. Each building has its own performance in regards to energy efficiency. The best way to monitor performance a new building is to compare its energy consumption to similar building in the area that was built without efficient design elements. There are variables to consider, but generally a Watts per square foot comparison of buildings with the same type of use can yield fair results. Renovated building performance can be evaluated by doing a before and after comparison of energy consumption. This should be done by the property owners, especially for renovated homes. Commercial building owners should share this information with the Energy Committee.

VI. TIMELINE

- September 16 - Group meeting discussing topic
- September 21 - Group meeting reviewing Arcata's old Green house gas emission plan
- September 23 - Review old Greenhouse gas emission plan
- September 28- Meeting scheduled with Becky Menten canceled "sick" and worked on background and problem statement as group
  - *Ryan:* Biophysical
  - *Josh:* Economic
  - *Stanley:* Legal
  - *Jon:* Historical
  - *Hannah:* Socio-political
- September 30 – Reschedule meeting with Becky to go over questions on old green house gas reduction plan
- October 5 – Turn in problem statement and background information
- October 7 – Group meeting developing goals and objectives
  - *Hannah:* Draft goals and objectives section
  - *Ryan, Josh, Jon, Stanley:* Revise
- October 12 – Turn in goals and objectives
- October 14 – Group meeting on revamping old sections and researching alternatives
  - *Stanley:* revising goals and objectives section
- October 19 – Group meeting on revamping old sections and researching alternatives
  - *Josh:* revising weighing alternatives section
- October 21 - Group meeting on revamping old sections and researching alternatives
  - *Josh and Jon:* Residential
  - *Stanley:* Green power purchasing
  - *Hannah and Ryan*: Transportation
- October 26- Turn in weighed alternatives
- October 28 – Determine preferred alternative, Work on implementation strategies
  - *Josh:* Weatherization
  - *Jon:* Appliance purchasing incentives
  - *Stanley:* Green building
  - *Hannah and Ryan:* Public Outreach
- November 2 – Turn in implementation strategies
- November 4 – Contact Becky on status of project
  - Ryan: Revise implementation section
- November 9 – Work on monitoring and evaluation implementation, each group member continue to work on previous sections
- November 11 – Potential meeting with Becky discussing possible monitoring / evaluation
- November 16- Turn in monitoring and evaluation plan
- November 18 – Group meeting before Thanksgiving to go over possible revisions
  - Hannah: editing background and content, compile paper
  - John: revising time line information
- November 30 – Review final draft/ email a copy to Becky for further review
- December 2 – Work on presentation
  - Stanley: Compile presentation

December 9 - Group presentation

- December 11 – Turn in final paper

VII. References

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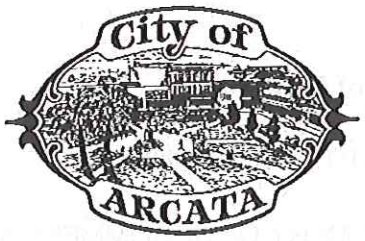
City of Arcata



International Council on Local Environmental Initiatives

Cities for Climate Protection Campaign

Community Greenhouse Gas Reduction Plan

Prepared by:
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Participants:

- The City of Arcata Energy Committee
- City of Arcata Environmental Services Department

August 2006

Table of Contents

EXECUTIVE SUMMARY

A strong majority of the world's scientists have concluded that humans are changing the global climate primarily through the use of fossil fuels. This has serious consequences for all life on earth. In response, the City of Arcata has joined an international effort to reduce greenhouse gas emissions and has committed to decrease locally generated greenhouse gas emissions by 20% below year 2000 levels by the year 2010. To meet this goal, the City has developed a Community Greenhouse Gas Reduction Plan. The plan focuses on six action areas: energy efficiency, renewable energy, sustainable transportation, waste and consumption reduction, carbon sequestration and other methods, and cross-cutting approaches.

In addition to reducing greenhouse gas emissions it is expected that the implementation of this plan will offer many other community benefits. These include: energy cost savings with subsequent benefits to the local economy, cleaner air, less reliance on fossil fuels and imported energy sources, and a move toward a more sustainable energy economy. Implementation of this plan will also serve to fulfill numerous objectives that are stated in the Arcata General Plan: 2020, Policy RC-8, Energy Resources Management.

The Community Greenhouse Gas Reduction Plan was developed by the City of Arcata Energy Committee with support from the City of Arcata Environmental Services Department. A public forum was held to present the plan to the community and to gather public input. Public comment on the plan has also been received at the regular monthly meetings of the Energy Committee and via written submissions. The public comment has been reviewed and incorporated into the plan as appropriate.

Successful implementation of the plan will require strong community-wide participation. We hope that the community response is enthusiastic. By doing our part here in our small rural community we can help bring about the global change that will be necessary to avert the serious anticipated impacts of global climate change.

In 2008, the Plan will be amended to project out to the year 2020. Additional implementation measures will be listed to achieve further Greenhouse Gas reductions

I. SUMMARY OF RECOMMENDATIONS

As part of the City of Arcata Community Greenhouse Gas Reduction Plan, we recommend the following greenhouse gas reduction measures in each of six program areas. The details and further recommendations can be found in Section V of this document.

A. Energy Efficiency

- Encourage Energy Efficient Buildings and Retrofit of Older Houses.
- Decrease Community Water Usage.
- Improve Energy Efficiency in City Operations.
- Encourage Energy Efficiency Policies at All Levels.
- Encourage Personal Energy Conservation in Residences, Businesses and City Operations.

B. Renewable Energy

- Encourage utility scale transitions to renewable energy.
- Conduct education and outreach.
- Adopt policies to encourage renewable energy.
- Install renewable energy systems on city facilities.
- Consider a locally-or regionally-owned green utility.
- Require "solar ready" buildings.
- Offer low interest loans for solar energy systems to participants in the First Time Home Buyers program.
- Examine the potential for wind energy and promote where feasible and compatible.

C. Sustainable Transportation

- Incorporate Energy and Climate Policy into the City's Transportation Plan and encourage policies at all levels for efficient and non-polluting transportation.
- Improve Bicycle infrastructure.
- Improve Pedestrian infrastructure (sidewalks, paths, and walkways).
- Improve Mass Transit Infrastructure.
- Educate to discourage driving and create incentives to lessen driving.
- Support local sustainable transportation efforts.
- Green the City Fleet.
- Promote "smart growth" policies and preserve rail rights-of-way where appropriate.

D. Waste and Consumption Reduction

- Confirm an overall Waste/ Consumption Reduction Strategy, including the 3R's – Reduce, Reuse, Recycle, with the goal of achieving zero waste.
- Continue to educate the public about the benefits of waste reduction.
- Adopt incentives that encourage waste reduction.
- Strengthen recycling programs, purchasing policies, and employee education.
- Join with other agencies and entities to implement waste reduction programs.

E. Carbon Sequestration and Other Methods

- Continue to manage the Community and Jacoby Creek Forests to enhance carbon sequestration.
- Utilize biogas from the City's wastewater treatment plant.
- Encourage policies for carbon sequestration at all levels.

F. Cross-Cutting Approaches

- Develop a City-wide Green Building promotional campaign.
- Develop a City-wide collaborative effort between the City, Humboldt State University and College of the Redwoods.
- Promote economic development that encourages businesses that employ sustainable energy practices.
- Work with regional groups, such as Redwood Coast Energy Authority, to promote programs that will serve to reduce greenhouse gas emissions.

II. INTRODUCTION

The City of Arcata has developed a Greenhouse Gas Reduction Plan to reduce locally generated greenhouse gas emissions. Carbon dioxide, methane, nitrous oxide, and other heat trapping gases naturally occur within the earth's atmosphere. *Greenhouse gas emissions* are releases, significantly beyond natural levels, of one or more of these gases. These emissions occur as a result of certain human activities (e.g. the burning of fossil fuels and deforestation), which ultimately lead to measurable changes in the global climate.

As a benefit, this plan may also help residents, businesses, and city government achieve energy cost savings (and thereby keep energy dollars in the local economy), promote cleaner air, rely less on fossil fuels and imported energy sources, and thus move us toward a more sustainable energy economy. This Greenhouse Gas Reduction Plan will also fulfill certain objectives outlined in the Arcata General Plan: 2020. These objectives include:

- reduce the net emissions of greenhouse gases from Arcata
- reduce other negative impacts of energy production and use, including risks from nuclear power, air emissions, fuel spills, and wildlife and habitat destruction
- reduce energy costs to the City and its residents
- increase the percent of energy purchases from sources within our region
- increase the City's and nation's energy security
- reduce our vulnerability to changes in energy availability and price
- increase public awareness of energy issues
- encourage an energy conservation ethic; and
- monitor the cost and effectiveness of Arcata's actions so we and others can learn from them. (Arcata General Plan: 2020, Policy RC-8, Energy Resources Management.)

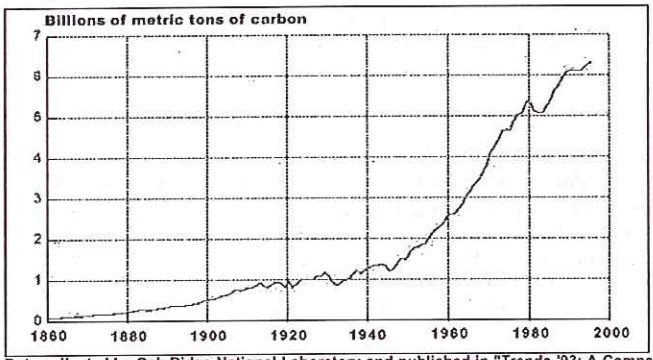
Implementing the suggested measures will require strong community-wide participation. It is our hope that this Greenhouse Gas Reduction Plan represents a giant step forward towards the above objectives; and that it will help our community act to avert the anticipated impacts of global warming.

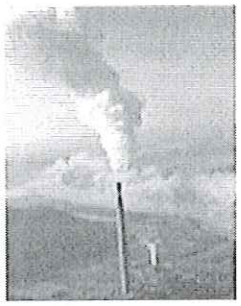
III. BACKGROUND

A strong majority of the world's scientists have concluded that humans are changing the global climate primarily through use of fossil fuel, as shown in Figure 1. *(Intergovernmental Panel on Climate Change, 2000).* This has serious consequences for all life on earth. Anticipated impacts include: an overall warming of the earth's climate, melting of ice and snow-pack, rising sea levels, increased frequency and intensity of storms, shifting ecological zones, spread of plant disease and mosquito-born illnesses, and related impacts to agricultural, social, and economic systems.

The scientific community also recognizes that fossil fuel use needs to be reduced 60 to 80 percent from current levels in order to stabilize atmospheric concentrations of carbon dioxide, the major greenhouse gas. Yet in the United States, and globally, carbon dioxide emissions are increasing. The Kyoto Protocol's target of a 5 percent reduction in industrial countries' carbon dioxide emissions below 1990 levels is a step in the right direction. The government of the United States, however, has chosen not to join the Kyoto Protocol. Therefore, in the United States, local governments must take the lead to stem the tide of global climate change that humans have set in motion.

Figure 1.





Data collected by Oak Ridge National Laboratory and published in "Trends '93: A Compendium of Data on Global Change" shows an overall increase in global carbon dioxide emissions from fossil fuels. (Graph courtesy of World Resources Institute)

IV. THE CITIES FOR CLIMATE PROTECTION CAMPAIGN

In August of 2000, the City of Arcata joined the International Council on Local Environmental Initiatives (ICLEI) Cities for Climate Protection (CCP) campaign. The CCP campaign is a global coalition of local governments working to reduce greenhouse gases at the community level. As a part of this campaign, the City has voluntarily committed to complete the following "milestones":

A. Conduct a baseline emissions inventory and forecast of emissions growth.
B. Set an emissions reduction target.
C. Develop an action plan to meet the emissions reduction target.
D. Implement the action plan
E. Monitor and verify progress and results.

To date, the City has completed Milestones number One and Two. The Greenhouse Gas Reduction Plan represents the completion of Milestone Three. Implementation and monitoring will meet the last two milestones, Four and Five.

A. Completion of Milestone One: Community Greenhouse Gas Inventory

In October 2001, the City completed the Community Greenhouse Gas Inventory (main body of report included in Appendix A, full report available from City of Arcata Environmental Services Department). Community data such as population, energy and fuel use, and vehicle travel patterns were entered into special computer software[1].

The Inventory estimated that approximately 45 percent of the emissions coming from the entire Arcata community are generated in the transportation sector. The commercial sector generated 26 percent, the industrial sector 14 percent, and the residential sector an additional 14 percent. These findings are summarized in Fig. 2 and Table 1. The City of Arcata's local government operations generate only 1 percent of the total emissions tonnage of the entire Arcata community. Emissions from local government operations, referred to as City of Arcata Corporate emissions, are broken down in Fig. 3 and Table 2.

Figure 2.
Community Greenhouse Gas Emissions by Sector in 2000 in Equivalent CO2 (%)

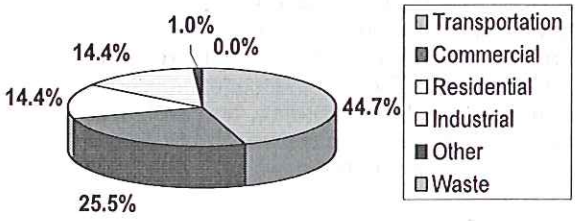


Table 1. Community Greenhouse Gas Emissions 2000 Base Year Sector Summary by eCO2 and Energy

Potential Sources	Equiv CO2 (tons)	Energy (million Btu)
Transportation	111,239	1,292,795
Commercial	63,494	600,337
Residential	35,874	572,077
Industrial	35,736	559,478
Other	2,471	0
Waste	-4,268	0
Subtotal	**244,546**	**3,024,688**
Measures		
Arcata Forest	-9844	0
TOTAL	**234,703**	**3,024,688**

[1] This software was developed for the ICLEI's CCP campaign by Torrie Smith and Associates. This software generated detailed reports, identifying the sources and estimated quantities of locally generated greenhouse gas emissions (expressed as tons of carbon dioxide equivalent, called "eCO2"), for the base year of 2000. The software allows for a community-wide analysis, as well as a detailed analysis of local government operations, which are included in the community-wide analysis. Reduction measures can also be included in the software analysis. The detailed inventory methodology and results are available in the Community Greenhouse Gas Inventory, 2001, through City offices.

Figure 3.

City of Arcata Corporate Greenhouse Gas Emissions in 2000 in Equivalent CO2 (%)

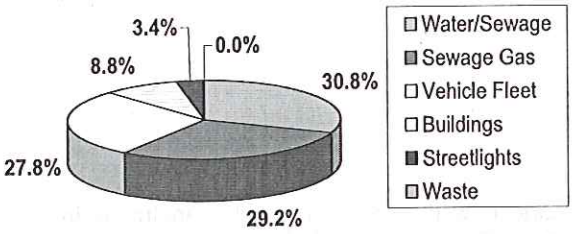


Table 2. City of Arcata Corporate Greenhouse Gas Emissions 2000
Base Year Activity Summary by eCO2 and Energy

Potential Sources	Equiv CO2 (tons)	Energy (million Btu)
Water/Sewage	644	6,108
Wastewater (Methane Gas)	611	0
Vehicle Fleet	582	6,707
Buildings	184	3,335
Streetlights	71	1,329
Waste	-28	0
Subtotal	**2,064**	**17,479**
Measures	**0**	**0**
TOTAL	**2,064**	**17,479**

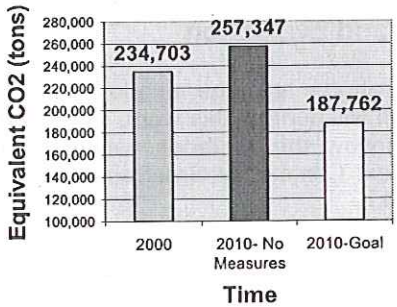
Note that the Arcata Forest and the Waste sectors in Tables 1 and 2 show negative emissions of greenhouse gases. This is because the sustainable management of the Arcata Community Forest and the recycling of paper and wood products serve to sequester carbon. One of the large-scale processes that influence the cycling of carbon is the uptake or release of carbon from forests. When trees are cleared for agriculture or other activities, carbon is released. In contrast, when forests are planted and allowed to continue growing, they absorb atmospheric CO2 and store it in the form of cellulose and other materials. When the rate of uptake exceeds the rate of release, carbon is said to be sequestered. (US EPA, Greenhouse Gas Emissions from Management of Selected Materials in Municipal Solid Waste, July 2002).

The Arcata Community Forest acts as a carbon sink because the growth of immature trees exceeds the effects of timber removal. Similarly, when paper and wood products are recycled or source reduced, trees that would otherwise be harvested are left standing. In the short term, this reduction in harvesting results in a larger quantity of carbon remaining sequestered.

B. Completion of Milestone Two: Set an Emissions Reduction Target

After completing the Inventory, the City chose Reduction Goals to be achieved by the year 2010. The City has established a reduction goal of 20 percent below year 2000 levels of greenhouse gas emissions by the year 2010. The computer software estimated emissions to be produced in 2010 in Arcata if no new reduction measures are taken. Figure 4 shows the greenhouse gas emissions for 2000 and the projected emissions for 2010 with and without the reductions.

Figure 4.
Arcata Community Greenhouse Gas Emissions In Equivalent CO2 (tons)



C. Milestone Three: Arcata's Greenhouse Gas Reduction Plan

The City next developed this draft Community Greenhouse Gas Reduction Plan, with input from the City's Energy Committee, staff, and the community, to achieve the stated reduction goals by 2010. Plan development included: 1) a research phase, which looked at other community plans and actions, 2) the creation of a master list of possible measures, 3) detailed ranking of measures based on certain criteria, and 4) final selection of measures to be included in the Plan. The ranking was based on the following criteria:

- greenhouse gas reduction potential
- cost feasibility
- other feasibility issues
- other costs or benefits associated with the measure

A complete list of all the measures that were considered and how they were ranked is included in Appendix B. Section V of this document outlines the measures that were selected for inclusion in the Plan. A brief description of each measure is given.

Once the draft Community Greenhouse Gas Reduction Plan was developed it was made available through the City's website and through the Environmental Services Department. A public forum was held to present the draft plan to the community and to solicit public input. Public input was also received at the regular monthly meetings of the Energy Committee and via written submissions to the Environmental Services Department. All public input was reviewed and incorporated into the plan as appropriate.

D. Milestone Four: Implementation Plan

The measures that have been selected for Arcata's Greenhouse Gas Reduction Plan are too numerous to be implemented all at once. Instead, a small number of key measures have been chosen for implementation in the first year or two (see Appendix D). Once these measures have been acted upon, then the Plan will be revisited and a second set of measures will be chosen for implementation. This process will be repeated on an annual basis (June of each year) until the City's greenhouse gas reduction goals are met.

During each implementation cycle, certain measures will be chosen and implementation plans will be developed for each measure. These implementation plans will be developed, with public input, by the City's Energy Committee and City staff, and will define: 1) what is to be done, 2) how it is to be accomplished, 3) who is responsible for what, 4) where the necessary resources will come from, and 5) when it will be accomplished by.

In the year 2000, the City of Arcata established the Energy Committee and joined the ICLEI Cities for Climate Protection campaign. Since that time the City has implemented a number of greenhouse gas reduction measures. Appendix C provides a list of greenhouse gas reduction measures that the City of Arcata has already implemented. Appendix D provides a brief, near-term implementation plan that lists the next set of greenhouse gas reduction measures the City will work to implement.

E. Milestone Five: Monitoring and Evaluation

Once measures are implemented, efforts must be employed to track their progress in reducing greenhouse gas emissions. City staff will perform this work. Staff will use the ICLEI/CCP greenhouse gas reduction software and will follow the methods recommended by ICLEI/CCP for tracking greenhouse gas reductions. The next Community Greenhouse Gas Inventory for the City of Arcata will be completed no later than 2010.

V. DETAILS OF ARCATA'S GREENHOUSE GAS REDUCTION PLAN (MILESTONE THREE)

This section of the report describes the measures that have been chosen to reduce locally generated greenhouse gas emissions. The selected measures are grouped into six program areas, including five major areas of emission reduction, plus a sixth approach which cuts across several of the five areas. The six program areas are:

A. Energy Efficiency
B. Renewable Energy
C. Sustainable Transportation
D. Sustainable Consumption and Waste
E. Carbon sequestration and other Methods
F. Cross-Cutting Approaches

A. Energy Efficiency

Fossil fuels (coal, oil, natural gas, and propane) are the main "culprits" in emitting greenhouse gases. They are also the primary energy sources for space heating, water heating, and electricity generation in the United States. Measures that conserve energy or reduce electricity and gas use will thus reduce greenhouse gas emissions. They also reduce energy costs, and can be highly cost-effective. Methods that the City can take to reduce energy use are:

1. Encourage Energy Efficient Buildings, Building Construction, and Retrofit

Homes, businesses and industries have significant impacts on energy consumption. According to the US Green Building Council, building construction and use accounts for 65 percent of electricity consumption and 30 percent of greenhouse gas emissions. Making structures more energy efficient will help reduce greenhouse gas emissions. Efficient design and materials also result in substantial energy savings.

Recommend that the City:

a) Develop land use regulations and building codes designed to encourage energy efficiency. Areas in which policy can promote energy efficiency in commercial or residential buildings include heating systems, lighting, insulation, building materials, and landscaping, among others.
b) Encourage documented energy audits to improve building energy efficiency prior to building sale.
c) Develop codes and regulations for new developments to minimize increase in community net energy use.
d) Modify the City's land use and development guidelines to include energy efficiency standards in the design review process.
e) Encourage commercial building guidelines to reach beyond CA Title 24 Building Energy Code.
f) Encourage co-generation projects on commercial & industrial facilities.
g) Give awards for the most energy efficient buildings.
h) Streamline permitting and provide incentives for energy efficient building construction.
i) Require energy audits to be performed when residential and commercial buildings are sold and that information regarding the opportunities for energy efficiency improvements be presented to the buyer.
j) Work with local lenders to promote energy efficient mortgages. Require that energy efficient mortgage information be presented to all buyers of commercial and residential properties at the time mortgages are secured.

2. Decrease Community Water Usage

Household water use in the United States is over 70 gallons per person per day. Energy is required to pump and process water. Much is wasted through leaks, inefficient fixtures, and inefficient habits. Water conservation will result in less greenhouse gas emissions, by decreasing the energy required to pump and process water.

Recommend that the City:

a) Conduct City-sponsored education to reduce the amount of water wasted in industrial processes, homes, and landscaping.
b) Strengthen land use and development guidelines for new buildings and retrofits. The permitting process for developers and contractors can include clear parameters for integrating water conservation infrastructure and technologies, including low-flush toilets and low-flow showerheads.
c) Increase water storage capacity to allow for off-peak pumping of water.

3. Improve Energy Efficiency in City Operations

The City has already begun to lead by example. Through the integration of energy conservation and efficiency into municipal buildings and day-to-day operations, the City can become a showcase for community energy efficiency, while also reducing its costs. City buildings should go beyond energy efficiency regulatory standards set forth for commercial and residential buildings.

Arcata is at the forefront of California cities recognizing the urgency and the advantages of integrating energy efficiency into city policy and community pursuits. Arcata should also urge regional, state, and national decisionmakers to embrace energy efficiency as a guiding policy force.

Recommend that the City:

a) Continue to implement lighting efficiency upgrades, such as replacing incandescent lighting.
b) Continue to use energy audits to identify needed insulation and heating systems retrofits.
c) Develop purchasing policies that require purchase of energy-efficient products with an Energy Star rating, where available. (NOTE: City staff should research industrial appliances for Energy Star ratings as well.)
d) Initiate in-service training for City staff.
e) Require that any buildings purchased in whole or in part with City funds meet the following energy efficiency requirements: 1) newly constructed commercial buildings must meet U.S. Green Building Council LEED™ criteria, 2) newly constructed residential buildings must meet the U.S. Environmental Protection Agency's ENERGY STAR® New Homes Program, 3) all newly constructed buildings incorporate passive solar design features (such as daylighting and passive solar heating), where feasible, and 4) existing buildings must be retrofitted to meet the current requirements of California's Title 24 Building Energy Code.

4. Encourage Energy Efficiency Policies at All Levels

Recommend that the City:

a) Direct letter writing by City officials to encourage regional, state and national policies to boost energy efficiency.
b) Partner with local organizations on energy-related projects; and
c) Develop relationships with other cities that are integrating energy efficiency in their municipal plans.

5. Encourage Personal Energy Conservation in Residences, Businesses and City Operations

Energy conservation may mean adjusting personal behavior and living patterns so that less energy is required for daily needs. For example, turning down the thermostat a few degrees, or putting on another layer of clothing, are examples of this kind of energy conservation. Using compact fluorescent instead of incandescent lighting is another example.

Recommend that the City:

a) Promote education and outreach. A well-informed citizenry will take positive action. Educational activities and outreach at local events, schools, and businesses, will increase community awareness of energy efficiency and conservation services, policies, products, rebates, and incentive programs.

b) Encourage efficiency practices. For example, office equipment such as computers, faxes, and printers, left on all day, every day, waste energy when not in use. Save energy in offices by replacing obsolete equipment with power-saving models. Through education and outreach the City can also encourage equipment vendors to sell more energy-efficient equipment.
c) Incorporate an Energy Star appliance requirement into contract specifications where possible.

B. Renewable Energy

One of the ways to reduce greenhouse gas emissions is to replace fossil fuels with cleaner energy sources such as solar and wind energy. This can take place at the utility scale and at the individual home or business. At the utility scale, wind farms and solar electric power plans can generate electricity, to be sold to consumers as "green electricity." Locally, home and business owners can install renewable energy systems such as rooftop solar panels. Municipal buildings should also transition to renewable energy, thus reducing the City's emissions and moving the City toward energy resources less subject to price volatility and political instability.

Recommend that the City promote renewable energy via the following activities:

1. Encourage utility scale transitions to renewable energy. Educate citizens about "green electricity" purchasing options. (NOTE: Although California consumers cannot currently choose to purchase "green power," this option will likely be available in the future.) The City should also choose to purchase "green electricity" when this option becomes available.

2. Conduct education and outreach. Inform residents about options and incentives for installing and utilizing renewable energy such as rooftop solar.

3. Adopt policies to encourage renewable energy. The City's Land Use Code revision contains policies that promote the use of solar energy. Incentives for promoting renewable energy should also be considered. City help should be offered to those wishing to access state and federal incentive programs.

4. Install renewable energy systems on city facilities. The City should install renewable energy systems where possible on City facilities. (NOTE that the City is installing a 10-kilowatt solar electric system on City Hall.)

5. Consider a locally- or regionally-owned green utility, perhaps in coordination with the RCEA or regional approaches. Consider implementing the Community Choice Aggregation (CCA) model as a means of aggregating the city's electricity loads and purchasing renewable electricity to meet the city's electricity needs. (Note: CCA would serve all electricity users in the City, including residents, businesses and municipal facilities, except those who choose to "opt out").

6. Solar ready buildings. Require that, where feasible, all new buildings be constructed to allow for the easy, cost-effective installation of future solar energy systems. "Solar ready" features should include: proper solar orientation (south facing roof area sloped at 20° to 55° from the horizontal), clear access on the south sloped roof (no chimneys, heating vents, plumbing vents, etc.), electrical conduit installed for solar electric system wiring, plumbing installed for solar hot water system, and space provided for a solar hot water storage tank.

7. Low interest loans. Provide low interest loans for residential solar energy systems in conjunction with the City's First Time Home Buyers Program.

8. Wind energy. Work with Humboldt State University to assess the potential for wind energy in the City of Arcata. Promote the development of wind energy systems where feasible and compatible with zoning regulations.

9. Retrofit Wood Stoves. Develop a woodstove retrofit program to bring woodstoves up to EPA omission/efficiency standards.

C. Sustainable Transportation

The transportation sector (autos, public transport, trains, airplanes, etc) is one of the largest sources nationally of greenhouse gas emissions. Likewise, in Arcata, vehicular travel is the largest source. Reduced automobile travel, more efficient vehicles and cleaner transportation fuels would help to reduce Arcata's greenhouse gas emissions. The City should support cleaner and alternative transportation to lower emissions and energy costs, to create energy independence, and to improve citizen health.

Recommend promotion of sustainable transportation via the following seven measures:

1. Incorporate Energy and Climate Policy into the City's Transportation Plan and Encourage Policies at all Levels for Efficient and Non-Polluting Transportation. Policies that address the importance of energy efficiency and lower emissions should be added to the City Transportation Plan to ensure a wide range of measures to reduce emissions.

2. Improve Bicycle Infrastructure. Create more bike lanes on existing roads and make bridges and intersections more bicycle-friendly. Bicycle parking should be easily accessible, plentiful, and protected from rain where possible.

3. Improve Pedestrian Infrastructure (sidewalks, paths, and walkways). Sidewalks need to be wide enough so people can walk comfortably side by side and be able to pass others. Walkways need to be well marked, accessible and continuous, so that walkers can safely share the roadways with cyclists and autos.

4. Improve Mass Transit Infrastructure. Bus stops and bus lanes should be convenient and efficient. Bus stops should be clearly marked, and frequently used stops should have a covered shelter for people to stay dry while waiting. Purchase more energy-efficient transit buses that run on less fuel. Consider also increasing service, more effective hours, and serving unserved arteries. Schedule and coordinate with the Transit Authorities.

5. Educate to Discourage Driving and Create Incentives to Lessen Driving. For both health and environmental reasons, the City should promote walking, bicycling, taking public transportation, ride sharing, alternatively fueled vehicles, and telecommuting. Create programs that encourage and reward walking, cycling or taking public transit. Consider disincentives including parking fees, traffic taming and gas taxes.

6. Support Local Sustainable Transportation Efforts. The City should support programs and efforts such as the Arcata Library Bike Program, the Bike-to-Work-Day and the Car-Free Day, which promote sustainable transportation.

7. Green the City Fleet. Use fuels or energy sources which emit fewer greenhouse gases, such as electricity or natural gas. Create a purchasing policy for acquiring new City vehicles that are more fuel efficient such as hybrids. The City should purchase a variety of vehicles, such as bicycles, electric bicycles, small electric vehicles, and energy efficient automobiles, and should institute policies that require that the most energy-efficient vehicle be used for each City purpose.

8. Smart Growth. The City should promote "smart growth" development strategies. These include: compact, mixed-use development, higher density development, and infill. The City should consider relaxing parking space requirements in new developments.

9. Rail Right-of-Way. The City should preserve existing rail rights-of-way where appropriate and should encourage the development of existing rail rights-of-way as "rails-to and with-trails."

D. Waste and Consumption Reduction

Energy is used to produce and package consumer goods. Methane, a potent greenhouse gas, is produced when organic material breaks down in landfills. Good planning should consider industrial

ecology, and should examine local, regional, and global uses and flows of materials and energy in products and processes. Efforts should be made to reduce environmental burdens throughout product life cycle. Measures that reduce waste in consumption, and encourage recycling and reuse in purchasing will also reduce greenhouse gas emissions.

Recommend that the City:

1. The City should continue to support policies at all levels for waste and consumption reduction with a goal of zero waste.

2. Expand education to the public about the benefits of waste reduction, via informational materials, organized events and workshops, including backyard composting workshops, office paper recycling programs, and organized brush drop-off programs.

3. Continue to promote incentives that encourage waste reduction, such as city-subsidized recycling and free composting bins.

4. Strengthen recycling programs, purchasing policies, and employee education, to reduce the amount of city waste produced.

5. Partner with other agencies and entities, such as the Humboldt Waste Management Authority, to implement waste reduction programs and develop other beneficial programs. The City does not landfill locally, but ships all of its solid waste to an out-of-state facility. The City should begin regional efforts to ensure that proper landfill gas collection practices are being observed at the landfill and that cogeneration is used where possible. Efforts should be made to reduce the carbon emissions from transportation to the site. Efforts should also be made to pursue regional waste reduction programs.

E. Carbon Sequestration and Other Methods

Vegetation, trees, and healthy soil remove and store, or "sequester," carbon dioxide from the atmosphere. Thus, an increase in carbon sequestration capacity can reduce greenhouse gas emissions. Measures that reduce greenhouse gas emissions through strategies other than energy efficiency, renewable energy, transportation, or waste reduction, are also included in this section.

Recommend that the City:

1. Continue to Sustainably Manage the Community Forest to increase timber inventory and biomass over time. Currently the Forest Plan allows for harvest of one-half the annual growth increment, thus, accrual of carbon occurs over time. Thirty five percent of the Community and Jacoby Creek Forests are set aside in reserve that will allow for old growth conditions and increased carbon storage to occur as well. Adding additional area to the ACF and JCF will likely increase carbon sequestration potential as the City Management Policy calls for growing long-rotations of 120+ years. The City should, in its Open Space policies, promote the carbon sequestration benefits of increased vegetation and continue to expand riparian forests along urban streams.

2. Utilize Biogas. The City's wastewater treatment plant (WWTP) has a cogeneration[2] system that was designed to utilize biogas[3]. It was built over twenty years ago, but was shut down due to operational problems. Currently much of the City's biogas is used to meet heating loads at the WWTP. However, not all of the biogas is utilized, and the excess is flared to convert it to carbon

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[2] Cogeneration refers to the production of electricity and useful heat from a common fuel source. For example, when fuel is burned in an internal combustion engine generator to produce electricity, the waste heat can be captured and utilized.

[3] Biogas is produced as a by-product of the wastewater treatment process. It consists of approximately 60% methane (natural gas), and therefore can be used as a fuel source.

dioxide rather than release methane directly to the atmosphere.[4] It is possible that the flared biogas could also be used as a fuel source. In order to determine if this is a viable option, metering equipment would need to be installed to measure how much biogas is currently being flared. The City could then determine whether it makes sense to capture the excess biogas for use as a fuel.

3. Encourage policies at all levels for carbon sequestration. The City can bring pressure to bear on state and national forest regulators to better manage logging practices by reducing non-sustainable timber harvesting, and promoting reforestation.

F. Cross-Cutting Approaches

Many strategies for reducing greenhouse gas emissions involve several of the above areas. Measures and strategies that involve two or more of the categories discussed above are listed in this section. Regardless of the strategy chosen, these cross-cutting approaches should consider involving tactics of education, outreach, training and promotion; adopting municipal codes, affecting changes in City operations such as purchasing and best practices, engaging in regional partnerships such as the Redwood Coast Energy Authority; and influencing regional, state and national policies.

Recommend that the City:

1. Develop a city-wide Green Building promotional campaign, which might involve educating city staff and policy makers about best practices, preparation and provision of checklists and specification guidelines for contractors, amending purchasing protocols, preparing a website, and offering opportunities for in-service and professional training. It should involve several City departments, including Public Works (for City buildings and infrastructure); Community Development; and Building and Planning (for construction permits and long-range planning). Detailed aspects of the Energy Efficiency, Renewable Energy, Waste Reduction, and other sections discussed above would then be utilized where appropriate for the entire Green Building Program.

2. Develop a city-wide collaborative effort between the City and the University in greenhouse gas reduction, as well as those of the regional authority, and other state and regional efforts. Such a crosscutting effort might adopt any number of the recommendations found in the first five sections.

3. Support green economic growth. The City should promote economic development policies that encourage businesses that employ sustainable energy practices. This could include: businesses that co-locate to make use of each others waste products (such as waste heat or waste materials), businesses that employ cogeneration, distributed generation or district heating technologies, and businesses that are furthering the research, development, promotion and sale of sustainable energy products, technologies, and services.

4. Develop regional educational programs, incentive programs, and partnerships, as appropriate. The City should work with regional groups, like the Redwood Coast Energy Authority, to promote energy efficiency, renewable energy, sustainable transportation, waste reduction, and other programs that will serve to reduce greenhouse gas emissions in our community.

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[4] Methane (CH4) is not only the primary constituent of natural gas, but is generally the product of anaerobic decomposition that takes place in landfills and primary wastewater treatment. On a per unit basis, methane has approximately 20 times the greenhouse impact of carbon dioxide, so it can be inferred that reduction or carbon sequestration of one unit of methane from any source is equivalent to the reduction or carbon sequestration of 20 units of carbon dioxide. This enhances the importance of proper operation of landfills and wastewater treatment plants. Methane from landfills and wastewater treatment plants is generally captured and flared, converting it to carbon dioxide. If the methane is instead used as a fuel, it can displace an alternative fuel source and offset the CO_2 generation associated with the other fuel.

Appendix A:
Community Greenhouse Gas Inventory and Forecast

The City of Arcata

International Council on Local Environmental Initiatives
Cities for Climate Protection Campaign

Community Greenhouse Gas Inventory and Forecast

Prepared for:
The City of Arcata

Prepared by:

Kathy Jack, Energy Program Specialist
Environmental Services Department
City of Arcata

August 2002

Acknowledgements

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Gerald Kindsfather, Humboldt County Waste Manager

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Stephen Tyler, Director of Environmental Services

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Sean Kinghorn, Natural Resources Planning and Interpretation Graduate Student at Humboldt State University, and National Wildlife Federation Fellow with the Center for Environmental Economic Development, for several hours of number crunching and for sharing data he gathered for the City fleet, HSU energy use, and community propane use.

Special thanks also goes to the City of Arcata Energy Committee, for their work in reviewing this document and in creating a plan to reduce local greenhouse gas emissions.

Melissa Royael, **Ryan Bell** and other **ICLEI** staff for their endless support!

Table of Contents

Copies are available at the City of Arcata Environmental Services Department

Introduction

Background

By Dan Ihara, PhD.

A consensus of the world's scientists have concluded that humans are changing the global climate primarily through our use of fossil fuel (Intergovernmental Panel on Climate Change, 2000). This has serious consequences for all life on earth.

The scientific community also recognizes that fossil fuel use needs to be reduced 60 –80% from current levels in order to stabilize atmospheric concentrations of carbon dioxide, the major greenhouse gas. Yet in the United States, and globally, carbon dioxide emissions are increasing. The Kyoto Protocol's target of a 5% reduction in industrial countries' carbon dioxide emissions below 1990 levels is a step in the right direction. The government of the United States, however, has chosen not to join with the other nations of the world in trying to solve this global problem. Because the U.S. has forsaken its planetary responsibilities, it has fallen on local governments, especially in the United States, to take the lead to stem the tide of global climate change that humans have set in motion.

ICLEI's Cities for Climate Protection Campaign

In August of 2000, the City of Arcata adopted a proclamation (**Appendix IV**) supporting the International Council on Local Environmental Initiatives' (ICLEI) Cities for Climate Protection (CCP) campaign. The CCP campaign is a global effort to reduce greenhouse gases, at the community level. As a part of the City's participation in the CCP campaign, the city has voluntarily committed to complete the following "milestones":

1) Conduct a baseline emissions inventory and forecast of emissions growth.
2) Set an emissions reduction target.
3) Develop an action plan to meet the emissions reduction target.
4) Implement the action plan.
5) Monitor and verify progress and results.

7 by '07

With this same proclamation, the City of Arcata voluntarily committed to reduce community greenhouse gas emissions to 7% below 1990 levels by 2007. The U.S. Environmental Protection Agency has estimated that U.S. greenhouse gas emissions have increased by 11% from 1990 to 2000. Based on this estimation, the community of Arcata would need to reduce greenhouse gas emissions by approximately 18% below 2000 levels by 2007, to achieve the "7 by '07" goal.

Reduction Goal

In line with the City Council's "7 by '07" proclamation, and consistent with other community greenhouse gas inventories which have set reduction targets for 2010, the City of Arcata seeks to reduce locally generated greenhouse gas emissions by 20% below 2000 levels, by the year 2010.

Purpose

The purpose of the inventory is to present a clear picture of how our community uses energy and to highlight those activities and sectors producing the most greenhouse gases. This will allow the City to better target our greenhouse gas reduction activities. Because greenhouse gas emissions are largely associated with energy use, this tool will also help the City to target energy conservation activities.

Methodology

Overview

The CCP methodology allows communities to systematically track energy and waste related activities in the community, and to calculate the relative quantities of greenhouse gases produced by each activity and sector. The methodology performs two assessments: a communitywide assessment (including local government activities) and a separate inventory of local government facilities and activities. This information can then be used to target appropriate areas for effective reduction of greenhouse gases.

The methodology also allows a community to calculate projected greenhouse gas emissions, which would be produced in the future if the community were to implement no emissions reduction measures. This could be considered the "business as usual" scenario.

The baseline greenhouse gas emissions inventory for 2000, along with the "business as usual" projection for 2010, will guide the City in setting a course to reach the reduction goal of 20% below 2000 levels by 2010.

CCP Software

ICLEI contracted with Torrie Smith & Associates, to create a software package incorporating the CCP methodology. The software calculates the equivalent carbon dioxide emissions (eCO_2) resulting from all energy and waste inputs. The emissions coefficients and methodology employed by the CCP software is consistent with National and International inventory standards established by the International Panel on Climate Change(*1996 Revised IPCC Guidelines for the Preparation of National Inventories)* and the U.S. Voluntary Greenhouse Gas Reporting Guidelines (EIA form1605). **Appendix III** includes an overview of the methodology employed by the CCP software for emissions calculations.

The City of Arcata has used the CCP software to conduct our Community Greenhouse Gas Inventory, and "business as usual" Forecast into the year 2010. We will continue to employ the CCP software to track our emissions and emission reducing measures, over time.

Application

The community wide analysis performed by the software includes an electrical and heat- fuel emissions analysis for the residential, commercial, and industrial sectors; a transportation emissions analysis; and a waste emissions analysis. The local government inventory, referred to as the "corporate" analysis in the software, takes a more detailed inventory of electrical, heat, and other fuel related emissions, as well as waste emissions for local government activities.

All software analyses required the input of information from a variety of sectors and sources. Most data collected for the baseline inventory is from the calendar year 2000. Some data, however, is from the fiscal year 2000- 2001. When data was not available for 2000 or 2000-2001, the most representative data was used and adjusted to reflect time.

Rather than describe the methodology and assumptions made for each sector and activity here, the data sources and calculations (including assumptions) are described in detail (in chart format) in **Appendix II .**

Inventory Results

Summary

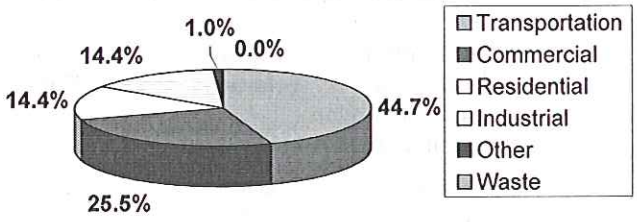
Community

In the base year 2000, the community of Arcata generated approximately **234,703 tons** of CO2 equivalent emissions. As **Table 1** exhibits, the transportation sector produced the largest portion of greenhouse gases and was also the largest energy consumer, followed by the commercial, residential, and industrial sectors, and other miscellaneous sources. The details of each sectors greenhouse gas generation and energy consumption are listed by source and quantity in the reports section (**Appendix I**). The waste sector is usually a significant contributor of the greenhouse gas methane. However, due to the excellent methane recovery rate at the landfill, the waste sector end up serving as a greenhouse gas "sink." This process is further described in **Appendix III**. The total greenhouse gases reported here include the carbon "sequestration" capacity of the Arcata Community Forest (detailed in **Appendix II**).

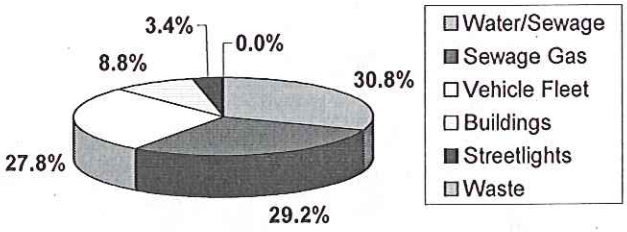
Table 1. Arcata Community Greenhouse Gas Emissions 2000
Base Year Sector Summary by eCO2 and Energy

Potential Sources	Equiv CO2 (tons)	Energy (million Btu)
Transportation	111,239	1,292,795
Commercial	63,494	600,337
Residential	35,874	572,077
Industrial	35,736	559,478
Other	2,471	0
Waste	-4,268	0
Subtotal	**244,546**	**3,024,688**
Measures		
Arcata Forest	-9844	0
TOTAL	**234,703**	**3,024,688**

Community Greenhouse Gas Emissions by Sector in 2000 in Equivalent CO2 (%)



City of Arcata Corporate Greenhouse Gas Emissions in 2000 in Equivalent CO2 (%)



Corporate

In the base year of 2000, the City of Arcata "Corporate" local government generated **2,064 tons** of eCO2 emissions. The City's "sustainable" management of the Community Forest is considered a community measure, rather than a corporate measure, because carbon is sequestered from the entire region. Large energy savings and greenhouse gas emission reduction opportunities remain within City operations, and the City is committed to reducing City energy consumption and greenhouse gas emissions. A detailed breakdown of City energy consumption and greenhouse gas emissions by activity are also included in the reports section (**Appendix I**).

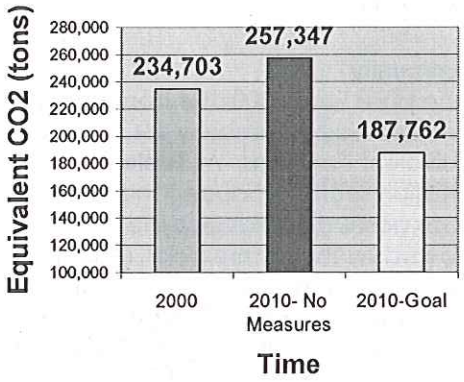
Table 2. City of Arcata Corporate Greenhouse Gas Emissions 2000
Base Year Activity Summary by eCO2 and Energy

Potential Sources	Equiv CO2 (tons)	Energy (million Btu)
Water/Sewage	644	6,108
Wastewater (Methane Gas)	611	0
Vehicle Fleet	582	6,707
Buildings	184	3,335
Streetlights	71	1,329
Waste	-28	0
Subtotal	**2,064**	**17,479**
Measures	0	0
TOTAL	**2,064**	**17,479**

Projection to Target Year 2010

The City of Arcata has voluntarily committed to reducing locally generated greenhouse gases by 10% below 1990 levels, or an estimated 20% below 2000 levels by 2010. Based on inventory results, this would mean a 20 % reduction from **234,703 tons.** The Community of Arcata's target for the year 2010 is **187,762 tons** of CO2 equivalent. The CCP software allows users to estimate future greenhouse gas emissions that will be generated if no further reduction measures are implemented in the community. Using growth rates estimated by planners for the various sectors of Arcata (see **Appendix II**), greenhouse gas emissions were estimated for Arcata in 2010 (our target year), given no emissions reduction activities. To achieve a 46,941 ton reduction from 2000 levels, the Community will need to make a 69,585 ton reduction, through measures, from the business as usual scenario. A detailed breakdown of the "no measure" scenario for 2010, is also included in the reports section (**Appendix I**).

Arcata Community Greenhouse Gas Emissions in Equivalent CO2 (tons)



Arcata Community Greenhouse Gas Emissions in Equivalent CO2 (tons)

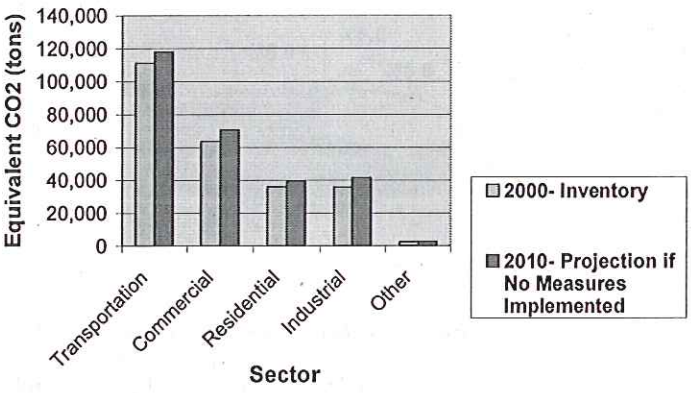


Table 3. Arcata Community Greenhouse Gas Emissions 2010 Target Year "No Measures" Sector Summary by eCO2 and Energy

Potential Sources	Equiv CO2 (tons)	Energy (million Btu)
Transportation	117,913	1,370,363
Commercial	70,479	666,375
Residential	39,462	629,285
Industrial	41,454	648,994
Other	2,578	0
Waste	-4,695	0
Subtotal	**267,191**	**3,315,017**
Measures		
Arcata Forest	-9844	0
TOTAL	**257,347**	**3,315,017**

Software Reports

The software reports are included as **Appendix I.** These reports are produced by the CCP software, and encompass the detailed reporting of emissions sources, including reference notes, for the community and corporate inventories and the 2010 "no measures" projection. The detailed reports are followed by summary reports, which indicate greenhouse gas estimates by sector and source.

Emissions Reduction Action Plan

The next step in reducing local emissions of greenhouse gases is to develop a cohesive plan, based on the information revealed from this study. Several initiatives have taken place since the baseline inventory year.

The City has developed an Energy Program that promotes "clean and secure energy resources for Arcata through conservation and generation (see www.arcatacityhall.org)." The scope of this program includes working to "reduce the net emissions of greenhouse gases from Arcata (General Plan 2020 Policy RC-8)." Further activities to reduce local GHG emissions, will be promoted through the City Energy Program.

The City has joined the International Council on Local Environmental Initiatives' Cities for Climate Protection Campaign, and City staff and the Arcata Energy Committee are working with ICLEI to develop a local Emissions Reduction Action Plan.

The City is working with the Humboldt Energy Task Force to promote conservation and renewable energy use in the area. The Arcata City Council has set a goal that 25% of the City fleet be alternative fueled vehicles by 2005, and 50% by 2010.

The City Wastewater treatment plant is no longer directly venting methane, but is combusting the methane to heat the digester. Excess methane is also combusted, reducing its potency as a greenhouse gas. The City is investigating the use of micro-turbines to utilize digester excess methane for electrical production.

The City is also participating with ICLEI and the USEPA to reduce local greenhouse gases associated with organic waste (see **Appendix V**), although as estimated by the CCP software, this sector represents a "negative" source of greenhouse gases for the area. With the next phase of greenhouse gas reduction "planning", the City will focus on those activities producing the largest quantities of greenhouse gases community-wide, and in municipal facilities.

Community Greenhouse Gas Emissions in 2000
Base Year Detailed Report

	Equiv CO 2 (tons)	Equiv CO 2 (%)	Energy (million Btu)
Residential			
PG&E customers			
Electricity	17,407	7.1	105,537
Natural Gas	16,991	6.9	275,300
LPG	7	0.0	98
Fuelwood (Air Dry)	1,469	0.6	191,143
Subtotal PG&E customers See Appendix I. pp: iv,vi, vii,viii.	35,874	14.7	572,077
Subtotal Residential	35,874	14.7	572,077
Commercial			
Corporate (City)			
Electricity	665	0.3	4,033
Natural Gas	232	0.1	3,758
LPG	1	0.0	20
Green Electricity	0	0.0	2,961
Subtotal Corporate (City) See Appendix I. pp: vii, xi,xiii, xvii,xviii,vii.	899	0.4	10,772
HSU			
Electricity	5,979	2.4	36,249
Natural Gas	7,010	2.9	113,571
LPG	61	0.0	834
Green Electricity	0	0.0	9,062
Subtotal HSU See Appendix I. pp: ix,xi,xii.	13,049	5.3	159,717
HSU Water Pumping			
Electricity	51	0.0	307
Subtotal HSU Water Pumping See Appendix I. p x.	51	0.0	307
PG&E Customers			
Electricity	36,247	14.8	219,766
Natural Gas	12,761	5.2	206,762
LPG	7	0.0	98
Subtotal PG&E Customers See Appendix I. pp: vii, xi,xii.	49,015	20.0	426,627
Water Pumping- non HSU			
Electricity	481	0.2	2,915
Subtotal Water Pumping- non HSU See Appendix I. p x.	481	0.2	2,915
Subtotal Commercial	63,494	26.0	600,337
Industrial			
PG&E customers			
Electricity	26,500	10.8	160,668
Natural Gas	7,042	2.9	114,093
LPG	7	0.0	98
Fuelwood (Air Dry)	2,187	0.9	284,619
Subtotal PG&E customers See Appendix I. pp: vi, vii, viii, xi, xii.	35,736	14.6	559,478
Subtotal Industrial	35,736	14.6	559,478

Community Greenhouse Gas Emissions in 2000
Base Year Detailed Report (cont.)

Transportation			
Road Transportation			
Gasoline	99,149	40.5	1,142,510
Diesel	8,868	3.6	101,705
LPG	1,491	0.6	20,540
CNG	1,731	0.7	28,041
Subtotal Road Transportation See Appendix I. p xiv.	111,239	45.5	1,292,795
Subtotal Transportation	111,239	45.5	1,292,795
Waste			
Dry Creek Landfill- Ashland,OR			
Paper Products	-2,339	-1.0	
Food Waste	82	0.0	
Plant Debris	-934	-0.4	
Wood/Textiles	-1,077	-0.4	
Subtotal Dry Creek Landfill- Ashland,OR See Appendix I. p xv. See "Other" for emissions associated with the transportation of solid waste to Oregon.	-4,268	-1.7	
Subtotal Waste	-4,268	-1.7	
Other			
Cattle Methane			
Methane	1,396	0.6	
Subtotal Cattle Methane See Appendix I, p xxiii.	1,396	0.6	
Sewage Gas/Methane Released			
Carbon Dioxide	611	0.2	
Subtotal Sewage Gas/Methane Released See Appendix I. p xxii.	611	0.2	
Transportation of Solid Waste			
Carbon Dioxide	464	0.2	
Subtotal Transportation of Solid Waste See Appendix I. p xxi.	464	0.2	
Subtotal Other	2,471	1.0	
Total	244,546	100.0	3,024,688

This report has been generated for Arcata, California with software created by Torrie Smith Associates for the Cities for Climate Protection Campaign of The International Council for Local Environmental Initiatives.

10/15/2002

Community Greenhouse Gas Emissions in 2000 Base Year Report by Source

	Equiv CO_2 (tons)	Equiv CO_2 (%)	Energy (million Btu)
Electricity	87,329	35.7	529475
Natural Gas	44,036	18.0	713,484
CNG	1,731	0.7	28,041
Gasoline	99,149	40.5	1,142,510
Diesel	8,868	3.6	101,705
LPG	1,575	0.6	21,689
Fuelwood (Air Dry)	3,656	1.5	475,762
Green Electricity	0	0.0	12,023
Paper Products	-2,339	-1.0	
Food Waste	82	0.0	
Plant Debris	-934	-0.4	
Wood/Textiles	-1,077	-0.4	
Carbon Dioxide	1,075	0.4	
Methane	1,396	0.6	
Total	244,546	100.0	3,024,688

Fuel costs include Buildings, Vehicle Fleet, Streetlights and Water/Sewage sectors only.
This report has been generated for Arcata, California with software created by Torrie Smith Associates for the Cities for Climate Protection Campaign of The International Council for Local Environmental Initiatives.

10/15/2002

Community Greenhouse Gas Emissions in 2000 Base Year Report by Sector and Source

	Equiv CO_2 (tons)	Equiv CO_2 (%)	Energy (million Btu)
Residential Sector			
Electricity	17,407	7.1	105,537
Natural Gas	16,991	6.9	275,300
LPG	7	0.0	98
Fuelwood (Air Dry)	1,469	0.6	191,143
Subtotal	35,874	14.7	572,077
Commercial Sector			
Electricity	43,422	17.8	263,270
Natural Gas	20,003	8.2	324,092
LPG	69	0.0	953
Green Electricity	0	0.0	12,023
Subtotal	63,494	26.0	600,337
Industrial Sector			
Electricity	26,500	10.8	160,668
Natural Gas	7,042	2.9	114,093
LPG	7	0.0	98
Fuelwood (Air Dry)	2,187	0.9	284,619
Subtotal	35,736	14.6	559,478
Transportation Sector			
CNG	1,731	0.7	28,041
Gasoline	99,149	40.5	1,142,510
Diesel	8,868	3.6	101,705
LPG	1,491	0.6	20,540
Subtotal	111,239	45.5	1,292,795
Waste Sector			
Paper Products	-2,339	-1.0	
Food Waste	82	0.0	
Plant Debris	-934	-0.4	
Wood/Textiles	-1,077	-0.4	
Subtotal	-4,268	-1.7	
Other Sector			
Carbon Dioxide	1,075	0.4	
Methane	1,396	0.6	
Subtotal	2,471	1.0	
Total			
	244,672	100.0	3,025,029

This report has been generated for Arcata, California with software created by Torrie Smith Associates for the Cities for Climate Protection Campaign of The International Council for Local Environmental Initiatives.

10/15/2002

Corporate Greenhouse Gas Emissions in 2000
Base Year Detailed Report

	Equiv CO 2 (tons)	Equiv CO 2 (%)	Energy (million Btu)	Cost ($)
Buildings				
Buildings, Rollup 85 & 81(pt)				
Electricity	72	3.5	439	12,142
Natural Gas	110	5.3	1,785	8,828
LPG	1	.1	20	352
Green Electricity	0	0.0	1,090	29,056
Subtotal Buildings, Rollup 85 & 81(pt)	184	8.9	3,335	50,378
See Appendix I. pp: xiii, xvi-xvii, xviii,vii.				
Subtotal Buildings	184	8.9	3,335	50,378
Vehicle Fleet				
City Transit				
Gasoline	5	0.2	57	693
Diesel	216	10.5	2,480	26,619
CNG	0	0.0	0	0
Subtotal City Transit	221	10.7	2,537	27,312
See Appendix I. p xix.				
Vehicle Fleet				
Gasoline	259	12.5	2,981	36,297
Diesel	98	4.8	1,127	12,098
CNG	4	0.2	62	644
Subtotal Vehicle Fleet	361	16.0	4,170	49,039
See Appendix I. p xix.				
Subtotal Vehicle Fleet	582	17.5	6,707	76,352
Streetlights				
Park Lighting, from Rollup 81				
Electricity	9	0.4	52	1,529
Green Electricity	0	0.0	121	3,434
Subtotal Park Lighting, from Rollup 81	9	04	173	4,963
Streetlighting is Rollup 81 from ABAG accounts. We have also included 94% of Rollup 41 (Parks), which is park lighting. See Appendix I. pp: xvi-xvii.				
Streetlighting, Rollup 41				
Electricity	62	3.0	376	8,335
Green Electricity	0	0.0	779	16,218
Subtotal Streetlighting, Rollup 41	62	3.0	1,156	24,553
See Appendix I. pp xvi-xvii.				
Subtotal Streetlights	71	3.4	1,329	29,516
Water/Sewage				
City Sewage & Water Treatment				
Electricity	522	25.3	3164	88,317
Natural Gas	122	5.9	1,974	7,304
Green Electricity	0	0.0	970	25,463
Subtotal City Sewage & Water Treatment	644	31.2	6,108	121,084
The City of Arcata does not operate a water supply plant. We are supplied by the Humboldt Bay Municipal Water District. Figures for energy expenditure associated with water supply are in the comunity analysis. See Appendix I. pp: xvi-xvii. The estimated methane "released" in the form of sewage gas, is included under "other".				
Subtotal Water/Sewage	644	31.2	6,108	121,084

[redacted] Greenhouse Gas Emissions in [redacted] Base Year Detailed Report (cont.)

	Equiv CO_2 (tons)	Equiv CO_2 (%)	Energy (million Btu)	Cost ($)
Waste				
City Facilities				
Paper Products	-20	-1.0		0
Food Waste	0	0.0		0
Plant Debris	-4	-0.2		0
Wood/Textiles	-4	-0.2		0
Subtotal City Facilities See Appendix I. p xxi.	-28	-1.3		0
Subtotal Waste	-28	-1.3		0
Other				
Sewage gas				
Carbon Dioxide	611	29.6		
Subtotal Sewage gas See Appendix I. p xxii.	611	29.6		
Subtotal Other	611	29.6		
Total	2,064	100.0	17,479	277,330

This report has been generated for Arcata, California with software created by Torrie Smith Associates for the Cities for Climate Protection Campaign of The International Council for Local Environmental Initiatives.

[redacted] Greenhouse Gas Emissions in [redacted] Base Year Report by Source

	Equiv CO_2 (tons)	Equiv CO_2 (%)	Energy (million Btu)	Cost ($)
Electricity	665	32.5	4,003	110,324
Natural Gas	232	11.2	3,758	16,132
CNG	4	0.2	62	644
Gasoline	264	12.8	3,038	36,990
Diesel	315	15.2	3,607	38,717
LPG	1	.1	20	352
Green Electricity	0	0.0	2,961	74,170
Paper Products	-20	-1.0	0	
Food Waste	0	0.0	0	
Plant Debris	-4	-0.2	0	
Wood/Textiles	-4	-0.2	0	
Carbon Dioxide	611	29.6	0	
Total	2,064	100.0	17,479	277,330

Fuel costs include Buildings, Vehicle Fleet, Streetlights and Water/Sewage sectors only.
This report has been generated for Arcata, California with software created by Torrie Smith Associates for the Cities for Climate Protection Campaign of The International Council for Local Environmental Initiatives

10/15/2002

Corporate Greenhouse Gas Emissions in 2000
Base Year Report by Sector and Source

	Equiv CO_2 (tons)	Equiv CO_2 (%)	Energy (million Btu)	Cost ($)
Buildings Sector				
Electricity	72	3.5	439	12,142
Natural Gas	110	5.3	1,785	8,828
LPG	1	.1	20	352
Green Electricity	0	0.0	1,090	29,056
Subtotal	184	8.9	3,335	50,378
Vehicle Fleet Sector				
CNG	4	0.2	62	644
Gasoline	264	12.8	3,038	36,990
Diesel	315	152	3,607	38,717
Subtotal	582	28.2	6,707	76,352
Streetlights Sector				
Electricity	71	3.4	429	9,864
Green Electricity	0	0.0	900	19652
Subtotal	71	3.4	1,329	29,516
Water/Sewage Sector				
Electricity	522	25.3	3,164	88,317
Natural Gas	122	59	1,974	7,304
Green Electricity	0	0.0	970	25,463
Subtotal	644	31.2	6,108	121,084
Waste Sector				
Paper Products	-20	-1.0	0	
Food Waste	0	0.0	0	
Plant Debris	-4	-0.2	0	
Wood/Textiles	-4	-0.2	0	
Subtotal	-28	-1.3	0	
Other Sector				
Carbon Dioxide	611	29.6		
Subtotal	611	29.6		
Total				
	2,064	100.0	17,479	277,330

This report has been generated for Arcata, California with software created by Torrie Smith Associates for the Cities for Climate Protection Campaign of The International Council for Local Environmental Initiatives.

10/15/2002

[redacted] Greenhouse Gas Emissions in [redacted] Base Year Indicators Report

	Equiv CO_2 (tons)	Energy (million Btu)	Cost ($)
Buildings			
Buildings, Rollup 85 & 81(pt)			
Per floor area (1000 sq. ft.)	2.2	40.0	604.1
Per occupant	.8	15.4	232.2
Sector Average			
Per floor area (1000 sq. ft.)	2.2	40.0	604.1
Per occupant	.8	15.4	232.2
Vehicle Fleet			
City Transit			
Per vehicle kilometre	0.0	0.0	0.3
Vehicle Fleet			
Per vehicle kilometre	0.0	0.0	0.1
Sector Average			
Per vehicle kilometre	0.0	0.0	0.1
Waste			
City Facilities			
Per employee	-0.1		0.0
Sector Average			
Per employee	-0.1		0.0

This report has been generated for Arcata, California with software created by Torrie Smith Associates for the Cities for Climate Protection Campaign of The International Council for Local Environmental Initiatives.

10/15/2002

Community Greenhouse Gas Emissions in 2010 Target Year Detailed Report

	Equiv CO_2 (tons)	Equiv CO_2 (%)	Energy (million Btu)
Residential			
PG&E customers			
Electricity	19,147	7.2	116,091
Natural Gas	18,690	7.0	302,829
LPG	8	0.0	108
Fuelwood (Air Dry)	1,616	0.6	210,257
Subtotal PG&E customers	39,462	14.8	629,285
Growth factors (see Appendix I, p v) were applied to baseline year data.			
Subtotal Residential	39,462	14.8	629,285
Commercial			
Corporate (City)			
Electricity	738	0.3	4,476
Natural Gas	257	0.1	4,172
LPG	2	0.0	22
Green Electricity	0	0.0	3,286
Subtotal Corporate (City)	997	0.4	11,957
Growth factors (see Appendix I, p v) were applied to baseline year data.			
HSU			
Electricity	6,636	2.5	40,237
Natural Gas	7,781	2.9	126,063
LPG	67	0.0	926
Green Electricity	0	0.0	10,059
Subtotal HSU	14,484	5.4	177,285
Growth factors (see Appendix I, p v) were applied to baseline year data.			
HSU Water Pumping			
Electricity	56	0.0	341
Subtotal HSU Water Pumping	56	0.0	341
Growth factors (see Appendix I, p v) were applied to baseline year data.			
PG&E Customers			
Electricity	40,234	15.1	243,941
Natural Gas	14,165	5.3	229,506
LPG	8	0.0	109
Subtotal PG&E Customers	54,407	20.4	473,556
Growth factors (see Appendix I, p v) were applied to baseline year data.			
Water Pumping- non HSU			
Electricity	534	0.2	3,236
Subtotal Water Pumping- non HSU	534	0.2	3,236
Growth factors (see Appendix I, p v) were applied to baseline year data.			
Subtotal Commercial	70,479	26.4	666,375
Industrial			
PG&E customers			
Electricity	30,740	11.5	186,375
Natural Gas	8,168	3.1	132,347
LPG	8	0.0	114
Fuelwood (Air Dry)	2,537	0.9	330,159
Subtotal PG&E customers	41,454	15.5	648,994
Growth factors (see Appendix I, p v) were applied to baseline year data.			
Subtotal Industrial	41,454	15.5	648,994

10/15/2002

Community Greenhouse Gas Emissions in 2010
Target Year Detailed Report

	Equiv CO_2 (tons)	Equiv CO_2 (%)	Energy (million Btu)
Transportation			
Road Transportation			
Gasoline	105,098	39.3	1,211,060
Diesel	9,400	3.5	107,807
LPG	1,581	0.6	21,772
CNG	1,835	0.7	29,723
Subtotal Road Transportation	117,913	44.1	1,370,363
Growth factors (see Appendix I, p v) were applied to baseline year data.			
Subtotal Transportation	117,913	44.1	1,370,363
Waste			
Dry Creek Landfill- Ashland,OR			
Paper Products	-2,572	-1.0	
Food Waste	90	0.0	
Plant Debris	-1,028	-0.4	
Wood/Textiles	-1,185	-0.4	
Subtotal Dry Creek Landfill- Ashland,OR	-4,695	-1.8	
Growth factors (see Appendix I, p v) were applied to baseline year data.			
Subtotal Waste	-4,695	-1.8	
Other			
Cattle Methane			
Methane	1,396	0.5	
Subtotal Cattle Methane	1,396	0.5	
Growth factors (see Appendix I, p v) were applied to baseline year data for transportation of waste, and for methane generated at the wastewater treatment facility. No growth factor was applied to cattle generated methane.			
Sewage Gas/Methane Released			
Carbon Dioxide	672	0.3	
Subtotal Sewage Gas/Methane Released	672	0.3	
Growth factors (see Appendix I, p v) were applied to baseline year data.			
Transportation of Solid Waste			
Carbon Dioxide	510	0.2	
Subtotal Transportation of Solid Waste	510	0.2	
Growth factors (see Appendix I, p v) were applied to baseline year data.			
Subtotal Other	2,578	1.0	
Total	267,191	100.0	3,315,071

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10/15/2002

Community Greenhouse Gas Emissions in 2010
Target Year Report by Source

	Equiv CO_2 (tons)	Equiv CO_2 (%)	Energy (million Btu)
Electricity	98,086	36.7	594,696
Natural Gas	49,062	18.4	794,918
CNG	1,835	0.7	29,723
Gasoline	105,098	39.3	1,211,060
Diesel	9,400	3.5	107,807
LPG	1,674	0.6	23,052
Fuelwood (Air Dry)	4,153	1.6	540,415
Green Electricity	0	0.0	13,345
Paper Products	-2,572	-1.0	
Food Waste	90	0.0	
Plant Debris	-1,028	-0.4	
Wood/Textiles	-1,185	-0.4	
Carbon Dioxide	1,182	0.4	
Methane	1,396	0.5	
Total	267,191	100.0	3,315,017

Fuel costs include Buildings, Vehicle Fleet, Streetlights and Water/Sewage sectors only.
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10/15/2002

Community Greenhouse Gas Emissions in 2010
Target Year Report by Sector and Source

	Equiv CO_2 (tons)	Equiv CO_2 (%)	Energy (million Btu)
Residential Sector			
Electricity	19,147	7.2	116,091
Natural Gas	18,690	7.0	302,829
LPG	8	0.0	108
Fuelwood (Air Dry)	1,616	0.6	210,257
Subtotal	39,462	14.8	629,285
Commercial Sector			
Electricity	48,199	18.0	292,230
Natural Gas	22,203	8.3	359,742
LPG	77	0.0	1,057
Green Electricity	0	0.0	13,345
Subtotal	70,6479	26.4	666, 375
Industrial Sector			
Electricity	30,740	11.5	186,375
Natural Gas	8,168	3.1	132,348
LPG	8	0.0	114
Fuelwood (Air Dry)	2,537	0.9	330,159
Subtotal	41,454	15.5	648,995
Transportation Sector			
CNG	1,835	0.7	29,723
Gasoline	105,098	39.3	1,211,060
Diesel	9,400	3.5	107,807
LPG	1,581	0.6	21,772
Subtotal	117,913	44.1	1,370,363

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10/15/2002

Community Greenhouse Gas Emissions in 2010
Target Year Report by Sector and Source

	Equiv CO_2 (tons)	Equiv CO_2 (%)	Energy (million Btu)
Waste Sector			
Paper Products	-2,572	-1.0	
Food Waste	90	0.0	
Plant Debris	-1,028	-0.4	
Wood/Textiles	-1,185	-0.4	
Subtotal	-4,695	-1.8	
Other Sector			
Carbon Dioxide	1,182	0.4	
Methane	1,396	0.5	
Subtotal	2,578	1.0	
Total			
	267,330	100.0	3,315,017

This report has been generated for Arcata, California with software created by Torrie Smith Associates for the Cities for Climate Protection Campaign of The International Council for Local Environmental Initiatives.

Appendix II
Data and Calculations

BASELINE COMMUNITY ANALYSIS DATA AND CALCULATIONS INDEX

Appendix II
Data and Calculations

		Data Source	Page
INDUSTRIAL	One Record		
Baseline	Industrial Establishments	Anita Alexander, North Coast Labor Market Consultant	xi
	Industrial Employees	Anita Alexander, North Coast Labor Market Consultant	xi
	Floor Area	Brian Kang, City of Arcata GIS Specialist	xii
Fuel Type	ELECTRICITY	PG&E	vi
	NATURAL GAS	PG&E	vi
	FUELWOOD	North Coast Air Quality Resources Board	viii

TRANSPORTATION

Arcata Traffic Model Draft Development Report , Fehr and Peers Associates, Inc, 1997, in Draft Program EIR for the Arcata General Plan: 2020 and Local Coastal Land Use Plan , November 1998. xiv

Doby Class, City of Arcata Deputy Director of Public Works.

WASTE:

1990 City of Arcata Waste Generation Study by the Matrix Management Group xv

Gerald Kensfather, Humboldt County Waste Manager

Don Cordell, Manager of the Dry Creek Landfill, Medford Oregon

OTHER

Transportation of Solid Waste xxi

Sewage Gas xxii

Cattle methane xxiii

MEASURES

Arcata Community Forest xxiv

BASELINE CORPORATE (CITY FACILITIES AND OPERATIONS) ANALYSIS DATA AND CALCULATIONS INDEX

INTIAL INPUT DATA

GROWTH INCREASES PER SECTOR (EXPRESSED AS A PERCENTAGE)
DATA SOURCE: Draft Program EIR for the Arcata General Plan: 2020 and Local Coastal Land Use (Draft EIR).
US Census Bureau. http://factfinder.census.gov
Anita Alexander, North Coast Labor Market Consultant
California Integrated Waste Management Board (CIWMB)

ORIGINAL DATA:
Residential

Arcata Population 2000 (US Census)	Arcata Population 1997 (Draft EIR p.2-2)	Arcata Projected Population 2020 (Draft EIR p. 2-2)
[redacted]	16,400	[redacted]

Households

Arcata Households (US Census)	Arcata Estimated Existing Residential Units (Draft EIR p.3-22)	Arcata Projected Residential Units 2020 (Draft EIR p.3-22)
7051	[redacted]	[redacted]

Commercial
From Draft EIR p.3-14. Table 3-6

	Existing Jobs 1997	Projected Jobs 2020
Retail	2,481	3171
Service	3180	3775
Total:	[redacted]	[redacted]

From Anita Alexander, North Coast Labor Market Consultant (see)

2000 Commercial Employment in Arcata
8000

Industrial
From Draft EIR. p.3-14. Table 3-6

	Existing Jobs 1997	Projected Jobs 2020
Production	[redacted]	[redacted]

From Anita Alexander, North Coast Labor Market Consultant (see)

2000 Industrial Employment in Arcata
2950

Transportation
From Arcata Traffic Model Draft Development Report, Fehr and Peers Associates, Inc, 1997 in Draft EIR . p. 4-8., Table 4-3.

Current Total Peak VMT	Projected Total Peak VMT 2020
56,254	63,329

Waste
Tons produced in Arcata in 2000:
12,181 (see xv)

ADJUSTMENTS/ INTERPRETATIONS OF DATA:
The projected growth (expressed as % increase) for each sector was taken from the Draft EIR, for 2020, and cut in half to *estimate* growth for 2010.

There are discrepancies between the data we used for baseline numbers for each sector, and the data we used to calculate projected increases per sector. The most accurate numbers available were used for baseline figures. These numbers were sometimes drawn from the Drat EIR, but were often drawn from other sources. Data from the Draft EIR were primarily used to calculate projected increases per sector. These calculated growth amounts were then applied to the baseline figures for each sector.

The residential baseline figure of 16651 was used to calculate projected increase (by percentage) in residential sector. To estimate increase in waste generation, by 2010, the current waste per person (in tons) was calculated. This number was then multiplied by the projected population for 2010.

The figures used for rate projections are highlighted in blue.
The figures used for baseline numbers are in boldface .

CALCULATIONS/ FINAL DATA:

Residential
Current Residential 16,651x=20,000= 1.20= 20% increase from 2000 to 2020. 20/2= **10%** increase by 2010.

Household
Current Household 8200x=9800=1.195= 20% increase from 2000 to 2020. 20/2= **10%** increase by 2010.

Commercial
5661(combined retail and service) x=6946=1.227= 22.7% increase from 2000 to 2020 = 22.7/2= **11.35%** increase by 2010.

Industrial
Current Production 4779x=6269= 1.3117= 31% increase from 2000 to 2020 = 31/2=**15.58%** increase by 2010.

Transportation
Current Total Peak VMT 56,254x=63,329= 1.125= 12.5% increase from 2000 to 2020= **6.25%** increase by 2010.

Waste
12,183 tons/ 16, 651 people= .73 tons/person in 2000.
16,651 x 1.10= 18,316 people in 2010 x .73 tons/person= 13,370.7 tons in 2010. 12,183x=13371=1.097=**10%** increase.

	Projected increase by 2020 (Draft EIR)	**Projected increase by 2010**
Residential	20%	**10%**
Households	20%	**10%**
Commercial	22.7%	**11%**
Industrial	31%	**16%**
Transportation	12.5%	**6 %**
Waste	NA	**10%**

ELECTRICITY and NATURAL GAS, PG&E Customers

DATA SOURCE: PG&E

ORIGINAL DATA:

Classification	*kWh*	*Therms*	*# of Customers*
Agricultural	6,212,901	656,852	83
Commercial	71,546,118	2,297,360	1206
Industrial	46,093,457	610,839	113
Unknown	4,990,368	150,558	478
Residential	34,358,187	3,058,883	7744

From PG&E. e-mailed data

ADJUSTMENTS/ INTERPRETATIONS OF DATA:
PG&E data was provided by PG&E Representative Robert Cherry 707-445-5627. PG&E gave electrical Usage in KWh and Natural Gas Usage in therms for 2000, for the entire zip code of 95521. This data was adjusted to account for the area of 95521 that extends beyond Arcata. The PG&E sectors also were adjusted to fit CCP software sectors.

Sectors
PG&E Data was given for agricultural, commercial, industrial, residential, and unknown. We put agriculture in with industrial.

Adjustment for Zip Code Discrepancy
PG&E lists 7,744 residential accounts in 95521. This is 693 (9.8%) more than residences listed in census data for 2000. This adjustment factor of 10% was applied to all numbers. Several commercial and industrial establishments have more than one account, so the residential discrepancy, was decidedly more accurate. Thus, all sector totals were reduced by 10%.

CALCULATIONS/ FINAL DATA:
Residential
34,358,187 - 10%= 30,922,368.3 Kwh
3,058,883 - 10% = 2,752,994.7 therms

Commercial
71,546,118 — 10% =64,391,506.2 Kwh
2,297,360 — 10% =2,067,624 therms

Industrial
46,093, 457 + 6,212, 901 = 52,306,358 — 10% = 47,075,722.2 Kwh
656,852 + 610,839 = 1,267,691 — 10% =1,140,921.9 therms

The **Unknown** energy category was not included. This exclusion may be balanced by the fact that energy usage of several agriculture & industry accounts in 95521, not within City limits, are included in the report. A portion of this **Unknown** number may be included at a later date.

LPG

DATA SOURCE: Amerigas Corp.

ORIGINAL DATA:
Total Amerigas LPG sales for Arcata area, not including the City government or HSU, in 2000:
3201 gallons

Total Amerigas LPG sales for City of Arcata for 2000.
220 gallons

Price per gallon:
$1.60

ADJUSTMENTS/ INTERPRETATIONS OF DATA:

The original total number of LPG sold in Arcata In 2000, was divided by three, to estimate numbers for residential, commercial, and industrial sectors.

CALCULATIONS/ FINAL DATA:
3201/ 3= **1067 gallons** for each sector (residential, commercial (non-HSU and non-City), industrial).

FUELWOOD DATA

DATA SOURCE: North Coast Air Quality Management District.
Bob Torzynski, 707-443-3093.
Information given by Telephone.

US Census Bureau. County Census data http://quickfacts.census.gov/qfd/states/06/06023.html

ORIGINAL DATA:
Humboldt County 1991 (90 data) 68,388 tons/yr of wood = 34,194 cords in 1990
LP = 1,459 tons of wood (2000)

County Census data http://quickfacts.census.gov/qfd/states/06/06023.html
Humboldt County Population 2000: 126,518
Population, percent change, 1990 to 2000 6.2%

http://www.arcatacityhall.org/profile.htm
Humboldt County Population 1990: 119,118

Humboldt County population

1990	2000
119,118	126,518

ADJUSTMENTS/ INTERPRETATIONS OF DATA:
Residential
County residential estimates were adjusted for time (10 years from 1990 to 2000) and for assumed discrepancies between Arcata and Humboldt county numbers.

The 1990 data was adjusted to represent 2000, by applying the county residential growth rate for the time period (6.2% increase), to the fuelwood consumption.

The percentage of county represented by Arcata residents was multiplied by the fuelwood consumption calculated for 2000.

Industrial
Any industrial establishment burning wood for fuel, is required to report this use to the NCAQB. The only Arcata industrial facility on file for the baseline year (or any year after) is Louisiana Pacific.
The residential conversion of 2 tons wood/cord was used (From NCAQMD).

NCAQMD presumed that Arcata would have slightly less wood fuel consumption per capita, than the county average.

CALCULATIONS/ FINAL DATA:
Residential
34,194 cords in 1990 x (.062) = 2120.028 + 34194 = 36,314.028 cords in 2000 for Humboldt county
16,651Arcata residents/126518 Humboldt county residents = .13 (or 13%)
36314.028 cords x (.13)= **4,721 cords** of wood fuel used by Arcata residents in 2000.

Industrial
14,059 tons/ 2= **7,029.5 cords in 2000.**

HSU ENERGY

DATA SOURCE: George Wright, HSU Plant Operations

ORIGINAL DATA:
ELECTRICITY PURCHASED
Enron:
13,276,300 kWh

ELECTRICITY PRODUCED (Cogeneration)
1,033,052 KWh

NATURAL GAS PURCHASED
Contract with State Supplier
For cogen:
167,810 therms
For other uses:
967,897 therms.
TOTAL: 1,135,707 therms

LPG
9063 US gallons

ADJUSTMENTS/ INTERPRETATIONS OF DATA:
HSU s electricity was purchased from ENRON on 2000. According to HSU, Enron had a separate green mix constituting 20% of the electricity provided to HSU. This green mix was separate from any green in the regular mix, which constituted 80% of the electricity provided to HSU.

Also, a portion of the natural gas purchased powers the cogen. ICLEI staff recommend that natural gas being used to power the cogen., be counted in natural gas purchased/used. Therefore, the emissions from cogen. electrical/heat production are accounted for in natural gas purchased/used.

CALCULATIONS/ FINAL DATA:
Enron
13,276,300 kWh x 20% = 2,655,260 KWh Green
13,276,300 kWh - 2,655,260 KWh Green =10,621,040 KWh Ungreen

California Mix
10,621,040 KWh

Green
2,655,260 KWh

Natural Gas (not for co-gen)
967,897 therms
For cogen:
\+ 167,810 therms
TOTAL: 1,135,707 therms

NOTES:
HSU electricity and natural gas figures are from the fiscal year 2000-2001. Propane is from 1999-2000.

ELECTRICITY ASSOCIATED WITH WATER PUMPING

DATA SOURCE: Humboldt Bay Municipal Water District
Jay Tarvin 443-5018, jtarvin@hbmwd.com.
Carol Rieche, Director of HBMWD

ORIGINAL DATA: From Jay Tarvin:

Start Date	End Date	Arcata Water Use (MG)	Arcata Usage as % of total municipal usage	Share of Power Use (kWh)	Share of Power Cost
#########	1/21/2000	73.9	24.3%	86,376	$ 4,689
1/21/2000	2/22/2000	61.7	23.9%	85,112	$ 4,621
2/22/2000	3/22/2000	64.3	23.2%	82,442	$ 4,476
3/22/2000	4/22/2000	67.0	23.9%	85,081	$ 4,619
4/20/2000	5/19/2000	76.8	23.3%	82,800	$ 4,495
5/19/2000	6/21/2000	82.4	22.1%	78,595	$ 4,267
6/21/2000	7/21/2000	86.7	20.7%	73,881	$ 4,011
7/21/2000	8/21/2000	86.7	20.7%	73,848	$ 4,009
8/21/2000	9/20/2000	87.3	20.6%	73,321	$ 3,980
9/21/2000	#########	79.3	21.4%	76,188	$ 4,136
10/19/00	11/17/00	78.4	23.0%	82,032	$ 4,453
11/17/00	12/19/00	57.5	20.9%	74,427	$ 4,040
	Totals -->	902.0		954,102	$ 51,796

Data sent to City Staff electronically, appeared as shown above.

HSU used 85 Million Gallons of water in 2000. HBMWD.

ADJUSTMENTS/ INTERPRETATIONS OF DATA:

Water is supplied to Arcata by the Humboldt Bay Municipal Water District.

According to Carol Rieche, Director of HBMWD, water pumping is responsible for 95% of the energy use involved with water supply. To calculate the amount of electricity associated with water pumping for the community, the KWh for water pumping only were used. Ms. Rieche also stated that HSU is the largest water user in Arcata, so an attempt was made to also identify the loads specific to HSU. A realistic estimate for KWh associated with HSU s water pumping was estimated by calculating the percentage of Arcata s water demand that comes from HSU. This percentage (9.4%) of the total Arcata KWh for water pumping was used to estimate the KWh due to HSU s water consumption.

CALCULATIONS/ FINAL DATA:

85 MG/ 902 MG= .094235033 or 9.4%
(.094235033)(954,102 KWh)= 89,909.83 KWh due to HSU water consumption.

	KWh	$	Totals- Million Gallons
Arcata	954,102	51,796	902
HSU	89,909.83	4880.9	85

COMMERCIAL AND INDUSTRIAL ESTABLISHMENTS AND EMPLOYEES

DATA SOURCE:
Anita Alexander, North Coast Labor Market Consultant
Labor Market Information Division of CA Development Department 1/23/02

ORIGINAL DATA:

To: City of Arcata
From: Anita Alexander, North Coast Labor Market Consultant
Labor Market Information Division of CA Employment Development Department

The data you requested on commercial and industrial employment in the City of Arcata follow:

3rd qtr 2000 employment in the industrial sector (which includes agriculture, construction, manufacturing and trucking) was **2950**. There are **160 establishments** in this sector.

3rd qtr 2000 employment in the commercial sector (which includes public utilities, wholesale trade, retail trade, finance, insurance and real estate, services and government) was **8000**; with **450 establishments**. HSU jobs were included.

e-mail to City Staff

ADJUSTMENTS/ INTERPRETATIONS OF DATA:
Ms. Alexander assembled the data provided by the State into categories to fit CCP software (see explanation above.)
Ms. Alexander s data were used for totals for all commercial and industrial sectors.
For community breakdowns in the commercial sector of the community analysis, HSU and the City were subtracted from total establishments, and their respective employees were subtracted from total employees:

CALCULATIONS/ FINAL DATA:
The data was used as provided by Ms. Alexander for totals.
For commercial Record breakdowns, the following calculations and data were used:

	Establishments	Employees
Commercial	450	8000
	- 1 (HSU)	- 1471 (HSU)
	-1 (City of Arcata)	- 217 (city of Arcata)
Total PG&E Customers Record	448	6312

HSU
DATA SOURCE:
Human Resources Department, HSU

ORIGINAL DATA:
Over the telephone: 4/02
Inlcudes part time and fulltime HSU employees for 3/31/2000: 1471

ADJUSTMENTS/ INTERPRETATIONS OF DATA:
None.
CALCULATIONS/ FINAL DATA:
None.

CITY OF ARCATA (CORPORATE)
DATA SOURCE:
City of Arcata Finance Department

ORIGINAL DATA:
The City had 217 Part and Full time Employees in 2000.

ADJUSTMENTS/ INTERPRETATIONS OF DATA:
None.
CALCULATIONS/ FINAL DATA:
None.

FLOOR AREA

DATA SOURCE: Brian Kang, **City of Arcata GIS Specialist**
ORIGINAL DATA:

1	Central Business District	850930.8	19.5
2	General Commercial	1225862.7	28.1
3	General Commercial Planned Development	363812.5	8.4
4	Heavy Industrial	3207206.7	73.6
5	Industrial Commercial	2887644.3	66.3
6	Industrial Commercial Planned Development	317252.4	7.3
7	Public Facility	4317386.5	99.1
8	Public Facility - Parks	208256.6	4.8
9	Public Facility Planned Development	314568.9	7.2
10	Thoroughfare Commercial	1100311.9	25.2
11	Thoroughfare Commercial Planned Development	62848.7	1.44

ADJUSTMENTS/ INTERPRETATIONS OF DATA:
The zone desriptions 1-3, and 7-11, were counted as commercial for the purposed of this inventory. Zone descriptions 4-6 were counted as Industrial for this study, giving the following totals for square footage:

Commercial	8,443,978.6 sq.ft.
Industrial	6,412,103.4 sq. ft

This square footage comes from GIS footprint data. Therefore, this is single story area, and does not incorporate multiple stories. The vast majority of commercial and industrial facilities in Arcata are single story. This number is a ballpark figure, on the conservative side.

To ascertain Commercial minus City government and HSU:
8,443,978.6 - 1,464,178 (HSU) - 81,800 (City)= **6,898,000.6 sq. ft.**

CALCULATIONS/ FINAL DATA:
The above data was used.

HSU
DATA SOURCE: Debra Hopkins, Senior Planner
Humboldt State University
Arcata, CA 95521
v: 707.826.4111 f: 707.826.5703, dah3@humboldt.edu

ORIGINAL DATA:

In response to your request for campus building square footages to be used
in the City of Arcata's greenhouse gas inventory program:

Campus buildings (main campus only): 1,130,636 gross square feet
Housing, including dining & residence halls: 333,542 gross square feet

e-mail to City Staff from Debra Hopkins

Note: In the above information, the housing, dining, and res. halls component is not included in the total Campus building figure.

ADJUSTMENTS/ INTERPRETATIONS OF DATA:

The total HSU Main campus (including residence halls) square footage was used: **1,464,178 sq. ft.**

CALCULATIONS/ FINAL DATA:
The original data was used.

FLOOR AREA (Cont)
CORPORATE
DATA SOURCE: Dan Diemer, City of Arcata
Kim Watson, City of Arcata Superintendent of Public Works

ORIGINAL DATA:
Dan Diemer, City of Arcata
Square Footage of City Buildings

Facility	Approximate Square Footage
Community Center	21,000
D Street Neighborhood Center	5,700
Redwood Lodge	2,400
SH	1,000
City Hall	16,000
AMIC	1,600
Library	5,600
TC	2,000
Judo Hut	2,600
Park Maintenance	2,500
Machato Barn	3,000
Miscellaneous	2,000

Kim Watson, City of Arcata Superintendent of Public Works

Facility	Approximate Square Footage
Wastewater Treatment Facility	18,000

ADJUSTMENTS/ INTERPRETATIONS OF DATA:
Corporate Square Footage (rough estimations) provided by Dan Diemer and Kim Watson were compiled for a total.

CALCULATIONS/ FINAL DATA:
Total Corporate Square Footage (approx): 83,400 sq.ft.

NOTE:
The square footage of City buildings includes many buildings that are rarely used.

TRANSPORTATION

DATA SOURCE: Fehr and Peers, Transportation Consultants, Arcata Traffic Model, Draft Model Development Report. December 10, 1997.
California Transportation Department (CalTrans)
Doby Class, City of Arcata Deputy Director of Public Works

ORIGINAL DATA:
Fehr and Pehrs

Total peak VMT	56,254

	IN	OUT
External-External Traffic Model (Through Traffic)	4731	4860

Doby Class
Miles for study area through traffic: 3 miles (from Humboldt County MI. 85.5 to Humboldt County Mi. 88.5)
Traffic count at the corner of 18th and H street, conducted midweek by Department of Public works.

9/27/2000

Time	%of daily traffic
1600	8.7%
1700	8.1%

9/28/00

Time	% of daily traffic
1600	7.2 %
1700	7.5 %

ADJUSTMENTS/ INTERPRETATIONS OF DATA:
Peak VMT (PVMT) data calculated for the City of Arcata by Fehr and Peers was used as the baseline data. PVMT data represents one peak afternoon hour daily. This VMT data included external-external traffic, or through traffic from highway 101. After discussions with ICLEI technical consultant, the decision was made to remove the external-external traffic from our VMT model. This process produces a VMT value, representative of traffic patterns that will be more easily impacted with community measures.

To remove through traffic from the VMT data, the average of the external-external traffic from the Fehr and Peers model was multiplied by the distance of the 101 corridor from Samoa boulevard to the Guintolli exit. This distance is actually slightly less than the study area, giving us a conservative number. Fehr and Peers, calculated peak hour VMT, which is estimated by them to be 8% of daily VMT. This figure was double checked with traffic count data collected from the Department of Public Works. Peak hour traffic does appear to be approximately 8% of daily traffic flow. The newly calculated PVMT number (minus through traffic)was adjusted to daily VMT, by dividing by 8%.

A 1 % increase in traffic per year (Doby Class) was assumed.

CALCULATIONS/ FINAL DATA:
traffic In out
(4731 + 4860)/ 2= 4790 cars x 3 miles = 14, 370 (1997) x .01 = 143.7 + 14,370= 14513.7 (1998) x .01= 145 + 14513.7= 14658.8 (1999) x .01= 146.588 + 14658.8 = 14,805.4(2000) Through traffic PVMT

56,254 PVMT (1997) x .01= 562.5 + 56254= 56816.5 (1998) x .01= 568.2 + 56816.5= 57384.7 (1999) x .01= 573.8 + 57384.7= 57,958.5 (2000) PVMT

57,958.5 (total PVMT) — 14,805.4 (through traffic)= 43,153 PVMT

43,153/ .08 = 539,412.5 daily VMT

Following ICLEI s suggestion, Arcata s daily VMT was multiplied by 330 days to accounts for fluctuation in weekday versus weekend and holiday traffic.

539,412.5 x 330 days= 178,006,125 Annual VMT

WASTE

DATA SOURCE: California Integrated Waste Management Board (CIWMB). www.ciwmb.ca.gov
Waste Generation Study for the City of Arcata. 1990. Table 1-1. The Matrix Management Group.

Gerald Kensfather, **Humboldt County Waste General Manger**
Don Cordell, **Manger of Dry Creek Landfill, Medford Oregon**

ORIGINAL DATA:
CIWMB

City/County	Tons Exported in 2000	% Waste Exported to Total Waste Disposed	Tons of Total Waste Disposed
Humboldt	78,850	86%	91,430
Arcata	11,828	97%	12,183

GHG Producing Waste Stream Composition, by percentage, from City and State

	1990 City Data	1999 Statewide Data. CIWMB
Paper	29.9	30.2
Plant	10.2	10.2
Food	10.5	15.7
Wood, furniture, textiles.	11.6	7.0
SUB TOTAL	62.2 %	63.1%
OTHER	37.8%	36.9%

Don Cordell, Manger of Dry Creek Landfill, Medford Oregon
Methane Recovery Rate:

ADJUSTMENTS/ INTERPRETATIONS OF DATA:

Note: Both the City and the State waste stream composition studies, listed other sources of organics which were not included in the CCP software categories. The City included Tires and Rubber (2.0%), and manure (0%) in organic waste; the State included manure (.1%) in organic waste. Neither of these sources were include in the waste stream analysis, here.
Current state-wide data was compared with older Arcata data, to decide which might be more accurate. The waste stream composition was very similar, so the 1990 Arcata waste stream percentages were applied to current tonnage data.

CALCULATIONS/ FINAL DATA:
The 1990 City Data percentages were applied to the total waste disposed listed above.
Total=12, 183 tons.

Waste stream Composition	
29.9	Paper
10.2	Plant
10.5	Food
11.6	Wood, furniture, textiles.
62.2 %	SUB TOTAL
37.8%	OTHER

NOTES:
There is a closed landfill located in Arcata. The County Waste manager is not aware of the landfill opening date, or how much garbage was dumped there. The landfill was closed in 1978 or 1979. There is no methane recovery at the site.

CORPORATE (CITY) ELECTRICITY, GREEN AND UNGREEN

DATA SOURCE:
For All Facilities, except for AMIC and the Treatment Plant:
ABAG, Association of Bay Area Governments Electricity, Online Account Billing Detail Report Invoices from.

For AMIC and the Treatment Plant:
PG&E Audit for the City of Arcata, January 1999.

ORIGINAL DATA:
ABAG

	BUILDINGS Account Rollups: 75, 85, 91		**STREET LIGHTS** Account Rollup: 41		**PARKS** Account Rollup: 81		**WATER/ SEWAGE** Account Rollups: 51, 64, 67	
2000	**KWh**	**$**	**KWh**	**$**	**KWh**	**$**	**KWh**	**$**
JANUARY	30102	2439.30	31677	2581.57	5525	515.93	29614	2712.72
FEBRUARY	31412	2267.78	27995	2122.86	4716	449.87	28883	2790.45
MARCH	31380	2486.79	27960	2155.97	3933	355.46	27562	2423.28
APRIL	30306	2432.14	27929	1989.40	3682	368.77	29598	2801.08
MAY	2874	297.17	27728	2120.35	579	314.18	26662	2478.70
JUNE	30761	3279.79	27897	2146.60	2788	284.93	28753	2806.28
JULY	4870	111.17	27896	2148.73	762	110.53	11017	1169.71
AUGUST	86000	9126.01	459	64.34	14466	1262.91	58895	6082.09
SEPTEMBER	29917	4082.02	55245	4267.99	70	42.23	20327	2058.70
OCTOBER	76450	10400.34	28119	2270.09	9819	1072.46	73972	8246.33
NOVEMBER	44886	2438	27877	2227.75	3536	385.84	31664	2177.46
DECEMBER	46082	1520.93	27893	457.19	4109	116.51	35950	986.21
TOTALS	445040	40881.44	338675	24552.84	53985	5279.62	402897	36733.01

TOTAL ABAG KWh 2000: 1,240,597

PG&E 1999 Audit

Facility	Account #	Annual KWh s	Annual Charges	Average KWh Charge
Interpretive Center	TLF-23-32661	2736	$ 307	$ .11
Treatment Plant	TLF-23-33201	805,680	$ 65,530	$ .08

TOTAL PG&E KWh 2000: 808,416

ADJUSTMENTS/ INTERPRETATIONS OF DATA:

Energy expenditures listed in the above chart, do not include energy taxes, but do include distribution charges as included in totals for monthly ABAG and PG&E billing.

Rollup 81 has been divided between Buildings and Streetlights , based on the delineation between park buildings and park lighting by Dan Diemer, the City of Arcata s Parks Superintendent. Approximately 94% of the Parks Rollup KWh is from Park lighting, and approximately 6% is from Park Buildings. This estimate was calculated from typical monthly KWh usage divided into building accounts and park lighting accounts.

According to ABAG Representative, Jerry Lahr and Connie Stewart, City Council Member, our ABAG electricity ranged from 60-90% green during 2000. Our electricity was 60% green from January — September of 2000, and 90% green from October to December of 2000. PG&E electricity generally follows California coefficients already entered into CCP software.

CALCULATIONS/ FINAL DATA:

J----------O----------D
60% Green 90% Green

Parks * (81)	Total KWh	Total Cost	% Green	Green Kwh	Green Cost	Ungreen Kwh	Ungreen Cost
	53985	5279.62					
J-S	36521	3662.58	0.60	21912.6	2197.48	14608.4	1465.1
0-D	17464	1617.04	0.90	15717.6	1455.336	1746.40	161.70
			TOTAL	37630.20	3652.82	16354.80	1626.80
	Lights		x .94	35372.38	3433.65	15373.51	1529.19
	Buildings		x .06	2257.81	219.17	981.29	97.61

*Parks were divided into Buildings and Streetlights and added to those sections below.

Buildings (75, 85, 91)	Total KWh	TOTAL COST	% Green	Green Kwh	Green Cost	Ungreen Kwh	Ungreen Cost
	445040	40881.44					
J-S	277622	26522.17	0.60	166573.2	15913.30	111048.8	10608.87
0-D	167418	14359.27	0.90	150676.2	12923.34	16741.8	1435.93
			SUBTOTAL	317249.4	28836.64	127,790.6	12044.8
			+ Parks (81) blngs.	2257.81	219.17	981.29	97.61
			TOTAL	319,507.21	29055.81	128,771.89	12142.41

Streetlights (41)	Total KWh	TOTAL COST	% Green	Green Kwh	Green Cost	Ungreen Kwh	Ungreen Cost
	338675	24552.84					
J-S	254786	19597.81	0.60	152871.6	11758.69	101914.4	7839.12
0-D	83889	4955.03	0.90	75500.10	4459.53	8388.9	495.50
			SUBTOTAL	228371.7	16218.22	110303.3	8334.62
			+ Parks (81) lights	35372.38	3433.65	15373.51	1529.19
			TOTAL	263,744.08	19651.87	125,676.81	9863.81

Water / WW (51,64,67)	Total KWh	TOTAL COST	% Green	Green Kwh	Green Cost	Ungreen Kwh	Ungreen Cost
	402897	36733.01					
J-S	261311	2532.01	0.60	156786.6	15193.81	104524.4	10129.20
0-D	141586	11410	0.90	127427.4	10269	14158.6	1141
			SUBTOTAL	284214	25462.81	118,683	11270.20
			PG&E			808,416	77107.20
			TOTAL	284,214	25,462.81	927,099	88,317.40

TOTAL ELECTRICITY	GREEN kWh		UNGREEN kWh	
	867,465.29	$74,170.49	1,181,547.70	$110,323.62

CORPORATE (CITY) NATURAL GAS

DATA SOURCE:
PG&E Audit for the City of Arcata, January 1999.

ORIGINAL DATA:

	Annual Therms	Annual Charges	Average Therm Charge
Treatment Plant	19,738	$ 7,304	$0.37
TOTAL City	37,584	$16,132	$0.43

ADJUSTMENTS/ INTERPRETATIONS OF DATA:
The treatment plant was subtracted from the total City usage, and the two numbers were entered in the appropriate categories.

CALCULATIONS/ FINAL DATA:
37,584- 19,738 = 17,846 therms: buildings
19,738 therms: treatment plant (water/sewage)

$ 16,132- 7,304 = $8,828: buildings
$ 7,304: treatment plant (water/sewage)

CORPORATE FLEET

DATA SOURCE:
City of Arcata, Public Works Department

ORIGINAL DATA:

2000	Fuel	Gallons	Cost ($)	Miles
Vehicle Fleet	Diesel	9218.680	12,097.86	Total diesel & unleaded:
	Unleaded	23,723.946	36.297.05	437,408.9
	CNG (2 trucks)	-	-	2085
Mad River Transit	Diesel		26,619.33	86,154
	Unleaded		693.10	15,384

ADJUSTMENTS/ INTERPRETATIONS OF DATA:
To estimate gallons for diesel and unleaded fuel used by transit vehicles, cost per gallon for fleet vehicles were estimated and applied to transit vehicle costs.

To estimate mileage for diesel and unleaded fleet vehicles, a ratio of diesel gallons to unleaded gallons was calculated and applied to the total mileage. This method is a rough estimation, and does not accurately take differences in fuel efficiencies for diesel and unleaded vehicles.

CALCULATIONS/ FINAL DATA:
Fleet Diesel: $12,097.86/ 9218.680 gallons = $1.3123/gallon
Transit Diesel: $26,619.33/ $1.3123 per gallon = 20284 gallons
Fleet Unleaded: $36,297.05/ 23, 723.946 gallons = $1.529/gallon
Transit Unleaded: $ 693.10/ $1.529 per gallon = 453.30 gallons
9218.680 + 23,723.946 = 32,942.63 9218.680/ 32,942.63 = .2798
.2798 (437,408.9) = 122,387 miles 437,408.9- 122,387= 315,021.9 miles

2000	Fuel	Gallons	Cost ($)	Miles
Vehicle Fleet	Diesel	9218.680	12,097.86	122,387
	Unleaded	23,723.946	36,297	315,021.9
	CNG (2 trucks)	-	-	2085
Mad River Transit	Diesel	20284	26,619	86,154
	Unleaded	453	693	15,384

CORPORATE WASTE

DATA SOURCE:
No data was available for the City of Arcata s waste generation. ICLEI staff provided data from another community analysis, that may reflect the City of Arcata s waste stream. In their inventory, the City of Chicago references methodology and estimates provided by the following:

Guide to Resource Conservation and Cost Savings Opportunities for Office Buildings by Engineering Interface Limited in association with RIS Limited for the Ontario Ministry of the Environment, 1997, p 3.

ORIGINAL DATA:
The City of Chicago conducted a waste analysis, where they estimated the average lbs. of waste generated per employee, per year. This number was estimated by taking the total amount of waste generated (in lbs), and dividing by the total number of employees. They estimated for three waste generation scenarios: low , medium , and high . The low estimate was 520 pounds per employee, per year.

This same document presented the waste stream composition for a typical office:

Paper:	54%
Newsprint:	2%
Cardboard:	10%
Yard waste:	9%
Food:	13%
Plastic:	8%
Metal:	2%
Glass:	2%

ADJUSTMENTS/ INTERPRETATIONS OF DATA:
Arcata s employees were assumed to be on the low side of waste generation. The City of Arcata has had a comprehensive and expanding facility recycling program, for over a decade. As such, we used the estimate of 520 lbs. of waste per employees per year.

The City conducted a major retrofit, during the baseline year of 2000, generating construction waste. Construction waste is not taken into account with the above estimations. However, it must be noted, that construction waste has a very low percentage of organics. Thus, for the purposes of this study, the construction waste figures are not necessary.

The waste stream breakdowns were entered in the appropriate software categories.

CALCULATIONS/ FINAL DATA:

(217 employees) x (520 lbs. of waste/ employees/ year) = 112,840 lbs waste/year.
1 ton= 2000 lbs.
112,840/2000= 56.42 tons/year.

TRANSPORATION OF SOLID WASTE OTHER

DATA SOURCE:
Waste Solutions, Trucking Company.
ICLEI.

ORIGINAL DATA:
Waste Solutions, Trucking Company.

24.1 tons of waste per trip from Arcata to Medford.

410 miles roundtrip from Arcata to Medford.

Estimated fuel efficiency: 5 mpg, diesel fuel.

ICLEI.

Emissions: 22.384 lbs. of CO_2 per gallon of diesel.

ADJUSTMENTS/ INTERPRETATIONS OF DATA:
The numbers of trips traveled by the Waste hauling company were estimated by dividing the known tonnage of waste hauled for 2000 by the estimated tonnage hauled per trip. Then, the miles traveled by the Waste hauling company were estimated by dividing the trips made by the round trip mileage between Arcata and the Medford landfill. This annual mileage was then divided by the fuel efficiency of 5 mpg for the trucks for total gallons used for waste transport in 2000. Then, the annual gallons were multiplied by the estimated emissions of CO_2 per diesel gallon.

CALCULATIONS/ FINAL DATA:
12,183 tons in 2000/ 24.1 tons per trip= 505.5 trips to Medford x 410 miles per trip = total 207,255 miles traveled.

207,255/ 5 mpg= 41,451 gallons. X 22.3842=

927,847.47 lbs. of CO_2 in 2000.

SEWAGE GAS OTHER

DATA SOURCE:
Dave Couch, **City of Arcata Water/Wastewater Operator**
ICLEI staff, from:
www.eia.doe.gov
Wisconsin Energy Bureau.
www.wifocusonenergy.com/renewable/wastewat.pdf

ORIGINAL DATA:
Dave Couch, **City of Arcata Water/Wastewater Operator**

2000	Volatile Solids destroyed (#)
January	18247
February	20957
March	22182
April	22112
May	18491
June	26088
July	25006
August	13825
September	28028
October	35366
November	36429
December	39564
TOTAL	306,295

Wisconsin Energy Bureau.
Madison Wisconsin Sewerage District estimated that 60% of their sewerage gas was methane.

ADJUSTMENTS/ INTERPRETATIONS OF DATA:
According to Dave Couch, the amount of sewage gas created by volatile solids destroyed by the sewage digester, can be estimated by multiplying total volatile solids by 15. Mr. Couch also estimates that roughly 50% of this gas is used to heat the digester, and roughly 50% is released to the atmosphere.

Madison Wisconsin Sewerage District estimated that 60% of their sewerage gas was methane. Therefore, 60% of the sewage gas released was reported as methane released, under Other.
Also, from ICLEI staff: 1 million cubic feet of methane= 443.5 tons eCO_2 (www.eia.doe.gov)

CALCULATIONS/ FINAL DATA:
306,295 x 15 = **4,594,425** cubic feet/gas created in 2000
50% x 4,594,425 cubic feet/gas = 2,297,212.5 cubic feet/gas released in 2000
2,297,212.5 cubic feet/gas used in 2000

2,297,212.5 (.6)= **1,378,327.5** Cubic feet of methane released.
1378327.5 /1million= 1.378 x 443.5= 611.28 tons eCO_2

CATTLE METHANE OTHER

DATA SOURCE:
Gary Markegard, **Farm Advisor, UC Davis**
EPA Inventory of US Greenhouse Gas Emissions and Sinks: 1990-1999 Annex J.

ORIGINAL DATA:
Gary Markegard, **Farm Advisor, UC Davis**

270 animal units of Dairy Cattle

370 animal units of Beef Cattle

EPA Inventory of US Greenhouse Gas Emissions and Sinks: 1990-1999 Annex J.

Dairy Cows-111 kg/methane/head/year
Beef Cows- 82 kg/methane/head/year

ADJUSTMENTS/ INTERPRETATIONS OF DATA:
An animal unit= 1000 lbs of cow. At various times of the year, there are many cows smaller than this. Also, at various times of the year, many cows are not pastured within city limts. The animal unit numbers were mutilplied by the beef and dairy cow coefficiecnts provided by ICLEI.

CALCULATIONS/ FINAL DATA:
270 Dairy cow units x 111 kg/methane/year= 29,970 kg methane/year
370 Beef cows units x 82 kg methane/head/year= 30,340 kg methane/year

29,970 + 30,340 = **60,310 kg methane/year**

ARCATA COMMUNITY FOREST **OTHER**
Sequestration of CO_2

DATA SOURCE:
Prichard, S.J., L.A. Wayburn, and M.A. White. 2000.
Modeling carbon storage in redwood forests with different
management scenarios.
http://nature.berkeley.edu/~jleblanc/WWW/Redwood/rdwd-Modeling.html

1999 Timber Management Plan, City of Arcata

ORIGINAL DATA:
Mark Andre, Deputy Director of Environmental Services, 1999 Timber Management Plan, City of Arcata

Community Forest Acres: 1150 acres (includes Jacoby Creek Acquisition)
Harvest rate: 50% of new growth in 65% of forest. (Harvest is not allowed in 35% of the forest area).
Average age of trees: Arcata Community Forest = 120 years. Jacoby Creek Forest: 90 years.

From Prichard, etal. 2000.
The following data represents the annual carbon storage (in metric tons of Carbon per hectare) for a coastal redwood forests (75% Redwood & 15% Doug-Fir), that has been harvested over time with a Stewardship Model (selectively harvested at 20 year intervals). The average age of trees in the stand were 60 years, at beginning of the study.

Time	Metric tons of live Carbon/ hectare/ year	Harvest Volume m3/hectare
10	347.2	
20	279.7	657.2
30	373.5	
40	368.1	870.0
50	454.9	
60	427.8	1126.1
70	508.4	
80	465.8	1413.4
90	542.4	
100	489.1	1722.6
110	569.0	
120	511.1	2053.1
130	576.5	
140	513.6	2391.8

ADJUSTMENTS/ INTERPRETATIONS OF DATA:
Prichard etal (2000), estimated the sequestration capacity, over time, of coastal Redwood Forests, being harvested with stewardship and industrial models. We used data from the stewardship model , to assess sequestration capacities from the Arcata Community Forest. The average age of trees in the Arcata Community Forest is 120 years. The average age of trees in the Jacoby Creek Forest is 90 years. Therefore, the average age of the two forests (100 years) was used to estimate annual carbon storage from Prichard s research. Given the average age of the study forest was 60 years at the beginning of the study, it was assumed that the average age of the forest would be 100 years after 40 study years.

To estimate annual growth , or carbon sequestration, in the forest, the change in biomass between two periods where no harvest took place was used. Harvest only took place every 20 years. There was no harvest between the study period of 40 and 50 years (when average age of study forest would approximate average age of Arcata Community Forest). The growth from decade to decade (for decades where the forest wasn t harvested) ranged from 59.8 metric tonnes of carbon per hectare per decade to 94 metric tonnes of carbon per hectare per decade for the study period, with **an average growth of 77.52 metric tones of carbon per hectare per decade**. The decade growth was divided by ten to estimate the average annual growth for non-harvest periods. The average annual growth during the study period, in non-harvest decades, was 7.752 metric tonnes of carbon per hectare. The growth during the study decade from 40 to 50 years, is 86.8 metric tonnes of carbon per hectare, or 8.68 metric tones of carbon per year. **The more conservative average of 7.752 metric tones of carbon per year will be used for our estimation.**

To include the impact of annual timber harvest upon carbon sequestration capacity, the annual harvest rate (50% of new growth) was subtracted from the estimated annual carbon growth rate (storage) for the harvest area. This amount of Carbon storage was added to the estimate for unharvested area.

Appendix II
Data and Calculations

CALCULATIONS/ FINAL DATA:
77.52 metric tC ha^{-1} per decade ÷ 10=7.752 metric tC ha^{-1}/ year growth.
7.752 metric tC ha^{-1}/ year ÷ 2.471 acres/ hectare= 3.13719 metric tC/ acre/year.
1150 acres x .65 (the acreage harvestable) = 747.5 acres in harvest area & 402.5 acres non-harvestable

747.5 acres x 3.13719 metric tC/ acre/year = 2345.04 metric tC/year growth in harvest area
2345.04 metric tC/year (amount of annual carbon growth) x .50 (amount of growth harvested annually)=
1172.52 metric tC/year sequestered in harvest area.

402.5 acres x 3.13719 metric tC/ acre/year = 1262.7 metric tC/year
1262.7 metric tC/year sequestered in non-harvest area.

1172.52 + 1262.7= **2435.22 metric tC/year sequestered in Community forest=**
2435.22 metric tC/year x 1.10231 short tons/ 1 metric tonne= 2684.367 short tons/ Carbon/ year sequestered =
2684.367 short tons Carbon/ year x 3.667 short tons of CO^2/ 1 short ton of Carbon = 9843.57 short tons of CO^2/ yr

9843.57 short tons of CO^2/ yr are sequestered by the Arcata Community Forest and Jacoby Creek Forest.

Appendix B:

Complete List of Measures That Were Considered for Inclusion in the City of Arcata's Greenhouse Gas Reduction Plan

Measure Group	Measure ID	Measure Name	Ongoing, Expanded, New	Total Score*
Energy Efficiency	**E1**	**Encourage Energy Conservation in Residences & Businesses (Behavior, Management, Small-Scale Retrofits)**	Expanded	15.6
	E1.1	Education/Outreach: Materials, Presentations, Events, PSA's Targeted at Residents, Businesses, Schools/Students & Community Groups	Expanded	13.8
	E1.1a	Promote existing eneregy efficiency programs	Expanded	14.8
	E1.1b	Energy Efficient appliances, powerstrips, office equipment compact fluorescents, water-heating blankets, weatherstripping, etc	Expanded	13.5
	E1.1b-1	Compact Fluorescent Program	New	14.5
	E1.1c	Load shifting.	Expanded	12.2
	E1.2	Energy Efficient Equipment Purchasing Policies	New	14.3
	E1.3	Incentives/ Rewards	New	13.2
	E1.3a	Reward/Acknowledge Businesses who achieve reductions	New	14.8
	E1.3b	Create a Fund for Energy Efficiency Upgrades	New	12.7
	E1.3b-1	Revolving loan fund for community investment in eneregy efficiency	New	12.2
	E1.3c	Aide to Low Income Households for Energy Efficiency Projects	Expanded	13.0
	E1.3d	Redwood Community Action Agency low income weatherization	Expanded	13.7
	E2	**Develop Energy Efficient Housing & Commercial Building Design/Stock (New and Existing Infrastructure)**	New	16.5
	E2.1	Develop/Promote Community Services to increase Energy Efficiency		14.4
	E2.1a	Promote Energy Audits for Residents and Businesses	New	15.5
	E2.2	Create Policy requiring Upgrades in New & Existing construction		14.3
	E2.2a	Include/Enforce Energy Efficiency in Building & Land Use Codes	Expanded	15.7
	E2.2a-1	Go "Beyond" Title 24 for new & retrofit construction	New	13.3
	E2.2b	Green Building Practices	New	15.3
	E2.2c	Mandate Solar Passive Design & Day Lighting in Construction of All New Buildings	New	16.2
	E2.2d	Require energy audits and efficiency upgrades at the time of building sale	New	12.8
	E2.3	Profesional Training	New	11.8
	E2.3a	Weatherization: training/ programs	Expanded	13.0
	E3	**Energy Efficiency in City Operations (seeE 6.2 also)**	Expanded	15.2
	E3.1	Retrofitting Municipal Buildings	Expanded	13.9
	E3.2	Standards for New Municipal Construction		14.5
	E3.2a	Green Building Standards for City Buildings	New	15.2
	E3.3	Efficiency in Street Lighting	Expanded	14.3
	E3.4	Load Management/ Energy Management	Expanded	14.0
	E3.5	Employee Training	Expanded	13.0
	E3.6	Purchasing Policy	New	14.5
	E3.7	Create Sustainable funding mechanism for Energy Efficient Upgrades	New	13.4
	E4	**Regional Partnerships/Collaboration**	Expanded	13.5
	E4a	District Heating & Cooling Systems	New	11.0
	E5	**Lobbying/Political Action for Energy Efficiency**		16.1
	E5a	Work to improve Local Representation/Accuracy in Title 24 criteria	Expanded	14.7

Measure Group	Measure ID	Measure Name	Ongoing, Expanded, New	Total Score*
	E6	**Community Water Conservation**	Expanded	15.4
	E6.1	Education Materials/Outreach	Expanded	11.8
	E6.2	City Retrofits	Expanded	13.2
	E6.3	Improved Stormwater Drainage	Expanded	10.1
	E6.3a	Encourage porous paving/sufaces	Expanded	10.0
Renewable Energy	**RE1**	**Encourage Purchase of RE (if possible).**	New	15.8
	RE1.1	Education/Outreach: Materials, PSA's, presentations, events	Expanded	11.9
	RE1.2	City purchase of renewable energy (if possible).	Renew	13.0
	RE2	**Encourage Installation of RE/Solar**	Expanded	15.1
	RE2.1	Education/Outreach: Materials, PSA's, presentations,events	Expanded	13.4
	RE2.1a	Promote exisiting programs	Expanded	13.3
	RE2.1b	Solar Works promotional program	Expanded	13.2
	RE2.1c	Professional Training	New	11.3
	RE2.1d	Resource library	Expanded	11.2
	RE2.1e	Cogeneration	New	12.2
	RE2.2	Promote renewable energy in Building and Land Use Codes	Expanded	15.0
	RE2.2a	Incentives, requirements, solar rights	Expanded	13.8
	RE2.2b	Active implementation of solar shade control act	Expanded	13.3
	RE2.3	Financial Incentives/Rebates to Solar Installers	Expanded	14.1
	RE2.3a	Promote exisiting programs	Expanded	14.8
	RE2.3b	Create a Renewable Energy Fund	New	12.3
	RE2.3b-1	Revolving loan fund for community investment in RE	New	12.7
	RE2.3c	Production Incentives for PV Installations	New	12.8
	RE2.3d	City involved with bulk purchase	New	11.7
	RE3	**Install Renewable Energy on City Facilities**	Expanded	14.8
	RE3.1	Physical Installations		14.1
	RE3.1a	Place solar electric systems on city facilities	Expanded	14.3
	RE3.1a-1	PV on City Hall	New	14.2
	RE3.1b	Solar Hot Water Systems in Municipal Buildings	New	12.5
	RE3.1c	Biogas use @ wastewater treatment facility	Expanded	13.5
	RE3.2	Create Funding Plan for renewable energy on City Facilities		12.9
	RE3.2a	Create a Renewable Energy Fund	New	10.1
	RE4	**Regional Partnerships/Efforts**	Expanded	14.0
	RE4a	Participate with Redwood Coast energy Authority (RCEA)	Expanded	13.3
	RE4a-1	Join Million Solar Roofs Campaign via RCEA	New	13.5
	RE4b	Promote Regional renewable energy Commerical Development	New	12.8
	RE4c	District Heating & Cooling Systems	New	11.0
	RE5	**Lobbying/Political Action for renewable energy**		13.7

Measure Group	Measure ID	Measure Name	Ongoing, Expanded, New	Total Score*
Transportation	T1	**Incorporate Energy/Climate Policy into City Transportation Plan**	Expanded	17.4
	T1.1	General	Expanded	13.8
	T1.1a	Spokes-of-the wheel design	New	11.8
	T1.1b	Infill	Ongoing	13.3
	T1.1c	Mixed-Use	Ongoing	13.5
	T1.1d	Change parking policies	Expanded	14.7
	T1.2	Improved Bicycle Infrasturcture	Expanded	15.9
	T1.2a	Bicycle Plan	Expanded	16.3
	T1.2b	Extend/Imporve bike lanes	Expanded	15.2
	T1.2b-1	Car-free paths	New	14.3
	T1.2b-2	Connected City/ Regional Lanes	Expanded	14.5
	T1.2b-2a	Bike Lanes between Eureka / Mckinleyville & Arcata	Expanded	15.3
	T1.2c	Bike lockers/bike stations/stands	Expanded	14.3
	T1.3	Improve Pedestrian Infrastructure	Expanded	14.6
	T1.3a	Pedestrian Master Plan	Ongoing	15.2
	T1.3b	Extend/Improve sidewalks & pedestrain safety	Expanded	13.8
	T1.3c	Widen sidewalks	Expanded	12.7
	T1.3d	Beautify pedestrian zones	Expanded	13.8
	T1.3e	Create Car-free zones	New	13.2
	T1.4	Improve Mass Transit Infrastructure	Expanded	15.5
	T1.4a	Use Public Parking Fees to Fund further subsidized public transit	Expanded	15.2
	T1.4b	Extend hours of service & frequency of buses to Arcata Outskirts	Expanded	16.0
	T1.4c	Cleaner fueled Transit	New	14.2
	T1.5	Improve Infrastructure for Alternative Fueled Vehicles	New	12.9
	T1.5a	Provide public renewable charging stations	New	11.8
	T1.5b	Collaborate Regionally .	Expanded	11.8
	T2	**Promotion/Educational Campaign to Discourage Driving:** Promote walking, bicycling, taking public transport, ridesharing, alternative fueled vehicles, telecommuniting.	Expanded	14.9
	T2.1	Support Existing Local Sustainable Transportation Efforts	New	16.2
	T2.2	Events: car free days/events, bike to work day	Expanded	13.5
	T2.3	Promote Car Sharing	New	14.3
	T2.3a	Carpool/ carshare programs	New	14.5
	T2.3b	Collaborate regionally in transport planning	Expanded	14.3
	T2.3c	Commuter Trip Reduction Program	New	14.2
	T3	**Incentives for People not to Drive/Disincentives for those who drive**	Expanded	14.6
	T3a	Parking incentives to drivers of AV's	Expanded	14.0
	T3b	Preferential parking	New	13.8
	T3c	Subsidize transit	Expanded	13.8
	T3d	Employees incentives to take transit, carpool, etc.	New	15.7
	T3e	Incentives to Businesses to reduce employee vehicle use	New	15.0
	T3f	Tax Businesses that utilize public parking for employees	New	14.2
	T3g	Incentives for carless people	New	13.7
	T3h	Finance Carpooling	New	12.2
	T3i	Rideshare Trust Fund:	New	12.7

Measure Group	Measure ID	Measure Name	Ongoing, Expanded, New	Total Score*
	T3j	Subsidize Arcata's Library Bike Program (shop space, employment)	Ongoing	13.0
	T3k	Encourage car insurance companies to offer pay by the mile	New	11.5
	T4	**City Fleet Greening**	Expanded	14.7
	T4.1	Policy of purchasing fuel efficient new vehicles/ alternative fuel vehicles	Expanded	15.7
	T4.2	Make modifications to city fleet	Expanded	14.4
	T4.2a	"Downsizing" the fleet	Expanded	14.7
	T4.2b	Retire old & underused vehicles	Expanded	15.3
	T4.2c	Efficient use of vehicles	Expanded	17.3
	T4.3	"Green" mass transit	New	14.6
	T4.4	City contracts with haulers,etc. specifiy alternative fuel vehicles	New	13.2
	T5	**City Employee Transportation Program**	Expanded	13.2
	T5.1	Infrastructure development		13.9
	T5.1a	Provide bike locker stations for City employees	New	13.0
	T5.1b	Car pooling network for city employees	New	14.8
	T5.2	Incentives		12.9
	T5.2a	Allocate library bikes to City employees	Ongoing	12.3
	T5.3	Education/Events		12.8
	T5.3a	Establish "Bike to work day" once a month: City employees	New	13.3
	T6	**Regional Partnerships/Collaboration**	Expanded	14.1
	T6a	Become a DOE Clean City's Partner	New	13.5
	T6b	Improve Regional Infrastructure for Cleaner vehicles	New	13.0
	T6c	Improve Regional Bicycle infrastructure	Expanded	14.0
	T7	**Lobbying/ Political Action for Efficien and Non-Polluting Transporation Options/Alternatives**	Expanded	16.2
	T7a	Lobby for alternative fuel vehicle legislation	Expanded	17.5
	T7b	Lobby for improved CAFÉ standards	Expanded	17.7
Waste/Consumption	**W1**	**Create Waste/ Consumption Reduction Strategy (R's)**	Expanded	13.9
	W1.2	Implement recommendations of City Waste Reduction Task Force	Expanded	13.4
	W2	**Include Waste Reduction in Community Building & Planning**	Expanded	13.6
	W2.1	Industrial Ecology (waste to use siting/planning)	New	14.9
	W2.2	Incorporate waste/consumtpion reduction in municpal codes.		15.6
	W3	**Education/Outreach:** Materials, events, training, etc. on R's, Composting, brush-drop	New	13.8
	W3a	Backyard Composting workshops	Expanded	13.2
	W3b	Office Paper Recycling	Expanded	13.7
	W4	**Incentives**	Expanded	13.2
	W4a	City Subsidized Recycling	Expanded	12.5

Measure Group	Measure ID	Measure Name	Ongoing, Expanded, New	Total Score*
	W4b	City provide free composting bins	Ongoing	11.8
	W5	**Municipal Waste Reduction**	Expanded	12.9
	W5.1	Recycling in City Facilities	Expanded	13.6
	W5.2	Purchasing Policies	New	14.8
	W5.3	Employee education	Expanded	13.4
	W6	**Regional Partnerships/Collaboration**		15.5
	W6a	Humboldt Waste Management Authority	Expanded	13.3
	W7	**Lobbying/Political Action for Waste/ Consumption Reduction**		14.0
Sequestration/Other	O1	**Sequestration**	Expanded	15.0
	O1.1	Community Forest	Ongoing	15.7
	O1.2	Urban Tree Planting	Expanded	15.5
	O1.2a	Create a Plan for in-town City Forestry/Planting	Expanded	14.8
	O2	**Methane Reduction**	Expanded	12.2
	O2a	Install biogas generator at wastewater treatment plant.	New	13.7
	O3	**Regional Partnerhips**		13.7
	O4	**Lobbying/Political Action for Carbon Sequestration**	Expanded	13.6
	O4a	Support Statewide Reforestation Efforts & Reduce Non-Sustainable Timber Harvest Plans	Expanded	14.8
Cross-Cutting	**M1**	**PR campaign/ 20 % challenge: Targeting all categories of GHG Emissions:** Residential, Commercial, Schools, Consumers, Churches & Community Groups, etc. Waste and consumption reduction, organics, carbon-neutral prurchasing, best practices, water efficiency	Expanded	15.7
	M1.1	Education events	Expanded	12.6
	M1.2	Develop materials	Expanded	10.6
	M1.3	Develop a thorough Business Outreach program	New	13.5
	M1.3a	Best practices strategies	Expanded	13.2
	M1.3b	Acknowledge Commercial Efforts to Reduce GHG	New	14.3
	M1.4	Climate/Energy Education in Schools	New	13.6
	M1.4a	Support "greening schools" programs	New	12.3
	M1.5	Create a city staff and policy makers education campaign	New	14.6
	M2	**Green Building:** Promote Sustainable Building	New	16.4
	M2.1	Municipal Green Building Policy-City-Wide	New	14.2
	M2.2	Municipal Green Building Policy-City Buildings	New	14.6
	M2.3	Professional Training	New	11.8
	M2.4	Development of Outreach Materials/ Guidelines	New	13.0

Measure Group	Measure ID	Measure Name	Ongoing, Expanded, New	Total Score*
	M3	**Incorporate Climate Strategies into Municipal Codes (See following sections for specific recommendations)**	Expanded	16.4
	M3a	Building Codes	New	15.0
	M3b	Land Use Codes	Expanded	15.0
	M3c	Commercial standards for resource reduction	Expanded	14.7
	M3d	Design/Project review process that promotes Climate Concerns	Expanded	15.0
	M4	**City Operations Strategy (See following sections for specific recommendations)**	Expanded	14.8
	M4.1	Purchasing Policies	Expanded	13.2
	M4.1a	Equipment	Expanded	14.5
	M4.1b	City purchase of carbon offsets	New	10.5
	M4.2	Best practices strategies	Expanded	13.1
	M5	**Regional Partnerships**	Expanded	14.9
	M5.1	Create Partnerships with Other Communities	Expanded	12.1
	M5.2	International Council for Local Environmental Initiatives	Ongoing	13.7
	M5.3	Encourage/Support HSU GHG reduction initiatives	New	15.6
	M5.4	Redwood Coast Energy Authority	Ongoing	15.4
	M5.5	Humboldt county Organization of Governments	Expanded	13.1
	M5.6	Humboldt Waste Management Authority	Expanded	13.1
	M6	**Lobbying/Political Action for Greenhouse Gas Reduction (specific recommendations under each topic)**	Expanded	14.4

* Maximum total score = 20. Higher score indicates the measure is more desirable.

Appendix C:
List of Greenhouse Gas Reduction Measures the City of Arcata has Already Implemented

A. Energy Efficiency

Energy audits for City facilities

Energy-efficiency retrofits for City facilities

City Hall
- 10 kW PV System
- 2 kW PV Expansion
- Relamped al interior lights to T8 Lamps w/ Low Ballast Factor Electronic Ballasts
- Converted Interior/Exterior Incandescent Fixtures to HPS or Fluorescent Fixtures
- Replaced EXIT Signs w/ LED Fixtures
- Installed all Programmable Thermostats

D St. Center
- Relamped al interior lights to T8 Lamps w/ Low Ballast Factor Electronic Ballasts
- Converted Interior/Exterior Incandescent Fixtures to HPS or Fluorescent Fixtures
- Replaced EXIT Signs w/ LED Fixtures
- Installed all Programmable Thermostats

Judo Hut
- Relamped all interior lights to T8 Lamps w/ Low Ballst Factor Electronic Ballasts
- Converted Interior/Exterior Incandescent Fixtures to HPS or Fluorescent Fixtures
- Replaced EXIT Signs w/ LED Fixtures
- Installed all Programmable Thermostats

Corp Yard
- Installed all Programmable Thermostats

Redwood Lodge/Lounge
- Converted Interior/Exterior Incandescent Fixtures to HPS or Fluorescent Fixtures
- Replaced EXIT Signs w/ LED Fixtures
- Installed all Programmable Thermostats

Service Center
- Replaced EXIT Signs w/ LED Fixtures

Private development projects that involved City sponsorship on affordable housing grants
--Solar electric and solar hot water systems on Windsong low-income housing
--Solar hot water systems on the Courtyard apartments
--Energy efficiency measures in City funded low-income housing

Co-sponsorship of energy efficiency workshop in Arcata with RCEA

B. Renewable Energy

Solar electric promotion and education
The City and the Humboldt Energy Task Force conducted a public forum in 2002 and produced an informational booklet called "Solar Works" to help promote rooftop solar electric systems. This document is now available from the City of Arcata Environmental Services Department. An updated version of this document is available from the Redwood Coast Energy Authority

12 KW Rooftop solar electric system on City Hall with educational display

C. Sustainable Transportation

Greening of the City fleet
The City has purchased or leased the following energy-efficient or alternative fueled vehicles for it's fleet: (3) Toyota Prius gasoline/electric hybrid vehicles, (1) Honda gasoline/electric hybrid vehicle, (3) compressed natural gas pick-ups with a slow-fill, natural gas fueling station, (4) GEMS electric vehicles for meter readers and the wastewater treatment plant, (4) Nissan HyperMini electric vehicles for parking meter readers, and biodiesel fuel is used in the street paving machine.

City-sponsored electric vehicle charging station to be installed downtown

Bike/Ped Master Plan

Land Use Code update
"Smart growth" planning policies (infill, work/live, spokes of wheel, bike/ped friendly, etc.)

D. Waste and Consumption Reduction

Waste reduction/diversion of 51% since 1990. Continued efforts to reach zero waste by recycling, waste reduction and reuse. City recently passed Environronmentally responsible purchasing ordinance.

E. Sequestration and Other Methods

Community forest management
Management Plan emphasizing carbon sequestration by growing trees on extended rotations, designating reserves and adding forest acres that could otherwise be developed.

Riparian forest establishment
Established more that 100 acres of new riparian forest along creeks and bottom lands

Salt Marsh Project
The McDaniel Slough Marsh Restoration Project expects to sequester additional carbon on a 240-acre site. Estimates are in progress.

Urban Forestry Program
Active program to expand planting of trees in the urban landscape including parks, the plaza, roadside greenways etc.

F. Cross-Cutting Approaches

Energy committee input to the new Land Use Code

Energy committee input to the Design Review Commissions Design Review Manual

Established relationship with the Redwood Coast Energy Authority

Education and outreach events (GHG public forum, sustainable energy fair, other local fairs)

Appendix D:
Near-term Implementation Plan for Arcata's Community Greenhouse Gas Reduction Plan

Implementation Measure	Responsible Party	Time Frame	Program Area(s)
Green Building Program "Green building" is a holistic approach to designing and constructing buildings that emphasizes quality construction, energy efficiency, resource conservation, good indoor air quality, and livable communities. The City will research what other communities are doing to promote green building and will work toward adoption of a local green building program. Key steps in this effort will include the following: 1. Form a green building team (with potential members from the Energy Committee, Design Review Commission, Planning Commission, and City staff from the Environmental Services Department and the Building Department), 2. Identify key stakeholders 3. Educate key stakeholders 4. Assess and leverage existing resources 5. Distribute educational materials 6. Adopt established green building guidelines as an official reference guide 7. Organize green building educational program for professionals and homeowners 8. Remove barriers to and develop incentives for green building 9. Develop a green building award program	Energy Committee (lead), Design Review Commission, Planning Commission, City staff	Steps 1-6 in 2006-2007, Steps 7-9 in 2007, on-going program	Energy Efficiency, Renewable Energy, Waste and Consumption Reduction
Time-of-Sale Program The time-of-sale program will establish a voluntary, pilot program that will offer energy audits at the time-of-sale of residential properties and will provide audit information, energy efficiency upgrade opportunities, and financing options to prospective buyers. Key steps in this effort will include: 1. Form a time-of-sale team (members from Energy Committee, RCEA, City staff) 2. Identify key stakeholders (e.g. realtors, lenders, energy professionals) 3. Develop a plan for the time-of-sale pilot program (involve key stakeholders) 4. Develop promotional/educational materials 5. Educate key stakeholders and broader community 6. Adopt a City resolution in support of the time-of-sale program 7. Engage an energy auditor for the pilot program 8. Promote and implement the time-of-sale program 9. Monitor the program and evaluate its effectiveness	Energy Committee (lead), Redwood Coast Energy Authority (RCEA), City staff	Pilot program 2006-2008 on-going program	Energy Efficiency

Appendix D:
Near-term Implementation Plan for Arcata's Community Greenhouse Gas Reduction Plan

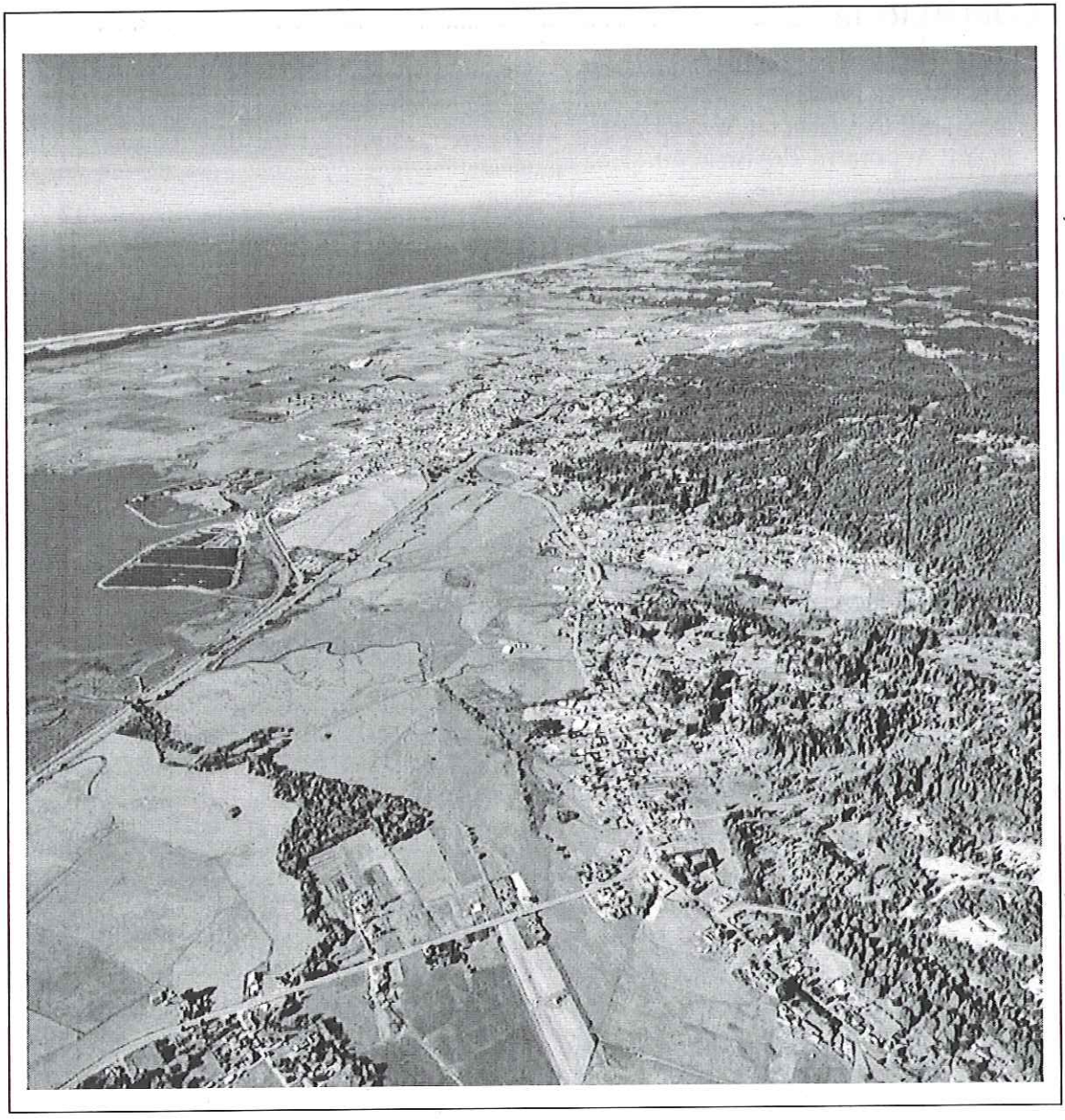
Implementation Measure	Responsible Party	Time Frame	Program Area(s)
Solar Roof Program Participate in efforts to promote the installation of rooftop solar energy systems. Activities may include: 1. Establish a City goal for the number of new solar energy installations 2. Adopt a resolution in support of rooftop solar energy systems 3. Develop/compile educational literature promoting the installation of solar energy systems 4. Provide promotional information to homeowners and builders 5. Add promotional information to the City's solar electric display at City Hall 6. Develop incentives for solar energy system installations 7. Sponsor educational workshops promoting solar energy	Energy Committee, City staff	2006-2007 development, on-going program	Renewable Energy
City Report on Energy Consumption Prepare an annual report detailing energy usage in all City facilities and operations. Use this information as an educational tool and to track the City's energy efficiency efforts. Tasks for this effort will include: 1. Develop an energy consumption report format 2. Develop a process for compiling the necessary information and preparing the report 3. Collect data and prepare the report 4. Publicize the report	Energy Committee, City staff	2006 development, on-going program	Energy Efficiency, Renewable Energy, Sustainable Transportation
Alternative Fuel Vehicles Continue to obtain alternative fuel vehicles for Arcata's vehicle fleet where possible. This will include hybrid-electric vehicles and electric vehicles. Near-term efforts will especially focus on electric vehicle replacements for the City's parking enforcement fleet. Efforts may generally be expanded to promote the use of electric vehicles and other alternative fuel vehicles in the community.	Energy Committee, City staff	Parking enforcement vehicles in 2006, on-going program	Sustainable Transportation
Energy Ordinance for City Funded Projects Establish an ordinance establishing energy efficiency standards for all City funded projects. Tasks will include: 1. Research various energy efficiency standards 2. Develop an energy efficiency standard that meets the goals stated in General Plan 2020 3. Adopt energy efficiency standard 4. Enforce the energy efficiency standard	Energy Committee, City staff	2006 development, on-going program	Energy Efficiency, Renewable Energy

Appendix D:
Near-term Implementation Plan for Arcata's Community Greenhouse Gas Reduction Plan

Implementation Measure	Responsible Party	Time Frame	Program Area(s)
Improve Arcata's Energy Program Website Improve and update the City's Energy Program website. Keep the information current. Add information about current activities in the City's Energy Program. Provide energy information resources.	Energy Committee, City staff	2006 development, on-going program	Cross-cutting
Coordinate with Local Energy Groups Coordinate our activities with those of other local energy groups, especially RCEA. Attend other energy group meetings, invite their members to our meetings, or otherwise keep informed about their activities and leverage our efforts to better meet each groups needs.	Energy Committee	on-going	Cross-cutting

Note: This implementation plan will be reviewed annually in June. Accomplishments will be noted and new implementation measures will be brought forward as appropriate.

City of Arcata
Updated Greenhouse Gas Inventory
2006



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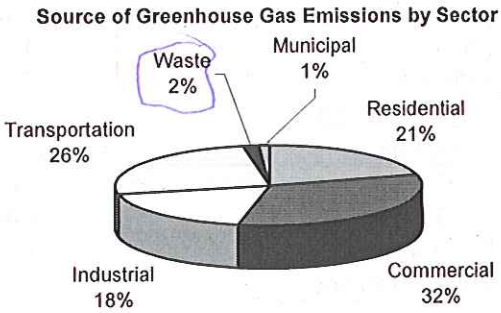
Summary of CO_2 Emissions

The City of Arcata has been taking active measures to monitor and reduce our community's contribution to climate change for almost a decade now. In 2001, the City joined the Cool Cities Campaign and committed to a 7% greenhouse gas reduction from 1990 emissions levels by 2007. In 2004, the City completed the first Greenhouse Gas Inventory for the community, setting 2000 as the baseline for emissions reductions. In 2006, the City passed the Greenhouse Gas Action Plan, which sets further emissions reductions targets of 20% below 2000 levels by 2010.

This Inventory is a 'progress check,' monitoring the City's progress towards emissions reductions goals. This Inventory can serve to show where the City and Community have made progress with emissions reductions, and where there still may be significant work or challenges to emissions reductions.



The 2006 Greenhouse Gas Inventory shows that there is much work to be done. Over all, energy usage has increased throughout the City. There has been a modest reduction in overall greenhouse gas emissions, but this is primarily due to PG&E efforts to provide a cleaner grid mix to their customers. In many cases, increases in energy usage were matched by decreases in emissions as a result of PG&E's efforts.

Transportation continues to be a troubling sector. A different methodology was used to quantify greenhouse gas emissions from transportation in this Inventory then in the 2000 GHG Inventory. The result was a significant drop in transportation emissions. For comparative purposes, the 2000 Inventory was updated as well. However, transportation, which was the single largest contributor to emissions in the 2000 Inventory, now contributes less than the commercial sector. It is not clear how accurate that is. For more on this, please see page 16.

Municipal emissions are another area of concern. In 2000, the City purchased electricity from the Association of Bay Area Governments (ABAG) via direct access agreements. This cooperative dissolved soon after, and since the City has purchased electricity from PG&E. ABAG guaranteed their power customers at least 20% green electricity, sometimes as much as 30% or more renewable energy in the power mix. Therefore, even though municipal energy usage has dropped considerably in some sectors due to energy retrofits and solar electric installations, the emissions have risen dramatically. This should reflect the importance of procurement decisions in supporting renewable energy and reducing greenhouse gas emissions. For more on this discussion, see page 23.

Summary of CO_2 Emissions, continued

2006-2006 Inventory Comparison at a Glance

Residential	CO_2 (tons)
2000	28,531
2006	28,137
Difference	-394
Percent Change	-1%
Commercial	**CO_2 (tons)**
2000	47,430
2006	43,814
Difference	-3,616
Percent Change	-8%
Industrial	**CO_2 (tons)**
2000	25,674
2006	24,462
Difference	-1,212
Percent Change	-5%
Transportation	**CO_2 (tons)**
2000	37,809
2006	34,465
Difference	-3,344
Percent Change	-9%
Municipal	**CO_2 (tons)**
2000	1,228
2006	1,539
Difference	311
Percent Change	25%
Waste	**CO_2 (tons)**
2000	2,108
2006	2,149
Difference	41
Percent Change	2%
Total	**CO_2 (tons)**
2000	142,690
2006	134,566
Difference	-8,124
Percent Change	-6%

Residential

2000 to 2006 Inventory Comparison at a Glance

Sector			2000	2000	2006	2006	% Change	% Change
	Source	Unit	Purchased	CO_2 (tons).	Purchased	CO_2 (tons).	Purchased	CO_2 (tons)
Residential	Natural Gas	Therms	2,752,945	17,009	2,938,710	18,156	7%	7%
Residential	Electricity	KWh	30,922,368	11,272	40,159,265	9,839	30%	-13%
Residential	Propane	Gallons	1,067	7	833	6	-22%	-14%
Water Pumping	Electricity	KWh	667,872	243	553,552	136	-17%	-44%
Totals				28,531		28,137		-1%

PG&E specific figures were used to calculate the kWh to carbon dioxide conversion. PG&E has significantly cleaned their grid mix since 2000. As a result, though there was a 10 million kWh increase in residential energy consumption (30%), actual emissions were reduced by 13%. The emissions could have been significantly lower if residential energy consumption had also reduced 13%. Natural gas consumption increased by 7% and resulting emissions were proportional. There was a significant reduction in water pumping energy. This is likely due to the installation of a freshwater pump at Heindon and Janes road, which supplies roughly 15% of the City water. The reduction in electricity usage here can also help explain the large increase in electricity usage in the municipal sector, further explained on page 23.

Residential

Non-HSU Water Pumping

Electricity from Water Pumping

Water and energy use obtained from HBMWD, Becky Moyle.

City of Arcata is responsible for 702 Million Gallons (MG) of the total from HBMWD, which is 19.37% of the total municipal water pumping demand. There are 4,297,414 kWh from municipal water usage.

City of Arcata water usage is .1937 * 4,297,414 = 832,409

HSU accounts for 5% of the water use, so that is subtracted from the total:

832,409 * .05 = 41,620 HSU water use kWh

832,409 – 41,620 = 790,789 kWh

Water printouts from the City of Arcata Finance Department show 30% of water consumption is by commercial accounts, so 30% of the kWh usage was subtracted and reported separately under commercial.

790,789 * .3 = 237,236

790,789 – 237,236 = 553,552

Non-HSU Water Pumping	KWh	CO_2 (tons)
2000	667,872[1]	243
2006	553,552	136
Change	-114,320	-107
Percent Difference	-17%	-44%

There was a large reduction in electricity usage in this sector. Right after the 2000 Inventory was completed, a freshwater pump went online near Heindon and Janes road. This pump supplies roughly 15% of the City water usage, helping to explain the 17% reduction from Humboldt Bay Municipal Water District. This is further supported by increases in the City electricity usage, especially in the water sector. Humboldt Bay Municipal Water District also gets electricity from PG&E, who cleaned their grid mix substantially over the past several years. This explains the 44% reduction in CO_2 while there is only a 17% reduction in electricity usage.

[1] In the 2000 Inventory, water-pumping kWh was not separated between commercial and residential. 30% of the pumping is for commercial uses, so I separated the kWh from 2000 by assuming a 30% mix was consistent for 2000 as well.

Residential

PG&E Accounts

Electricity and Natural Gas Use

In the 2000 Inventory, there was a 10% difference between the number of PG&E accounts and the US Census data for Arcata. I used the same 10% reduction with the 2006 numbers. In addition, I used PG&E specific kWh to CO_2 conversion factors in the software that applied to both the year 2000 and 2006. The PG&E emissions data for 2006 is actually the data from 2005, which is the most recent year available.

Propane Use

Propane numbers from Amerigas were 2500 gallons. I divided the amount of gallons by three to account for industrial, commercial, and residential sectors, as was done in the 2000 Inventory.

PG&E Accounts

Electricity	KWh	CO_2 (tons)
2000	30,922,368	11,272
2006	40,159,265	9,839
Change	9,236,897	-1,433
Percent Difference	30%	-13%
Natural Gas	**Therms**	**CO_2 (tons)**
2000	2,752,95	17,009
2006	2,938,710	18,156
Change	185,765	1,147
Percent Difference	7%	7%
Propane	**Gallons**	**CO_2 (tons)**
2000	1,067	7
2006	833	6
Change	-234	-1
Percent Difference	-22%	-14%

PG&E has made significant increases in the cleanliness of their grid mix, and this is reflected in the emissions. For example, though Residential energy consumption increased by 30%, the reported emissions actually decreased by roughly 13%. A significant portion of that is likely the increase in the percentage of PG&E electricity that comes from renewable sources. This should exemplify the support for cleaner energy forms that use less coal and carbon-intensive fuels, and promote a push for renewable energy. As the 2000 Inventory did not include data from Sequoia propane providers, it is difficult to tell where the reduction in residential propane usage comes from, and if it is truly accurate. It is likely that the significant reduction is really a result of reporting methods, as the propane consumption increased significantly in the commercial and industrial sectors.

Commercial

2000-2006 Inventory Comparison at a Glance

Sector			2000	2000	2006	2006	% Change	% Change
	Source	Unit	Purchased	CO_2 (tons)	Purchased	CO_2 (tons)	Purchased	CO_2 (tons)
Commercial	NG	Therms	2,067,624	12,774	2,805,732	17,334	36%	36%
Commercial	Electricity	KWh	64,391,506	23,472	58,176,605	14,253	-10%	-39%
Commercial	Propane	Gallons	1,067	7	36,833	249	3,374%	3,457%
HSU	NG	Therms	1,135,707	7,017	1,416,765	8,753	25%	25%
HSU	Electricity	KWh	10,621,040	3,872	8,171,079	3,138	-23%	-19%
HSU	Propane	Gallons	9,063	61	2,793	19	-69%	-69%
Water Pumping (HSU)	Electricity	KWh	89,910	33	41,620	10	-54%	-70%
Water Pumping (non-HSU)	Electricity	KWh	286,230	104	237,237	58	-17%	-44%
Total				47,340		43,814		-7%

The 2000 Inventory included the City of Arcata figures in the commercial sector. This is because in the year 2000, the City purchased electricity from an independent provider, and therefore wasn't included in PG&E accounts. The City now purchases their electricity from PG&E, and therefore it would be redundant to list the electricity twice. The impact of the City carbon footprint is accounted for separately under 'Municipal.' There has been a significant reduction of both electricity use and resulting emissions in the commercial sector. However, natural gas consumption has increased by 36%.

Data for propane consumption was from Amerigas and Sequoia. The 2000 Inventory did not include figures for Sequoia, who is the largest propane provider in the City. Figures from Sequoia were included in this Inventory, and the result is a seemingly large increase in propane consumption. It is hard to compare consumption to 2000, as figures from Sequoia are not available.

HSU has achieved broad savings across the board. In 2003, HSU conducted a campus wide energy audit and retrofits and as a result has decreased electricity consumption by almost 20%. However, natural gas consumption increased considerably at HSU. One reason for the rise in natural gas consumption at HSU could be increased usage of the co-generation system on campus, which burns natural gas to produce both electricity and heat. HSU also upgraded the irrigation system on campus, and water consumption has dropped considerably.

Commercial

HSU

Humboldt State University data was sent to me in 12 monthly reports from Tim Moxon, Senior Director of Facilities Management.

HSU electricity is delivered by PG&E, but purchased from APS (HSU is an unbundled customer.) Tim says APS guarantees 20% green electricity; meaning 20% of the electricity they provide comes from certified renewable sources. I applied a reduction of 20% to extract the green kWh, as a green kWh is considered carbon neutral. Tim mentioned that most of the propane goes towards fueling the Telonicher lab in Trinidad, but as some of the propane is for forklifts and some is for back-up generators, I included the propane figures as well.

HSU Electricity	KWh	CO_2 (tons)
2000	10,621,040	3,872
2006	8,171,079	3,138
Difference	-2,449,961	-734
Percent Change	-23%	-19%

HSU Natural Gas	Therms	CO_2 (tons)
2000	1,135,707	7,017
2006	1,416,765	8,753
Difference	281,058	1,736
Percent Change	25%	25%

HSU Propane	Propane (gal)	CO_2 (tons)
2000	9,063	61
2006	2,793	19
Difference	-6,270	-42
Percent Change	-69%	-69%

HSU Green Electricity	Green kWh
2000	2,665,260
2006	2,042,770
Difference	-622,490
Percent Change	-23%

HSU conducted a series of retrofits to campus buildings that have significantly reduced electricity consumption on campus. These retrofits vary from lighting to HVAC systems, and even include simple actions like putting idle computers on standby in computer labs. It is worth noting that HSU has reduced its kWh consumption by 3 million kWh while the other sectors have increased their consumption. Another factor could be the increased usage of co-generation systems on campus, which burns natural gas to create electricity and heat.

Commercial

HSU Water Pumping

Information obtained from Tim Moxon, Senior Director of Facilities Management at HSU. HSU uses about 33 MG of city water a year, which is 5% of the total Arcata usage. I subtracted 5% of the kWh demand associated with water pumping and reported it here.
832,409 kWh City of Arcata total * .05 = 41,620 kWh

HSU Water Pumping	KWh	CO_2 (tons)
2000	89,910	33
2006	41,620	10
Difference	-48,290	-23
Percent Change	-54%	-70%

HSU retrofitted the irrigation system on campus, resulting in a dramatic reduction in water consumption. The reduction in emissions is also a result of the increasing cleanliness of the PG&E grid mix.

Commercial

Non-HSU Commercial Water Use

Becky Moyle at the Humboldt Bay Municipal Water District provided the electricity use from water pumping. The percentage of City water used by commercial accounts was determined from account printouts provided by David Bradley. The total share of kWh (not including HSU) was split 30/70, with commercial accounts being responsible for 30% of the power use.

Total usage (not including HSU) 790,789 kWh * .30 = 237,237 kWh

Non-HSU Water Pumping	KWh	CO_2 (tons)
2000	286,230	104
2006	237,237	58
Difference	-48,993	-46
Percent Change	-17%	-44%

The Humboldt Bay Municipal Water District supplies water to many of the municipalities locally. The electricity usage shown here is proportional to the percentage of water that the City uses, and hence the percentage of electricity we are responsible for. In 2000 shortly after the Inventory was completed, the City installed a freshwater pump at Heindon and Janes road. This pump supplies roughly 15% of our water supply, and is consistent with the drop in usage from HBMWD. As the freshwater pump provides electricity for the entire City, these water pumping savings were shared across each sector. However, there is a proportionate increase in electricity in the municipal sector as well. The CO_2 reduction is again a result of the cleaner PG&E grid mix.

Commercial

PG&E Accounts, Commercial

The data I received in 2006 did not separate commercial and industrial customers. Using the figures from the 2000 Inventory, I was able to assume that industrial was responsible for 39% of the demand, and commercial was responsible for 61%. I also assumed there was the same 10% discrepancy between the data and the US Census reports as in the 2000 Inventory. I applied these figures to the data:
2314507.96 kWh * .61 = 64640672.0513 kWh *.10 = 6464067 kWh: 64640672.0513 kWh - 6464067 kWh = **58176604.8462 total kWh commercial**
5125911 therms * .61 =3117480.09344 *.10 = 311748.009344: 3117480.09344 - 311748.009344 = **2805732.0841 total therms commercial**
Electricity co-efficients are based on PG&E report to the California Energy Commission for year 2005. 2006 numbers are not yet available.
Propane numbers were received from Amerigas and Sequoia. Amerigas figures were divided by three to account for the three sectors, commercial, industrial, and residential. Sequoia figures were divided by two to account for commercial and industrial.
Amerigas= 2500/3 = 833.33
Sequoia= 72,000/2 = 36000
Commercial = 833.33 + 36000 = 36833.33

Electricity	KWh	CO_2 (tons)
2000	64,391,506	23,472
2006	58,176,605	14,253
Difference	-6,214,901	-9,219
Percent Change	-10%	-39%

Natural Gas	Therms	CO_2 (tons)
2000	2,067,624	12,774
2006	2,805,732	17,334
Difference	738,108	4,560
Percent Change	36%	36%

Propane	Gallons	CO_2 (tons)
2000	1,067	7
2006	36,833	249
Difference	33,632	242
Percent Change	3,352%	3457%

Reductions in CO_2 emissions are a result of the cleaner grid mix provided by PG&E. See page 4 for more discussion on this. The 2000 Inventory did not include propane data from Sequoia, though Sequoia is the largest propane dealer in the City of Arcata. The resulting propane emissions had a less than 1% impact on the total emissions, though they do have an impact on the individual sectors.

Industrial

2000-2006 Inventory Comparison at a Glance

Sector			2000	2000	2006	2006	% Change	% Change
	Source	Unit	Purchased	CO_2 (tons)	Purchased	CO_2 (tons)	Purchased	CO_2 (tons)
Industrial	NG	Therms	1,140,922	7,049	1,821,792	11,255	60%	60%
Industrial	Electricity	KWh	47,075,722	17,160	50,590,852	12,395	7%	-28%
Industrial	Propane	Gallons	1,067	7	36,833	249	3352%	3457%
Industrial	Fuelwood	Tons	14,059	1,458	6,500	563	-54%	-61%
Total				25,674		24,462		-5%

The large increase in propane consumption is a result of different data collection methods between the 2000 and 2006 Inventory, see page 8 for further discussion. There was a large increase in industrial natural gas consumption. Sun Valley Floral Farms had a large increase in their operations, which could likely be one of the explanations for the spike in natural gas usage. The reduction in CO_2 from electricity usage is due to a cleaner PG&E grid mix.

Industrial

Humboldt Flakeboard

The North Coast Unified Air Quality Management District (NCUAQMD) keeps burn permits on file for all industries that use wood burning for energy. Humboldt Flakeboard was the only facility in Arcata city limits that uses biomass for an energy source. NCUAQMD provided the information in tons of wood burned / year. Kerry Bartlett at the Humboldt Flakeboard plant informed me that the biomass they use in the boilers is leftover shavings from processed wood, so I classified the biomass as dry.

Fuel Wood	Tons	CO_2 (tons)
2000	14,059	1,458
2006	6,500	563
Difference	-7,559	-895
Percent Change	-54%	-61%

The 2000 Inventory data was for Louisiana Pacific. That mill is no longer operating, but in its place Humboldt Flakeboard has sprouted up. Therefore, this data is not a direct comparison. In addition, the 2000 Inventory included numbers for residential fuel wood consumption, and I was not able to find those numbers for this Inventory. However, the total emissions from residential fuel wood consumption constitute less than 1% of the total emissions, so I considered the fuel wood contribution de minimus.

Industrial

PG&E Accounts

The data I received in 2006 did not separate commercial and industrial customers. Using the figures from the 2000 Inventory, I assumed that industrial was responsible for 39% of the demand, and commercial was responsible for 61%. Agricultural data was included with industrial. I also assumed there was the same 10% discrepancy between the data and the US Census reports as in the 2000 Inventory. I applied these figures to the data:
106285308 * .39 = 41644636 * .10 = 4164463: 41644636 - 4164464 = 37480172 + (14567422 agricultural kWh- (14567422*.1)) = **50590852 kWh total industrial**
5125911 therms * .39 = 2008431 * .10 = 200843: 2008431 - 200843 = 1807588 + (15782 agricultural therms -(15782 * .10)) = **1821792 total therms industrial**
Propane numbers were received from Amerigas and Sequoia and split as in the commercial sector.
Amerigas= 2500/3 = 833.33
Sequoia= 72,000/2 = 36000
Commercial = 833.33 + 36000 = 36833

PG&E Accounts

Electricity	KWh	CO_2 (tons)
2000	47,075,722	17,160
2006	50,590,852	12,395
Difference	3,515,130	-4,765
Percent Change	7%	-28%

Natural Gas	Therms	CO_2 (tons)
2000	1,140,922	7,049
2006	1,821,792	11,255
Difference	680,870	4,206
Percent Change	60%	60%

Propane	Gallons	CO_2 (tons)
2000	1,067	7
2006	36,833	249
Difference	33,632	242
Percent Change	3,352%	3457%

The propane consumption did not increase as dramatically as this graph would indicate. The 2000 Inventory did not include figures from Sequoia, a major provider in Arcata. I did include these numbers for the 2006 Inventory, and so it appears as though the propane usage skyrocketed. The contribution of propane emissions is less than 1% of total community emissions, however, and was considered de minimus. The large increase in natural gas consumption could be due to the increase in size of Sun Valley Floral Farms, the largest industrial customer in the City of Arcata. The reduction in CO_2 emissions from electricity is a result of the increased cleanliness of the PG&E grid mix.

Transportation
2006-2006 Inventory Comparison at a Glance

Sector		2000	2000	2006	2006	% Change	% Change
	Unit	Recorded	CO_2 (tons)	Recorded	CO_2 (tons)	Recorded	CO_2 (tons)
Community Transportation	AVMT	55,005,500	37,809	52,768,050	34,465	-4%	-9%
Transportation of Waste	AVMT	207,255	464	180,600	349	-13%	-25%
Totals			38,273		34,814		-9%

The transportation data was the most difficult to calculate. There was no realistic data available for the 2006 Inventory. Through speaking with ICLEI, it was recommended that I use the CalTrans Highway Performance Monitoring System data. Because the data had VMT levels that were 2/3 less than the 2000 Inventory, I updated the original Inventory for comparative purposes using the same database. One result of the updated transportation data is that commercial energy usage now accounts for more of the greenhouse gas emissions in the City of Arcata then the transportation sector. Though this is an attractive concept, as it is much easier to address commercial energy consumption with technology retrofits and business practices then it is to get people out of cars, it is not clear how realistic this is. Transportation data is clearly very sensitive to assumptions. As the transportation sector is such a large part of the emissions, the City of Arcata is working to establish a permanent and repeatable method for quantifying transportation data. Also accounted for in the transportation sector is the transportation of solid waste from Arcata. All the solid waste created in Arcata is shipped to either southern Oregon or the Redding area. This shows the need for reducing waste in affecting greenhouse gas emissions in our community.

Transportation

Community Transportation

Conversations with ICLEI revealed that the preferred method for transportation data comes from the Highway Performance Monitoring System (HPMS). The numbers given by the HPMS data varied quite significantly from the numbers reported in the 2000 Inventory and the numbers that would have been reported in the 2006 inventory. After discussion with ICLEI and Doby Class, Director of Public Works at the City of Arcata, I decided to report the HPMS figures in place of the Fehr and Peers figures, as they seemed to accurately model traffic volumes. Hence, for the purposes of the updated Inventory, I have changed the historical 2000 data using HPMS year 2000 data obtained from the HPMS website, http://www.dot.ca.gov/hq/tsip/hpms/datalibrary.php. The original inventory will remain unchanged, but the numbers need to be updated for the current report so there can be a comparative analysis of transportation based GHG emissions.
I took the reported daily vehicle miles traveled (DVMT) miles and multiplied them by 365 to get annual vehicle miles traveled (AVMT). Contrary to ICLEI recommendations, I have not included highway mileage in these figures, as the City of Arcata does not have jurisdictional control over the highway, and cannot therefore impact emissions meaningfully.

		MAINTAINED MILES			DAILY VEHICLE MILES OF TRAVEL (DVMT) [1,000]		
COUNTY	JURISDICTION	RURAL	URBAN	TOTAL	RURAL	URBAN	TOTAL
HUMBOLDT							
CITIES	ARCATA	0.00	68.69	68.69	0.00	144.57	144.57
	BLUE LAKE	6.70	0.00	6.70	3.22	0.00	3.22
	EUREKA	0.00	126.26	126.26	0.00	353.00	353.00
	FERNDALE	8.66	0.00	8.66	4.32	0.00	4.32
	FORTUNA	0.72	46.28	47.00	0.68	86.50	87.18
	RIO DELL	10.09	2.91	13.00	8.77	2.23	10.99
	TRINIDAD	6.60	0.00	6.60	3.49	0.00	3.49
OTHER	BUREAU OF INDIAN AFFAIRS	202.10	0.00	202.10	13.53	0.00	13.53
	COUNTY (UNINCORPORATED)	1,095.53	109.53	1,205.06	482.74	222.27	705.01
	INDIAN TRIBAL NATION	0.20	0.00	0.20	0.07	0.00	0.07
	NATIONAL PARK SERVICE	12.95	0.00	12.95	4.39	0.00	4.39
	STATE HIGHWAY	289.80	47.26	337.06	1,220.49	1,017.55	2,238.04
	STATE PARK SERVICE	96.86	0.00	96.86	10.22	0.00	10.22
	US FISH & WILDLIFE SERVICE	1.41	0.00	1.41	0.49	0.00	0.49
	US FOREST SERVICE	321.47	0.00	321.47	9.64	0.00	9.64
HUMBOLDT Total		2,052.09	400.93	2,453.02	1,762.06	1,826.72	3,588.78

Table from CalTrans HPMS, found online at http://www.dot.ca.gov/hq/tsip/hpms/datalibrary.php, 10/30/2007

2000 MAINTAINED MILEAGE & DAILY VEHICLE
MILES OF TRAVEL ESTIMATES BY JURISDICTION

COUNTY	MAINTAINED MILES			DVMT (1000)		
	JURISDICTION	RURAL	URBAN	TOTAL	RURAL	URBAN	TOTAL
HUMBOLDT							
	ARCATA	0.0	67.1	67.1	0.0	150.7	150.7
	BLUE LAKE	6.7	0.0	6.7	4.0	0.0	4.0
	EUREKA	0.0	126.0	126.0	0.0	349.2	349.2
	FERNDALE	6.7	0.0	6.7	5.4	0.0	5.4
	FORTUNA	0.0	47.0	47.0	0.0	91.8	91.8
	RIO DELL	13.0	0.0	13.0	12.2	0.0	12.2
	TRINIDAD	5.6	0.0	5.6	4.7	0.0	4.7
CITIES TOTAL		34.0	240.1	274.0	26.3	591.7	618.0
COUNTY		1,113.9	87.6	1,201.4	599.3	161.5	759.8
HIGHWAY		308.0	31.5	337.5	1,307.5	621.6	1,929.1
STATE PARKS&REC		99.9	0.0	99.9	12.7	0.0	12.7
USBIA		202.3	0.0	202.3	17.7	0.0	17.7
USFS		310.5	0.0	310.5	12.2	0.0	12.2
USNPS		33.5	0.0	33.5	6.9	0.0	6.9
HUMBOLDT COUNTY TOTAL		2,096.9	359.1	2,456.0	1,981.6	1,374.8	3,356.4

Table found from archived HPMS data at:
http://www.dot.ca.gov/hq/tsip/hpms/hpmsarchives.php

2000: 150.7 * 1000 * 365 = 55,005,500
2006: 144.75 * 1000* 365 = 52,833,750

Transportation	AVMT	CO_2 (tons)
2000	55,005,500	37,809
2006	52,768,050	34,465
Difference	-2,237,450	-3,344
Percent Change	-4%	-9%

Transportation

Solid Waste Transportation

The solid waste in Arcata is shipped to two different landfills, either Dry Creek in Southern Oregon or Anderson by Redding, CA. I calculated the associated transportation emissions based on the amount of garbage sent to each landfill. This information was obtained from Karen Sherman at Humboldt Waste Management Authority (HWMA).

Anderson:
With 2/3 of 12,417 tons going to Anderson, that means: 8,278 tons going to Anderson. 8,278 tons divided by truck capacity of 24.1 tons means 344 trips. 160 miles, multiplied by two for round trip, means 320 miles per trip. 344 trips times 320 miles means **110,080 total miles to Anderson a year.**

Dry Creek:
1/3 of waste goes to Dry Creek. 1/3 of 12, 417 is 4,139 tons going to Dry Creek. 4,139 divided by 24.1-ton capacity of truck means 172 trips to Dry Creek. Dry Creek is 205 miles away, so 410 miles round trip. 172 trips multiplied by 410 miles = **70,520 miles traveled**.

Transportation of solid waste	Miles	CO_2 (tons)
2000	207,255	464
2006	180,600	349
Difference	-26,655	-115
Percent Change	-13%	-25%

The difference in mileage between 2000 and 2006 is due to the fact that the original Inventory calculated mileage only to Dry Creek, which is further away then Anderson. The change in emissions is due to slightly improved gas mileage in the trucks compared to 2000. The 2000 Inventory recorded 5 MPG, while for this Inventory we calculated 5.5 MPG based on information from HWMA.

Solid Waste

2006-2006 Inventory Comparison at a Glance

Sector		2000	2000	2006	2006	% Change	% Change
	Unit	Produced	CO_2 (tons)	Produced	CO_2 (tons)	Produce	CO_2 (tons)
Waste	Tons	12,183	2,108	12,417	2,149	2%	2%

All of the solid waste created in the City of Arcata is shipped to either Dry Creek in Oregon or Anderson near Redding. Because the landfills are managed outside of the County, the City has little input as to the methane recovery practiced at these sites. The landfill in Dry Creek claims a very competitive recovery rate, but the landfill in Anderson has no methane recovery as of 2006. However, Anderson landfill is installing a very competitive methane recovery system for generating electricity from methane. This system went online in 2007, and the landfill managers expect to obtain very high methane recovery rates. In terms of limiting emissions associated with waste, the City can control the creation of waste. The new curbside recycling program implemented 2007 will likely have a positive impact on the volume of recycling, and hopefully there will be an associated reduction of waste tonnage. Less tonnage of waste also means less waste to be shipped out of the County, and a reduction in emissions associated with solid waste transportation.

Solid Waste

Community Solid Waste

Information obtained from Karen Sherman with the HWMA over the phone (268-8680).
Tons of garbage: from tipping station: **11,687** (extrapolated from total of 104,240 for County.) Including tonnage from Kernin, Arcata totals are **12,417 tons.** The solid waste in Arcata is sent to two separate locations, and each practice different methods of methane recovery.

Methane recovery factor:
Dry Creek obtains a competitive methane recovery rate of 87%. Currently methane is flared, but micro turbines will go on line soon. (Information obtained from phone conversation with Dry Creek landfill management.) 1/3 of waste goes to Dry Creek landfill. **4,139 tons of waste to Dry Creek.**

Anderson Valley installed a great landfill gas collection system in 2006-2007, which obtains around 75-85% of the landfill gas. Currently they flare. Unfortunately, prior to December 2006, the landfill released their landfill gas to the atmosphere. (Information obtained from phone conversation with Greg Johnson, 530-347-5236). Currently, 2/3 of waste goes to Anderson. This means that 2/3 of 12,417 tons of garbage have no methane treatment system. **8,278 tons of garbage to Anderson.**

To obtain methane recovery rate, I calculated a weighted average:
[(4,139/12,417)(.87)]+[(8,278/12,417)(0)]= .29 percent recovery rate

Waste Characterization
2000 Inventory used a waste characterization study from the State and from Arcata, and then assumed the figures for Arcata were still consistent, though outdated (1990.)

Waste	Tons	CO_2 (tons)
2000	12,183	2,108
2006	12,417	2,149
Difference	234	41
Percent Change	2%	2%

Other

Methane emissions from cows

I spoke with Alan Bauer from the UC Davis cooperative extension (445-7351.) He did not have any more recent data then was used in the 2000 Inventory, nor did he have any indicator data that could explain growth or decay in the agricultural industry within city limits. It was determined that methane emissions from cattle will contribute less than one percent of total GHG emissions. Therefore, this item was designated De Minimus, and the same numbers from the year 2000 were used.

60,310 kg of methane

Municipal

2000-2006 Inventory Comparison at a Glance

Sector			2000	2000	2006	2006	% Change	% Change
	Source	Unit	Purchased	CO_2 (tons)	Purchased	CO_2 (tons)	Purchased	CO_2 (tons)
Municipal Energy	NG	Therms	37,584	232	33,533	207	-11%	-11%
Municipal Energy	Electricity	KWh	2,049,015	431	2,725,751	668	33%	55%
Municipal Fleet	Miles	AVMT	439,494	339	440,151	331	<1%	-2%
Public Transit	Miles	AVMT	101,538	197	120,000	232	18%	18%
Sewage Gas	Methane	Tons	2.15	50	2.22	51	3%	2%
Totals				1,228		1,539		25%

In 2000, the City purchased electricity through direct access agreements with the Association of Bay Area Governments. ABAG guaranteed minimum 20% of the electricity mix to come from renewable energy sources. ABAG dissolved the electricity portion of their energy services soon after 2000, and the City was forced to switch to PG&E, as at this time direct access laws had been repealed, and only those customers with existing contracts could continue the direct access arrangement. PG&E has made significant improvements in the cleanliness of the grid mix they provide, but they still guarantee only 13% renewable energy sources, as compared with ABAG's 20% guarantee. As a result, City emissions from electricity consumption have increased by 55%, where consumption has only increased by 30%. This conundrum exemplifies the importance of electricity procurement decisions in affecting greenhouse gas emissions. The increase in electricity consumption is largely due to the water sector; increased water consumption and increased pumping demands at the wastewater treatment plant. The City has been working for many years to upgrade existing facilities, and has achieved a 20% reduction in energy use in those buildings that have been upgraded. The City is also working hard to address energy consumption in the water sector, through improving motors to premium efficiency and selecting variable frequency drives where appropriate. A capital improvements plan has been put into effect to upgrade existing infrastructure, largely responsible for water infiltration into the system and increased pumping. In addition, the City is still researching feasible areas to improve their existing renewable energy generation capabilities. The increase of public transportation usage in the City is an excellent trend, which is worth noting. Additionally, the supervisor of the Arcata transit system is investigating fuel saving options.

Municipal

City of Arcata energy usage

Ivan Marruffo at PG&E contributed data from 1/2006-12/31/2006. Electric data was accumulated in three separate areas. Coefficients for electricity production were obtained from ICLEI and reflect the reports of PG&E.
Propane figures were received from Amerigas in Arcata, CA. Solar figures were drawn from the interactive data display at City Hall. I took the total number of kWh produced since the panels were installed, divided that by the number of months the system has been in place to get a monthly figure, and then multiplied that by 12 for an annual figure.

The emissions from electricity seem to have increased drastically between 2000 and 2006, even though this change is not well mirrored by actual consumption. This is due to the switch in service providers. In 2000, the City purchased electricity from an independent provider, the Association of Bay Area Governments (ABAG) who guaranteed 20% renewable energy. Now the City is with PG&E, which provides a clean mix of electricity, but does not guarantee 20% renewable energy. With natural gas consumption, it is clear that the City has reduced consumption overall. A series of energy retrofits conducted between 2003-2006 are likely the cause of reduced consumption in both kWh and therms. This disconnect between consumption and emissions exemplifies the importance of procurement decisions in promoting renewable energy and reducing greenhouse gas emissions.

City Electricity	Buildings	Streetlights	Water	CO_2 (tons)
2000	448,279	389,423	1,211,313	431
2006	416,948	474,025	1,834,778	668
Difference	-31,331	84,602	623,465	237
Percent Change	-7%	22%	51%	55%

City Natural Gas	Therms	CO_2 (tons)
2000	37,584	232
2006	33,533	207
Difference	-4,051	-25
Percent Change	-11%	-11%

The main reductions were achieved in the buildings sector, as the City implemented a broad capital improvements plan in the year 2005 to improve the efficiency of buildings. Meanwhile, increased street lighting in town has resulted in a large increase in this area. Additionally, there has been a very large increase in the electricity usage from the water sector. This is probably a combination of factors. For one, increased growth and therefore usage of the City water system would be reflected here, due to increased pumping. Also, the City installed a freshwater pump that now supplies 15% of the water for the City, but uses a lot of electricity.

Municipal

Transportation

Arcata Transit
Information from Larry Pardi, Transportation Superintendent at the City of Arcata. Mileage includes 'dead miles' from buses traveling to and from Eureka (where they are parked) each day.

Mad River Transit

	Miles	CO_2 (tons)
2000	101,538	176
2006	120,000	232
Difference	18,462	56
Percent Change	18%	32%

City of Arcata Fleet

Information obtained from Randy Flint and Lori at the City of Arcata Central Garage. Mileage is recorded for each vehicle, as well as gasoline consumption and cost of maintenance.

Municipal Fleet

2000	**Gallons**	**Miles**	CO_2 **(tons)**
Diesel	9,219	Diesel/ unleaded 437,409	
Unleaded	23,724		
CNG		2,085	
Total, 2000		**439,494**	**339**
2006			
Diesel	22,226	39,114	
Unleaded	75,441	366,262	
CNG	685	11,855	
Hybrid	469	22,043	
Propane		746	
Biodiesel		131	
Total, 2006		**440,151**	**331**
Difference		**657**	**-8**
Percent Change		**>1%%**	**-2%**

The City purchased several hybrids in 2003. These vehicles have supplemented much of the usage of non-hybrid cars. This is likely why there is only a 14% increase in CO_2 emissions, while there is a 22% increase in mileage.

Municipal

Water / Wastewater

EPA estimates that for 4.5 MGD flow, an estimated 45,000 scf of methane gas can be expected. These estimates hold when compared to the City of Eureka, which treats 4.5-5 MGD and produces around 45,000 scf/day of gas production. Using data obtained from Erik Lust at the City of Arcata WWTP, an average of the summertime flows was taken to estimate 1.3 MGD treated influent. Though flows can be as high as 3 MGD in the wintertime, much of this is assumed to be infiltration through old infrastructure of storm water, and not actually wastewater. This would indicate that high flows do not also mean higher gas production. Therefore, the summertime average flow was used in calculating the gas, and an average 13,000 scf/day is assumed. This number is within 3% of the number used for the 2000 Inventory. Both the US EPA and the IPCC consider methane from wastewater treatment to be of bio-genic origin, and do not count the CO_2 emissions resulting from combustion of biomethane as a contribution to greenhouse gasses. However, most flares that combust methane to convert it to CO_2 are assumed to have a 95% efficiency (US EPA), and the 5% of the biomethane that escapes combustion is reported as the global warming potential (GWP) is so high.
The 2000 Inventory counted the 50% of methane gas that was combusted in the flare as a contribution to GHG emissions. I have therefore updated the numbers of the 2000 Inventory to be consistent with the EPA and IPCC approach: see below.

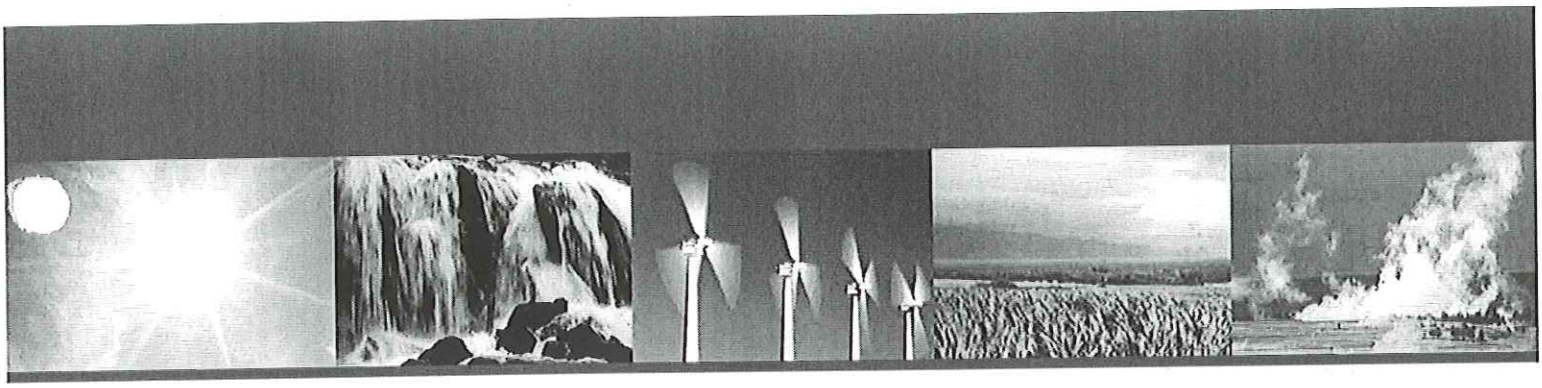
13,000 f^3 / day * 365 days / year = 4,745,000 f^3 / methane a year
4,745,000 * .5 = 2,372,500 f^3 of methane combusted in the flare each year
2,372,500 f^3 methane*.05=118,625 f^3 methane escaped from combustion
118,625 f^3 methane* 1 m^3/ 35.315 f^3 * (662 g / m^3)[2] * 1 ton / 1,000,000 g = 2.22 tons methane
According to the Energy Information Administration of the US Government, the Global Warming Potential of methane is 23 times that of CO_2, so I multiplied the tonnage of methane by 23 to calculate the eCO_2.
2.22 tons methane * 23 (GWP of methane) = 51 tons eCO_2

2000 Inventory update:
4,594,425 f^3 methane * .5 = 2,297,212.5 f^3 of methane combusted in the flare annually
2,297,212.5 * .05 = 114,861 f^3 escaped from combustion
114,861 f^3 methane * 1 m^3/ 35.315 f^3 * (662 g / m^3) * 1 ton / 1,000,000 g = 2.15 tons methane
2.15 tons methane * 23 (GWP of methane) = 50 tons eCO_2

Sewage Gas

	Methane (tons)	eCO_2 (tons)
2000	2.15	51
2006	2.22	50
Difference	.07	1
Percent Change	3%	2%

[2] Density of sewage methane gas, from the US EPA.



Guide to Purchasing Green Power

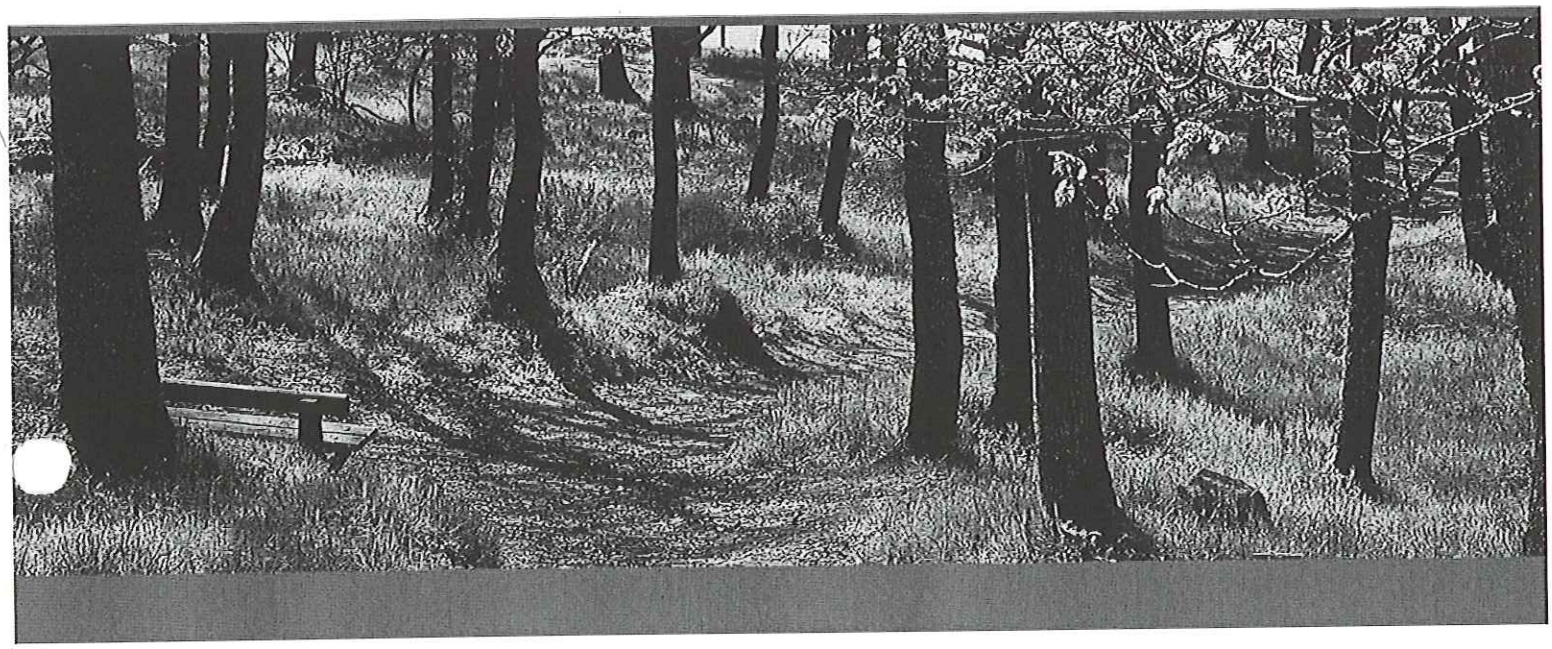
Renewable Electricity, Renewable Energy Certificates and On-Site Renewable Generation

U.S. Department of Energy
Energy Efficiency and Renewable Energy
Federal Energy Management Program

EPA GREEN POWER PARTNERSHIP

World Resources Institute
Sustainable Enterprise Program

Center for Resource Solutions
Green-e Renewable Energy
Certification Program



This guide can be downloaded from:

www.eere.energy.gov/femp/technologies/renewable_purchasepower.cfm

www.epa.gov/greenpower/buygreenpower.htm

www.thegreenpowergroup.org/publications.html

www.resource-solutions.org

Office of Air (6202J)
EPA430-K-04-015
www.epa.gov/greenpower
September 2004

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Table of Contents

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Summary

The *Guide to Purchasing Green Power* is intended for organizations that are considering the merits of buying green power as well as those that have decided to buy it and want help doing so. The *Guide* was written for a broad audience, including businesses, government agencies, universities, and all organizations wanting to diversify their energy supply and to reduce the environmental impact of their electricity use.

The *Guide* provides an overview of green power markets and describes the necessary steps to buying green power. This section summarizes the *Guide* to help readers find the information they need.

Chapter 1 describes the concepts of renewable energy and green power and discusses their differences from traditional energy sources. This section also summarizes recent changes in electricity markets.

Chapter 2 defines three types of green power products: renewable electricity, renewable energy certificates, and on-site renewable generation. Renewable electricity is generated using renewable energy resources and delivered through the utility grid; renewable energy certificates (RECs) represent the environmental, social, and other positive attributes of power generated by renewable resources; and on-site renewable generation is electricity generated using renewable energy resources at the end-user's facility.

Chapter 3 summarizes the benefits and costs of purchasing green power. Benefits include a financial hedge against various risks, improving relations with organizational stakeholders, helping the environment, and bolstering economic development and security. Conversely, green power may be more expensive than traditional power and present new contracting challenges.

Chapter 4 describes in detail the three main green power products, including the alternative renewable electricity products, the details of RECs transactions, and the technologies that can be used to harness on-site renewable resources.

Chapter 5 outlines the general steps needed to prepare to buy green power: identifying the key decision makers, gathering energy data, and choosing the specific green power options available to the purchaser's facilities.

Chapter 6 discusses the steps to procure renewable electricity or renewable energy certificates: developing screening criteria, collecting product information, and drawing up a procurement plan.

Chapter 7 describes the steps to establish an on-site renewable energy system: screening the technologies best suited to the purchaser's site, obtaining technical and financial assistance, creating a project plan, anticipating possible barriers, and installing and operating the on-site generation system.

Chapter 8 explores ways of taking advantage of promotional opportunities after buying green power. This section covers promotion both inside and outside the organization and options for quantifying the environmental benefits of the purchase.

Chapters 9 and 10 of the *Guide* conclude with a list of resources offering more information about all aspects of green power. Because electricity from renewable resources is relatively new and may be generated in a variety of ways, many institutions are working to facilitate the development of green power markets. Several of these organizations' programs—the U.S. Department of Energy's Federal Energy Management Program (FEMP), the U.S. Environmental Protection Agency's Green Power Partnership, the Sustainable Enterprise Program of the World Resources Institute (WRI), and the Green-e Renewable Energy Certification Program administered by the Center for Resource Solutions—worked together to write this purchasing guide. More information about these programs is available from the Web sites listed in chapter 10, Resources for Additional Information.

Finally, the appendix to the *Guide* discusses considerations specific to federal agencies that buy green power, particularly the procurement regulations that cover the purchase of green power.

Chapter 1
Introduction

Today the energy sources used to create electricity differ in many ways, including in their environmental impacts. In the United States, conventional means of electricity generation use fossil or nuclear fuels—forms of power generation that impact human health and the environment through air emissions and other effects. Despite advances in pollution controls over the last 30 years, conventional power generation is still the nation's single largest source of industrial air pollution.

Electricity markets are changing, however, offering cleaner ways of producing power and giving many consumers the ability to choose how their power is generated. One of these choices is power from renewable sources that is marketed as green power. Innovative organizations are encouraging the use of these new sources of green power and, at the same time, are reducing their own impact on the environment.

In some parts of the United States, the deregulation of electricity has enabled consumers to choose the provider of their electric power and thus to buy green power from their chosen supplier. In regulated markets, too, hundreds of utilities now offer their customers the opportunity to purchase green power through "green-pricing" programs. Even in areas where consumers cannot buy green power directly, renewable energy certificates (RECs) are available in every state to allow consumers to support green power.

While no form of electric power generation is completely benign, electricity generated from renewable resources such as solar, wind, geothermal, small and low-impact hydropower, and biomass has proved to be environmentally preferable to electricity generated from conventional energy sources such as coal, oil, nuclear, and natural gas. The *Guide to Purchasing Green Power* focuses on electricity generated from renewable energy resources, both delivered through the grid and generated on-site. Although renewable energy can also be used for heating needs or for transportation fuels, the *Guide* does not address those applications.

By buying green power instead of conventional power, consumers can reduce the environmental impact caused by their use of electricity and fossil fuel. For instance, on average, every kilowatt-hour (kWh) of renewable power avoids the emission of more than one pound of carbon dioxide. Because of the sheer quantities of energy involved, consumers of a large amount of electricity may have an enormous environmental impact. If the typical commercial facility switched to 100 percent renewable power or used RECs to offset emissions, this could amount to thousands of tons of emissions avoided each year.

A wide range of organizations have purchased green power: federal, state, and local governments; universities; businesses; nonprofits; and individual consumers. By purchasing green power, these organizations are both helping the environment and meeting their own environmental goals. The many other benefits to buying green power range from financial benefits to public relations and even national security. As of the end of 2003, nearly 1,650 megawatts (MW) of new renewable generating capacity had been added to meet the United States' demand for green power. This capacity is enough to meet the annual electricity needs of more than 500,000 houses.

Leading organizations are finding that green power is an effective part of a strategic energy management plan to achieve environmental, financial, and other goals. Successful energy management plans are often a "portfolio analysis" that considers options such as energy efficiency, load management, power purchases, on-site generation, and nonelectric (thermal) energy needs. As with any investment portfolio, the best mix of these options depends on the particular situation.

Because buying green power is still relatively uncommon in today's energy markets and because these markets offer a wide range of choices, the *Guide* is intended for organizations that have decided to buy green power but want help in figuring out how to do it, as well as for organizations that are still considering the merits of buying green power.

The *Guide to Purchasing Green Power* addresses the following commonly asked questions:

- What are renewable energy and green power? (p. 4)
- What benefits will my green power purchase bring? (p. 5)
- How do I make a business case for buying green power? (p. 5)
- What is the cost of green power? (p. 6)
- What are the options for purchasing green power? (p. 9)
- What is the importance of product certification and verification? (p. 9)
- What are the best ways of buying green power? (p. 16)
- How should an organization choose a green power product? (p. 13)
- What are the steps to installing on-site renewable generation? (p. 21)
- What is the best way of telling the organization, employees, and community about the benefits of green power? (p. 25)

Chapter 2
The Definition of Green Power

Renewable energy is derived from natural sources that replenish themselves over short periods of time. These resources include the sun, wind, moving water, organic plant and waste material (biomass), and the earth's heat (geothermal). This renewable energy can be used to generate electricity as well as for other applications. For example, biomass may be used as boiler fuel to generate steam heat; solar energy may be used to heat water or for passive space heating; and landfill methane gas can be used for heating or cooking.

Although the environmental impacts of renewable energy are generally minimal, these power sources still do have some effect on the environment. For example, biomass resources are converted to electricity through combustion, which emits some air pollutants. Hydroelectric dams can flood the surrounding land and impede the passage of fish. Compared with conventional power, however, renewable power generally avoids, or at least significantly reduces, the adverse environmental impacts of conventional electricity generation.

The term *green power* is used in a number of different ways. In the broadest sense, green power refers to environmentally preferable energy and energy technologies, both electric and thermal. This definition of green power includes many things, from solar photovoltaic systems to wind turbines to fuel cells for automobiles.

Although renewable resources do more than generate electricity, green power is most commonly used in a narrower, marketing, sense to refer specifically to *electricity* from renewable resources. In the context of the *Guide to Purchasing Green Power*, the term *green power* refers to electricity products that include significant proportions of electricity generated from energy resources that are both renewable and environmentally preferable.

In the *Guide*, green power includes the following three products:

- "Renewable electricity" is generated using renewable energy resources and is delivered through the utility grid.
- "Renewable Energy Certificates" (RECs) represent the environmental, social, and other positive attributes of power generated by renewable resources.
- "On-site renewable generation" refers to electricity generated using renewable energy resources at the end-user's facility.

Note that the terms *green power, environmentally preferable,* and *renewable energy* may be used in slightly different ways, which differ primarily according to the varying assessments of the environmental impacts of harnessing specific resources and of the relative significance of each impact. The exact definitions of these terms, while always important, take on added significance when dealing with state and federal government requirements or determining eligibility for government and utility incentives. For more discussion of how each of the organizations that collaborated on this document defines green power, please refer to their Web sites, listed in Chapter 10.

Helping Define Green Power

To help consumers more easily identify green power products, the "Green-e" Renewable Energy Certification Program is working to build market-based, consensus definitions for environmentally-preferable renewable electricity and renewable energy certificates. The Green-e program, administered by the non-profit Center for Resource Solutions (CRS), certifies and verifies renewable electricity products in competitive power markets, as well as utility green pricing programs and in national markets for RECs. Further details about Green-e certification are available from the Green-e Web sites listed in Chapter 10.

Chapter 3
The Benefits and Costs of Green Power

The Benefits

Green power can help many organizations meet environmental, financial, stakeholder relations, economic development, and national security objectives.

Environmental

- **Avoid environmental impacts.** Green power and renewable energy avoid most of the environmental impacts associated with traditional power generation, helping protect human health and the health of the environment.

Financial

- **Provide a hedge against risks posed by**
  - *Electricity price instability*. Purchasing electricity generated by renewable energy resources creates a financial hedge against unstable or rising fossil fuel prices by diversifying a consumer's energy portfolio. Wind, geothermal, hydro, and solar energy are not subject to the rise and fall of fuel costs. For these reasons, renewable electricity can offer a fixed price over the long term.
  - *Fuel supply disruptions*. On-site renewable generation can reduce the risk of disruptions in fuel supplies resulting from transportation difficulties or international conflict.
  - *Additional environmental regulation*. To address global climate change and regional air quality issues, federal and state regulations have been proposed that would effectively increase the price of conventional electricity. But green power would be largely unaffected by these regulations, resulting in more stable prices over the long run.
  - *Electricity blackouts*. Organizations that need highly reliable power usually use on-site power generation, such as diesel engines and gas turbines, for their facilities in the event of a power outage. On-site renewable generation can provide this backup power without fossil fuel emissions. Some renewable sources, however, require battery storage or other backup devices for essential electrical services during an outage.

Price Stability of Green Power

IBM has a longstanding corporate energy management program that is intended to improve the environment and reduce energy costs. The energy managers at IBM's Austin, Texas facility furthered both these goals by signing up for Austin Energy's GreenChoice® program in 2001. Under GreenChoice, the normal fossil fuel charge on the customer's bill is replaced by a green power charge for the amount of green power that the customer chooses to buy. Unlike the fossil fuel charge, which fluctuates over time, the green power charge is fixed until 2011. As it turned out, Austin Energy's fuel charge for conventional power spiked in 2001 and IBM saved $20,000 in its first year in the program. With the fuel charge having increased again in 2004, IBM expects to save over $60,000 per year. Moreover, the cost stability provided by this contract made it easier to manage the facility's energy budget.

Stakeholder relations

- **Meet organizational environmental objectives.** Reducing an organization's environmental impact is one of the main motivations for buying green power. For example, buying green power can help meet greenhouse gas reduction targets. If an organization is interested in ISO-14001 certification for environmental performance, a program for reducing energy-related emissions will be an important part of this certification process.
- **Demonstrate civic leadership.** Being among the first in a community to purchase green power is a demonstration of civic leadership. It makes a statement that an organization is willing to act on its stated

environmental or social goals. These purchases also demonstrate an organization's responsiveness to its customers, the majority of whom favor renewable energy (see chapter 10 for more details).

- **Generate positive publicity.** Buying green power affords an opportunity for public recognition and public relations that advertising and media relations cannot buy. Companies that are in the public eye need to be responsive to the concerns of environmentally conscious customers, shareholders, regulators, and other constituents. Groups promoting green power, such as the EPA's Green Power Partnership, provide assistance in reaching broad audiences to convey the benefits of green power purchases.

- **Improve employee morale.** Progressive action and leadership on environmental issues like renewable energy may improve employee morale, which in turn can reduce employee turnover, attract new employees, and improve productivity. In a survey of 464 organizations, sponsored by the National Wind Coordinating Committee, improving employee morale was cited as the third most important motivation for buying green power.

- **Differentiate products or services.** By purchasing green power, a company may be able to differentiate its products or services by, for example, offering them as "made with certified renewable energy" or "climate neutral." Purchasers of green power can also join their power supplier to market their products together. In addition, purchasers of products certified by the Center for Resource Solutions Green-e program can display the Green-e logo on their product packaging to indicate the share of renewable energy used by the company or in its production.

Demonstrating Leadership

On January 1, 2003, Dyess Air Force Base (AFB), Texas, became the largest consumer of renewable electricity at a single site in the nation. The base now purchases 100 percent wind-generated electricity for all its electrical needs, resulting in approximately 80 million kWh of wind energy generated annually. The Dyess energy managers decided to make such a large purchase in order to demonstrate leadership to other agencies in meeting the federal renewable purchase goal. This builds on earlier, award-winning improvements that the base made in energy efficiency and water conservation.

Economic development and national security

- **Stimulate local economies.** Because renewable resources are typically local, jobs are created to install and operate renewable generation facilities. Renewable power facilities also increase the local tax base and can provide income for farmers and rural communities. The renewable energy industry may be an important growth opportunity in mature, postindustrial economies like that of the United States.

- **Increase fuel diversity.** Renewable energy diversifies the nation's fuel resources—a good way to manage risk—and, because renewable resources are indigenous, reduces its dependence on imported fuels.

- **Reduce infrastructure vulnerability.** The wide distribution of most renewable energy resources improves the robustness of energy systems by reducing the country's reliance on a vulnerable, centralized energy infrastructure.

- **Market transformation.** By purchasing green power now, organizations can reduce long-term production costs and transform markets for renewable energy technologies. Most renewable technologies are not yet produced in great volumes, but their production costs should drop significantly as their production volume increases, which in turn will attract more purchases.

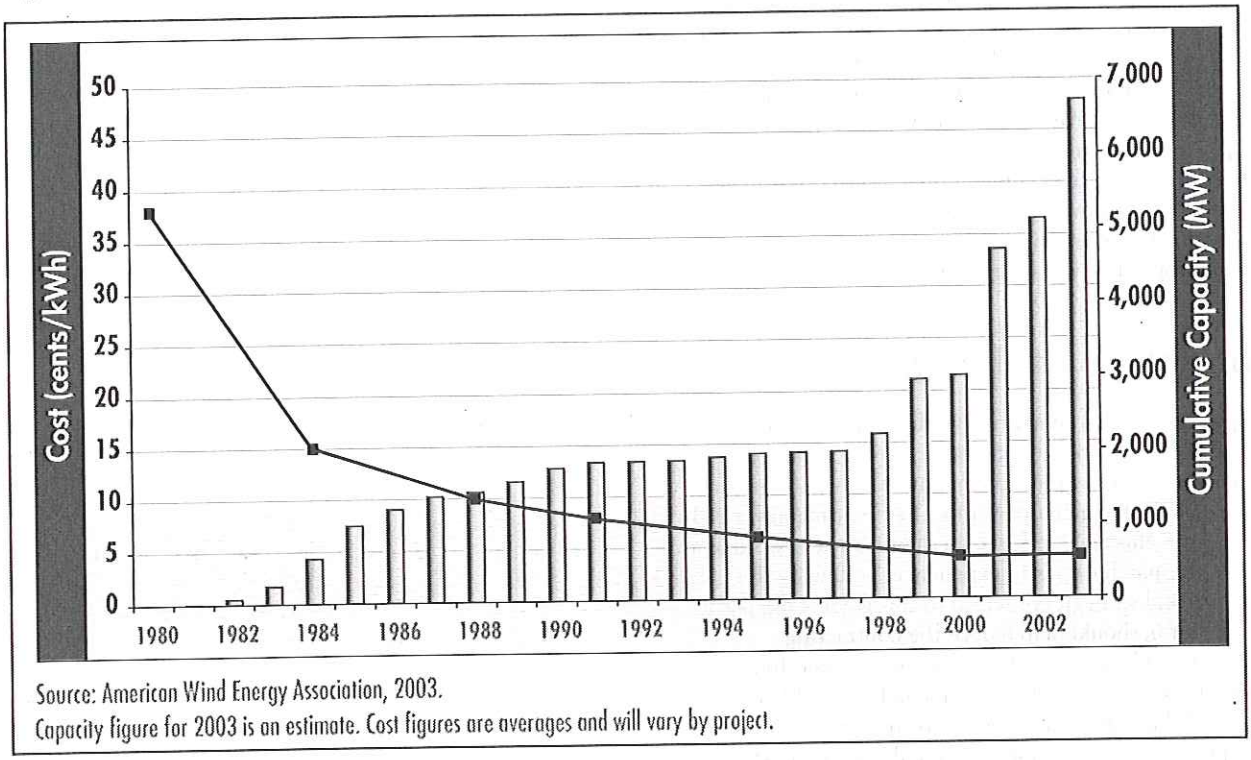
The Costs

Green power may cost more than standard power sources, for several reasons.

Price premiums

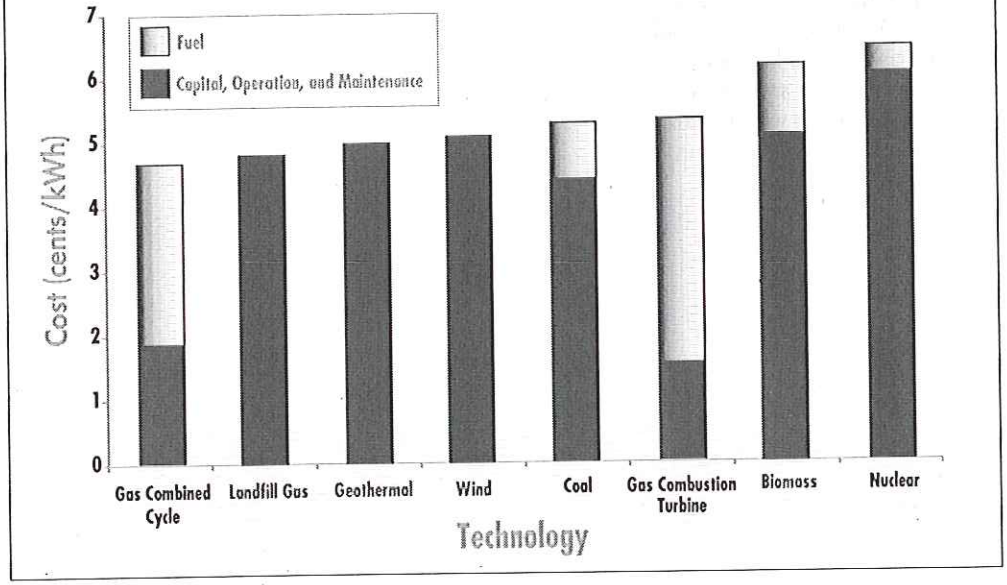
Renewable energy has usually been more expensive than conventional power sources. These higher costs are largely due to the relative immaturity of renewable technologies and their concentration in niche markets, compared with conventional energy sources. Chapter 6 of the *Guide* suggests ways of minimizing these costs in conjunction with a procurement plan. Nonetheless, despite the currently higher prices, the cost of renewable energy is falling as the growing demand justifies the expansion of manufacturing facilities and reduces production costs. Figure 1 illustrates the dramatic decline in the cost of wind power over the last two decades, while figure 2 shows that several renewable power technologies are now nearly cost competitive with conventional sources.

Figure 1: Wind Energy Costs Fall as Installed Capacity Increases



Source: American Wind Energy Association, 2003.
Capacity figure for 2003 is an estimate. Cost figures are averages and will vary by project.

Figure 2: Cost Comparison of New Power Plants Using Renewable and Conventional Electricity Technologies



Source: Energy Information Administration Annual Energy Outlook, 2004.
Solar technologies are not included because their costs are application specific.

The actual price for green power depends on a number of factors, including the availability and quality of the resource, the market price of conventional electricity, the availability of subsidies to encourage green power, and the quantity and terms of the contract. Generally, the price of green power ranges from less than that of the standard power mix, especially in competitive markets and where state subsidies exist, up to one to four cents more per kilowatt-hour. When the market price of conventional electricity is high, purchasers of green power at a fixed price may actually save money. Of course, when the market price of conventional electricity drops, they will be paying a premium.

Contracting challenges

Green power may also be more difficult than conventional power for an organization to purchase, causing transaction costs in addition to any price premiums. Although organizations that are buying green power for the first time may need to invest extra effort, these costs fall significantly over time as the electricity purchasers gain experience. Following the information and strategies provided in this guidebook, particularly chapter 6, should help reduce the contracting challenges faced by new purchasers of green power. In addition, sample contract templates are publicly available to help buyers avoid difficulties in signing a green power contract (see chapter 10, Resources for Additional Information).

Public relations risk

Some stakeholders may regard the purchase of green power as a token effort or "green washing." Organizations can avoid this criticism by buying green power as part of a broader environmental management program. Another strategy to improve the credibility of a purchase is to work with third-party organizations for independent auditing, endorsement, and minimum purchasing benchmarks.

Chapter 4
Options for Purchasing Green Power

Green power can be purchased in several different ways. The main distinction among the options depends on where the power generation equipment is located: on the power grid or on-site at the facility. For electricity delivered over the power grid, the status of utility restructuring in that state will determine whether an organization can buy green power from either the existing utility or a competitive power supplier. Even if the state has no green power marketers or the utility does not offer a green power option, an organization can buy renewable energy certificates (RECs). For on-site renewable generation, the renewable energy resources available at that site (e.g., solar, wind, biomass) are the main factors determining the project's feasibility.

These options are not mutually exclusive. Some organizations may want to first buy a green power product requiring less financial commitment (such as an electricity product with a smaller fraction of renewable content). Over time, this can be supplemented by larger purchases or the installation of on-site generation. As discussed later, RECs can be a good place to start because of the ease and flexibility of the purchase.

Renewable Electricity Products

Renewable electricity products—offered by either the utility or the power marketer that provides the organization's power—can be structured in several different ways. The availability of each of these products varies according to the facility's location and the electricity provider's offerings. Although each product differs slightly, most renewable electricity products fall into one of two types.

- **Fixed energy quantity block.** A block is a quantity of 100 percent renewable electricity, often 100 kilowatt-hours (kWh), offered for a fixed monthly price. The price is often expressed as a price premium above the price of conventional power. Customers usually may sign up for as many blocks as they wish, with the monthly cost of these products based on how many blocks they buy. This type of product is available in some competitive markets but is more often found in regulated utility green-pricing programs.
- **Percentage of monthly use.** Customers may choose renewable electricity to supply a fixed percentage of their monthly electricity use. In practice, this usually results in the purchase of a blend of renewable and conventional power. This is typically priced as a premium on a cents per kWh basis over the standard rate or as a fixed charge per kWh. The monthly cost for these products varies with energy use and the percentage of renewable energy chosen.

Some renewable electricity products require a fixed monthly fee to support a given amount of renewable generation capacity, or even require contributing to a renewable energy fund that finances renewable projects. These products can be an effective way to assist the green power industry but do not, however, result in a metered amount of renewable electricity

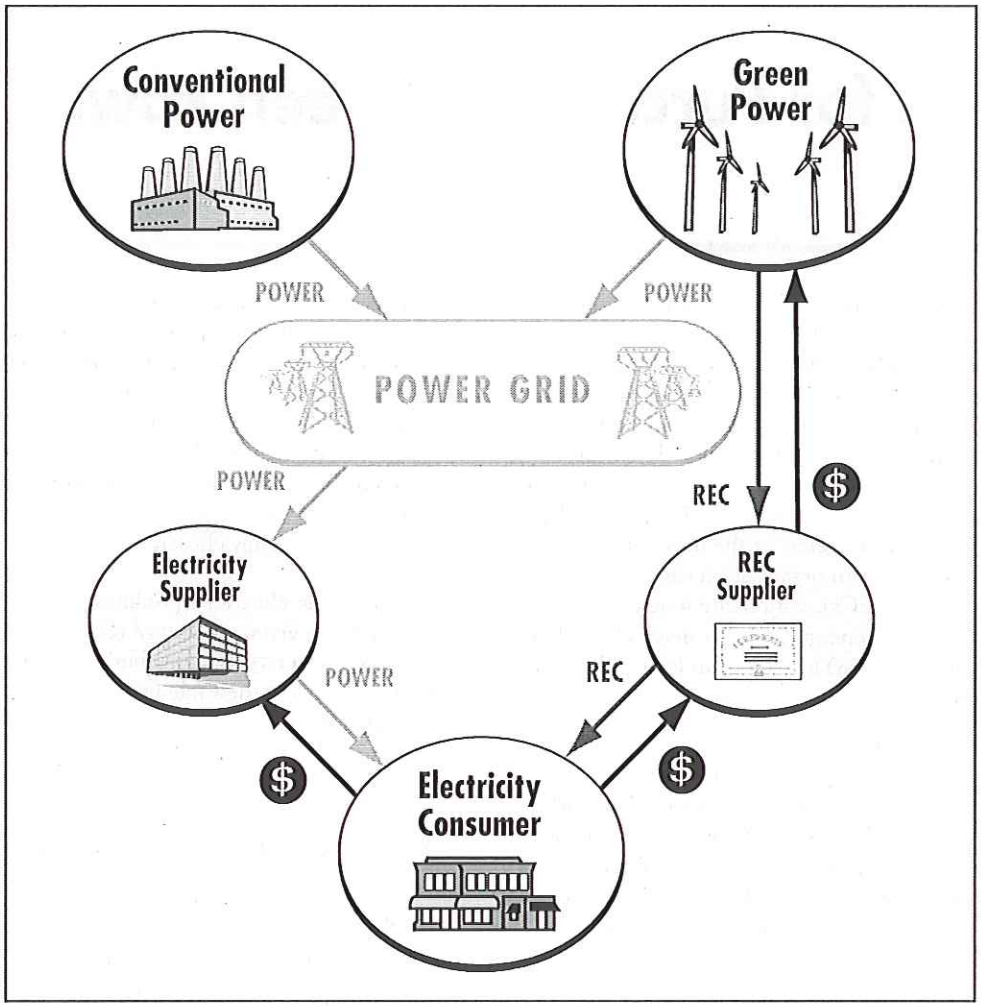
The Role of Product Certification

One of the major concerns with buying green power is ensuring that purchasers get what they pay for. It can be difficult to substantiate claims made about the quantity and characteristics of the product purchased. Also, it is important to ensure that two organizations are not claiming to have purchased the same green power, or are double-counting the same green power benefits. Moreover, purchasers may be unable to ensure public acceptance of their purchase and avoid criticism from external stakeholders without independent information about the product. Third-party certification addresses these concerns by setting standards for green power products in the following areas:

- Minimum levels of environmentally-acceptable renewable resources,
- Overall environmental impact,
- Ethical conduct for suppliers, including advertising claims and regular reporting.

Third-party certification usually also requires independent verification by an auditor to document that green power purchased equals green power supplied, and to verify other resource claims. Visit www.green-e.org for additional information about third-party certification and verification.

Figure 3: REC Transaction



being generated, which is necessary to quantify the environmental benefits of the green power purchase. For this reason, these products are not discussed further in this guide. Chapter 6 provides more details about implementing a renewable electricity purchase.

Renewable Energy Certificates (RECs)

A REC represents the environmental, social, and other positive attributes of power generated by renewable resources. These attributes may be sold separately from the underlying commodity electricity (figure 3). For example, RECs represent the reduced emissions of renewable generation compared with those of conventional generation. The actual power that is sold is no longer considered "green" and is treated like any other commodity electricity. In practice, REC transactions can take many forms in addition to that shown in figure 3. For more details about REC transactions, see chapter 10, Resources for Additional Information.

Because RECs are sold separately from electricity, they can be purchased from locations anywhere, enabling organizations to choose renewable power even if their local utility or power marketer does not offer a green power product. Although theoretically there are no geographic constraints on buying RECs, accounting systems to record and track the exchange of certificates are not yet available everywhere. In addition, the location of environmental benefits may be important to some purchasers. A variety of REC products are available from local and national sources.

Customers do not need to switch from their current electricity supplier to purchase certificates, and they can buy RECs based on a fixed amount of energy (or carbon footprint)

rather than on their daily or monthly load profile. Because certificates are independent of the customer's energy use, load profile, and the delivery of energy to the customer's facility, they provide greater flexibility than purchasing energy and attributes bundled together as renewable power. One drawback to RECs is that they do not offer the same financial hedge value that some other green power products provide.

Purchasing RECs for special events

RECs can offer flexibility by allowing a buyer to offset electricity used for special events, such as conferences, rather than requiring long-term purchases. The Department of Energy used this approach for the Labs for the 21st Century annual meeting, where the conference organizers purchased green power certificates equivalent to 100% of the energy consumed at the meeting. Because special events inherently generate a lot of publicity, the public and employee relations benefit from this approach can be significant.

Price premiums for certificates may be lower than those for renewable electricity products, for several reasons: (1) RECs have no geographic constraints and therefore can provide access to the least expensive renewable resources; (2) the supplier does not have to deliver the power to the REC purchaser with the associated transmission and distribution costs; and (3) the supplier is not responsible for meeting the purchaser's electricity needs on a real-time basis.

An alternative way to buy RECs is through a subscription, or "future RECs," which involves an up-front purchase of RECs to be generated in the future by a new renewable facility. The advantage of this approach is that it promotes new renewable facilities by providing up-front financial assistance for their development and construction. In return, the purchaser receives the RECs as they are generated over an extended period of years. Compared to annually buying RECS close to the time they are generated, the subscription method emphasizes the up-front payment for a future stream of RECs. The additional risk of this approach is that the plant might not be constructed, and buyers should investigate what remedy the seller proposes in such an event. As with all products, independent product certification and verification of the claims made is an important aspect to consider.

For a company or institution with operations and offices in multiple locations, purchasing RECs can consolidate the procurement of renewable energy, thus eliminating the need to buy renewable electricity for different facilities through multiple suppliers. Chapter 6 provides more details about purchasing RECs.

On-site Renewable Generation

In addition to buying renewable electricity from a utility or buying renewable energy certificates, organizations can install renewable power generation at their facilities. They can either buy the system outright or install a system that is owned by another party and buy the electricity as it is generated.

On-site renewable generation offers advantages such as enhanced reliability, power quality, and protection against price volatility, as well as a visible demonstration of environmental commitment. In many states, electricity generated with on-site renewable generation may be sold back to the grid at the same price at which power is bought, through a process called *net metering*. This arrangement may improve the financial return for on-site renewable power systems, although net metering is often limited to small installations.

On-site renewable energy technologies for power generation include photovoltaic panels, wind turbines, fuel cells, and biomass combustion. Large facilities sited near a municipal landfill or sewage treatment plant may be able to use recovered methane gas for on-site electricity and/or heat production. The following describes each of these options in more detail:

- **Solar.** Photovoltaic (PV) cells and modules can be configured to almost any size from a few kilowatts up to more than one megawatt. On-site photovoltaic cells may be situated on schools, homes, community facilities, and commercial buildings. Photovoltaic cells can be made part of a building, displacing other building material costs, for example, roofing shingles or car park shading.

- **Wind.** Wind turbines vary in size. A typical small unit provides fewer than 25 kW, whereas large turbines range from 500 kW to more than 3 MW. On-site applications are usually only possible in nonurban areas, and often require zoning permits to exceed 35-foot height restrictions (a tower for a 250 kW turbine is 130 feet high with a blade sweep of 98 feet). Such installations usually require approximately one acre of land per turbine and wind speeds that average 15 mph at a 50-meter height. In addition, placing turbines near tall buildings is inadvisable because the building may create wind turbulence that can disrupt the turbines' performance.

- **Landfill and sewage methane gas.** Methane gas derived from landfills or sewage treatment plants may be used to generate electricity. Methane gas also may be generated using digesters that operate on manure or agricultural wastes. The methane gas is then converted to electricity

using an internal combustion engine, gas turbine (depending on the quality and quantity of the gas), direct combustion boiler and steam turbine generator set, microturbine unit, or other power conversion technology. Most methane gas projects produce from 0.5 to 4 MW of electrical output.

- **Biomass.** Biomass is plant material burned in a boiler to drive a steam turbine to produce electricity. This system is good for producing combined heat and power (CHP) at facilities with large thermal loads. Biomass projects are best suited to locations with abundant biomass resources (often using waste products from the forest industry or agriculture).

- **Fuel cells.** Fuel cells are another way of producing power. They emit essentially no air pollution and are more efficient than other forms of generation. But they cannot be considered a renewable resource unless they operate on a renewably generated fuel, such as digester gas or hydrogen derived from PV or wind power.

On-site generation case study

Car-maker BMW pipes methane gas 9.5 miles from a landfill to serve the electric and thermal needs of its manufacturing facility in Greer, South Carolina. Rather than invest in new internal combustion engines to generate electricity, BMW converted four turbines that previously ran on purchased natural gas. By recovering the waste heat from the turbines, the 5 MW combined heat and power project satisfies 80% of the facility's thermal needs, as well as 25% of its electricity use.

In this era of power reliability problems and national security concerns, on-site renewable generation offers important advantages over central-station and fossil-fueled power plants. Moreover, on-site generation can be designed to provide backup power for critical loads when power from the grid is interrupted, as well as when the renewable resource is not available. This ability to operate independently of the power grid is a great advantage, particularly at remote facilities. Because renewable generation technologies tend to be modular and used on a small scale, the on-site generation system can be designed to enhance the redundancy and diversity of a facility's energy supply.

On-site renewable generation has higher capital costs and lower operating costs compared with installing fossil-fueled generation. Although these costs may make the initial investment in on-site generation more difficult to justify, once that investment has been made, the annual budgets for maintaining the system are much easier to justify (compared with purchasing renewable electricity), which makes it easier to sustain a commitment to renewable power.

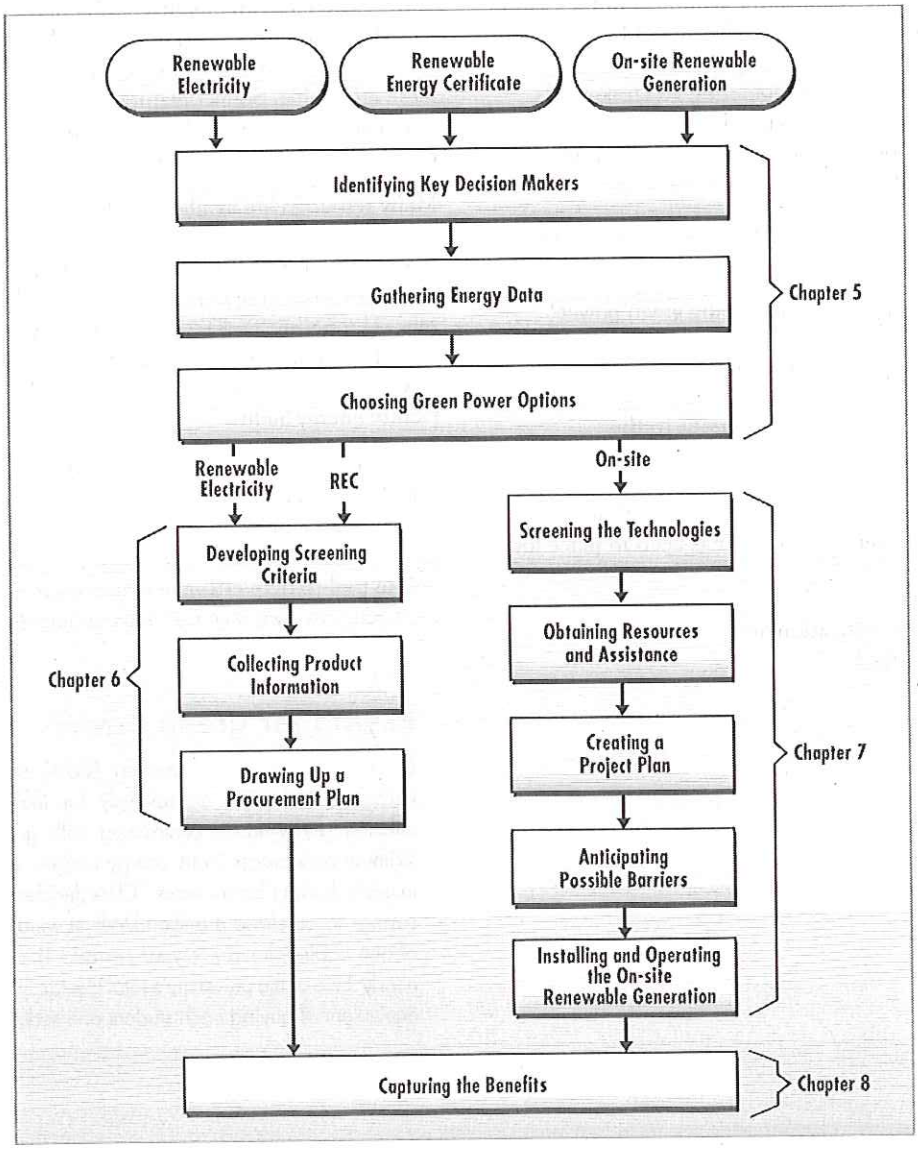
An organization that installs its own generation capability may have problems with the requirements for connecting to the utility distribution system, commonly referred to as *interconnection*. Standardizing the interconnection rules may help in the future, but in some cases, the rules for large generators are unnecessarily burdensome for small installations. In recognition of this problem—and to encourage on-site generation—a few states have simplified their interconnection rules; in addition, national standards are being drawn up that may ease interconnection. Net-metering laws, which allow an owner of an on-site power system to sell electricity back to the grid, usually provide more lenient interconnection rules for small installations. Chapter 7 provides more details about procuring an on-site renewable generation system.

Chapter 5
Steps to Purchasing Green Power

To buy green power, an organization first should determine whether green power will help fulfill its energy needs, identify the best products for its particular situation, and decide how to procure those products. Figure 4 describes the steps in this process.

The preliminary steps, described in this section, are the same for all types of green power products. The final steps differ for purchased green power products and on-site renewable generation. These steps are explained in later chapters of this guide.

Figure 4: Steps to a Successful Green Power Project



Identifying Key Decision Makers

The people in an organization who are interested in green power may be high-level decision makers as well as staff from the purchasing, facilities/energy management, environmental health and safety, legal, corporate relations, and/or marketing departments. Their interests and concerns need to be addressed. Experience has demonstrated that not doing so often leads to disagreements later in the process, whereas including these interested people in the early planning stages goes a long way toward addressing their concerns. These departments (such as environmental or marketing) may also contribute funds to help pay for green power.

It is important to designate a contact person who can draw on expertise from throughout the organization. Which departments are chosen to participate will probably depend on the type of products being considered. It also is important to involve senior management in the planning and decision process. In some cases, the greatest advocate of buying green power is an executive such as a CEO or president. With this high-level support, buying and promoting green power is much easier. Some organizations involve their employees (or students, in the case of educational institutions) in selecting the green power products.

At this early stage it is necessary to decide on the objectives for purchasing green power.

- Why is the organization considering green power?
- What does it hope to get from it?
- What selection criteria are important to the organization?
- Is buying new generation more important than maintaining the generation that has been in place for many years?
- Is independent certification and verification important to the organization?

Gathering Energy Data

The organization should take an inventory of its energy use, including both electricity and fossil fuels. Its monthly energy use can be calculated from the utility bills for each facility or business unit and for the entire organization. These data will help (1) find where energy can be saved, (2) determine how much green power to buy, and (3) evaluate the environmental impacts of the organization's electricity use. Monthly electricity consumption data are the most important, while peak demand and interval-meter data are useful if available. The organization should study its consumption data over the past year before specifying its requirements. Outside consultants or organizations can help with these steps.

As mentioned earlier, green power can be considered part of an energy portfolio that includes energy efficiency upgrades, load management, combined heat and power, and green power. The more an organization's energy requirements can be reduced, the less green power it will need to buy to achieve a given objective, which in turn makes green power more affordable. Some organizations that have bought green power have saved enough from energy efficiency upgrades to enable them to pay the higher price of green power.

Many resources are available to help improve the energy efficiency of buildings and equipment. A good starting point is the ENERGY STAR Portfolio Manager, an online tool that compares a building's energy usage with that of similar buildings. The ENERGY STAR Web site (www.energystar.gov) also offers simple energy-saving tips and a directory of energy services companies to provide additional assistance, such as a facility energy audit.

An organization's annual energy consumption can be used to calculate the emissions associated with its current use and estimate the emissions that could be displaced by buying green power. The EPA's Green Power Partnership offers an online tool to help estimate emissions from an organization's electricity use (www.epa.gov/cleanenergy/powerprofiler.htm).

Paying for green power

Catholic University of America (CUA) has been pursuing energy conservation aggressively for the past eight years, utilizing performance contracting with guaranteed savings. Without an increase in its energy budget, CUA has still come in under budget for six years. CUA decided to use some of the savings to purchase 4 million kWh of wind power (the output of one turbine) for a five-year period. This purchase supplies nearly 12% of the university's total electricity, and the cost is the equivalent of buying each student one soda per month.

Choosing Green Power Options

The next step is finding the appropriate green power solutions for the organization. Another goal of this step is becoming familiar with the electricity markets in the organization's area and the available green power technologies.

The first decision is whether to generate power on-site and/or to purchase power or RECs from outside vendors. The main differences between these options are the ease and cost of implementation, the need for capital investment, the ability to hedge risk, and the length of time over which one realizes the benefits. On-site renewable generation requires an up-front investment (as part of either a financed project or a capital appropriation), but the reduction in the consumption of conventional energy can last for as many as 30 years. Renewable electricity purchases and renewable energy certificates, however, require no up-front capital and are relatively easy to procure, but they deliver benefits only for the term of the purchase contract.

An organization's motivations for purchasing green power will help decide which costs and benefits are most important and thus which type of green power is most appropriate. For example, an organization wanting to manage fuel price risk may be more interested in buying fixed-price renewable electricity. An organization to which the reliability of its power supply is most important may be more interested in on-site renewable generation. These options can also be combined. For instance, an organization might install on-site generation to meet part of its electrical needs and purchase RECs to offset some or all of its remaining electricity usage. Likewise, organizations with facilities in multiple locations must select the appropriate green power product for each site.

The choice of green power options is determined partly by the electricity market structure in the state in which the facility is located. For renewable electricity, if the state's electricity market has been restructured, an organization can probably choose both its supplier and the product it prefers. Each state has different rules governing power marketers, and the level of competition varies among the states. If the organization's state electricity market has not been restructured, the local utility may offer a renewable electricity option (sometimes called utility green pricing). Large electricity purchasers may be able to work with their local utility or electricity provider to tailor a product to meet their needs.

Assembling a list of green power products offered in a specific area

- Perhaps the most complete source of information is the U.S. Department of Energy's Green Power Network Web site (www.eere.energy.gov/greenpower).
- Many state governments, often the public utilities commission, maintain a list of power marketers offering green power products in their state.
- Organizations with facilities in several states should use a national locator such as EPA's Green Power Locator (www.epa.gov/greenpower/locator.htm) or the Green-e "Pick your Power" locator (www.green-e.org/your_e_choices/pyp.html). The latter is also useful for locating certified products.
- Smaller facilities (such as retail stores) may find it easier to have a single point of contact compiling this information and making it available across the entire organization. Larger facilities (such as factories or research campuses) often have enough expertise to gather information and negotiate contracts on their own.
- See Section 10 for more resources.

For on-site renewable generation, the organization should assess the renewable energy resources available at its facility, including the quality of wind and solar resources, the availability of biomass fuel or landfill gas, and siting constraints (such as space limitations or shading from neighboring buildings). The cost of conventional power at the facility also is important to consider. The organization should read over its utility's and state's interconnection rules to make sure there are no obvious provisions that would prohibit grid-connected, on-site generation. The goal at this stage is to eliminate any renewable options that are clearly not feasible for the organization.

Chapter 6
Procuring Renewable Electricity and Renewable Energy Certificates

Developing Criteria for Screening Suppliers and Products

To help select both the green power supplier and the product, it is helpful to develop specific criteria for judging the alternatives. These criteria may be ranked, keeping in mind the goals identified early in the process when the project team was assembled.

For selecting green power suppliers, the following criteria may be helpful:

- **Reputation.** A supplier's reputation is influenced by factors such as how well it honors its commitments, how easy it is to work with, and how well it is viewed by the industry. Assessing a supplier's reputation may require references and a perusal of the energy industry's literature. Environmental groups also may have information about the supplier.
- **Financial strength.** To research the financial health of a power supplier, look at its Web site and perhaps its annual report, SEC filings, and bond ratings.
- **Location.** If buying green power from a local supplier is important, call the supplier and find out where its headquarters and branch offices are located. Public utility commissions' Web sites often have contact information for registered retail suppliers.
- **Product choice.** Some suppliers offer several green power products, varying in the amount of renewable power, types of resources, and the like. If a supplier offers a choice of green power products, this may enable the organization to change the product it purchases in the future without having to search for a new supplier and negotiate a new contract.
- **Social responsibility.** Determining a supplier's social values and commitment to environmental conservation requires some research. The supplier's Web site is a good place to start. Organizations should review the supplier's annual report or environmental report, examine its other electricity products, and review its other business activities.

For green power products, consider the following criteria:

- **Price.** Green power prices may be quoted in total cents per kilowatt-hour or in extra cents per kilowatt-hour (incremental to the standard power rate). If the organization is in a regulated utility's service territory, compare the price of green power with the price of conventional power. In competitive markets, compare the price of green power with that of electric service under standard utility rates, that of electric service under the lowest-price competitive alternative, and that of the electric service that the organization is currently receiving. Also make sure to determine whether the price is fixed over time or fluctuates with changes in standard power rates (some utility green-pricing program participants are exempt from variable fuel charges).
- **Percentage of renewable energy.** For a particular green power product, the resource mix can range from 1 to 100 percent renewable power. When buying certificates or block products, an organization can still calculate the percentage of its energy use served by renewable power.
- **Percentage of new or incremental renewable sources.** Although it is important to support existing renewable generation, many experts argue that only new generation provides incremental environmental benefits. "New" renewable resources refer to renewable facilities that have been created specifically for the green power market. Existing facilities presumably sold power into the grid before a particular green power purchase and would continue to do so. Therefore, purchasing power from the existing facilities may not change the composition or the environmental impact of the region's generation mix. Besides the direct impact of purchases from new renewable sources, these purchases also create the demand necessary for constructing additional renewable resources.

In some situations, however, buying power from existing renewable generation facilities can provide support for existing facilities that otherwise would have been underutilized or possibly even shut down, thus preventing their displacement by dirtier nonrenewable plants. When the demand for green power exceeds the supply, purchasing from existing facilities can eventually lead to the installation of new renewable generation capacity.

In states that have adopted a renewable portfolio standard (RPS), electricity providers are required to include a minimal percentage of renewable electricity in their standard product offering. Renewable electricity products create additional environmental benefits only if the power purchased is not already part of the provider's minimal RPS requirement.

- **Renewable energy/resource mix.** A renewable energy/resource mix refers to the kinds of resources used in the green power product. For example, is the product generated from wind, biomass, solar, geothermal, or hydro? Some resources have a greater environmental impact than others do, with different associated costs. Wind, solar, and geothermal power usually are the most environmentally preferable energy sources. Each is renewable and nonpolluting, with little impact on the land or local habitats. Certain environmental groups regard some types of hydropower, biomass, and municipal solid waste as less desirable. Hydropower dams may drastically alter river habitats and fish populations; biomass facilities may emit significant quantities of NO_X; and burning municipal solid waste may release heavy metals and other toxins into the environment.

  It also is important to check the environmental characteristics of any nonrenewable generation resources, as they will contribute to the overall environmental impact of the power purchased. One advantage of buying Green-e certified power is that the certification requires a product's nonrenewable resources to be, on average, cleaner than those of the local system power.

- **Length of contract.** Some buyers prefer a short-term contract in case the market changes and better offers come along. But an organization may be able to lock in a lower price if it signs a multiyear contract. A longer-term contract may also offer greater price stability. When determining the value of price stability, be aware of "typical" market fluctuations in power prices and how the price of renewable electricity can vary. Finally, a contract may include options for renewal, which can offer flexibility in the future.

- **Third-party certification and verification.** A green power product can be certified and verified by an independent third party. Such certification can provide credibility and confirmation of the product's environmental value. Visit www.green-e.org for more information about certification.

- **Location of generation.** In order to support the local economy and to contribute local environmental benefits, some organizations may prefer local or in-state renewable generation. Some renewable electricity products, however, use resources located out-of-state, and renewable energy certificates may be based on generation located nationally or even internationally.

- **Specific generation facility.** Some green power providers generate their power at a specific site, such as a nearby wind farm. These products, such as the annual output of one particular wind turbine, offer the benefit of being more tangible because they are associated with an identifiable generating facility.

Collecting Product Information

A good place to start collecting information about specific green power options is the many Internet sources listed in this *Guide*. Be sure to collect enough information to answer the decision criteria listed earlier. For useful comparisons, the information should be as consistent as possible among suppliers and among products. A good way to find consistent information is through an exploratory letter or a request for information (RFI) addressed to specific suppliers.

In many states, competing electricity suppliers are required to provide an electricity label—like a list of food ingredients—that provides information in a standard format and makes product comparisons easier. This information is generally available from the state's public utility commission. Another source of public information is third-party certifiers, such as Green-e, Environmental Resources Trust, or Climate Neutral Network, which provide information about the products they have certified to meet minimum environmental standards. All Green-e certified products give standardized product content labels to prospective customers.

The next step is estimating the cost of green power for the organization and calculating the cost/benefit ratio. For help finding data, contact one of the organizations that sponsored this guidebook (listed in chapter 10).

Creating a Procurement Plan

A procurement plan documents the project team's decisions and addresses possible problems in buying green power. A procurement plan can also help convince others in the organization that purchasing green power is a wise choice.

The main audience for the procurement plan is the managers who need to support the purchase decision. Their support should be secured as early in the process as possible. As soon as the team can show the costs and benefits of purchasing green power to the organization, they should present their information to management. Expect the managers to ask about the products the organization would buy, their cost, and their benefits. Also find out whether management might limit a green power purchase or whether they would buy more aggressively.

Besides providing the information that management needs to make the decision, a procurement plan can also help overcome resistance to green power within the organization. Some organizations have outdated perceptions of the reliability of renewable energy technologies, misunderstandings about using an intermittent resource, or worries about the cost. As part of the procurement process, the project team will probably need to educate others about these topics and the benefits of green power. The organizations that sponsored this guidebook can provide helpful information to overcome these misconceptions.

The scope and detail of the procurement plan will depend on the organization's needs and requirements, but it should address the following:

Scope of procurement

Specify the amount of power that will be purchased (as either a fixed amount of money for renewable purchases or a percentage of total power use) and for which facilities. If this procurement is a trial that may lead to additional purchases in the future, spell out the criteria that will be used to judge the trial's success. Also discuss whatever is known at this point about future procurement phases.

Expected benefits

Keeping in mind the general benefits outlined earlier in this guide, list the particular benefits hoped for by buying green power for the organization. Wherever possible, these benefits should be linked to the organization's environmental goals.

Financial considerations

Cost is usually the primary concern with green power, so the procurement plan should make a point of discussing it. Several strategies are available to help minimize and manage the extra cost of green power:

- **Buy green power for only part of the organization's energy use.** Green power does not have to be used for all energy needs. For example, the organization might buy green power for just 5 or 10 percent of its electricity use. Buying 5 percent green power may add less than 2 percent to the organization's electricity bill. Alternatively, some renewable electricity products cost less because they already are blended with conventional electricity.

- **Make a longer-term purchase.** Consider the contract's length in conjunction with the quantity and cost of power purchased. A short-term contract (typically less than three years) may offer greater flexibility in the future but also may cost more. But a longer contract can reduce the risk to the supplier, allowing it to offer a lower price than under a shorter contract. The right contract length is based on the particular situation and products available.

- **Seek a fixed-price contract.** Because its cost of fuel is predictable, renewable energy is often available at a fixed price without any fuel-cost adjustments. Check with the supplier, particularly if the organization is considering a utility green-pricing program, to see whether green power customers are exempted from fuel-cost adjustments.

- **Offset the cost with savings from energy efficiency.** Reducing the total amount of electricity purchased helps make green power more affordable. When reviewing green power providers, organizations may find that some providers also offer energy efficiency services, with the goal of no net increase in their customers' power bills.

Reducing the cost of green power

In 2003, the University of Pennsylvania doubled its already large purchase of green power to 40 million kWh. In addition to doubling its purchase, Penn extended its earlier commitment term from 3 years to 10 years. Both of these factors may have reduced the price they pay for green power. Penn also has paid for its significant commitment through savings from aggressive energy conservation. For example, over the past few years, Penn has reduced its peak electric demand by 18%.

- **Use savings from competitive choices.** Competitive choices of either green power or commodity electricity may lead to savings on energy costs, which can be used to buy green power. Or the extra cost of green power can be limited to the amount of savings from competition. Be aware that switching to less expensive conventional power can also mean dirtier power, so ask the electricity supplier for information about the emissions from its product, and make sure those emissions do not cancel out the benefits of the green power bought with the savings.

- **Specify a price cap or maximum total budget.** Specify the maximum price per kilowatt-hour or the total cost, or simply place a cap on the renewable portion of the purchase. A drawback of this approach is that suppliers are likely to bid at or near the specified price cap. But if the organization is interested mainly in other aspects of green power, such as environmental benefits or hedge value, this can be a good approach. Even if a price cap is not the most important consideration, it is a good idea to decide on the highest price the organization is willing to pay for green power, as part of its internal procurement planning.

- **Use incentives for buying green power.** A few states offer incentives that reduce the cost of green power. In almost all cases, these incentives are paid directly to the power marketer, so the incentive will already be factored into the price quoted and does not need to be requested separately. The power marketers and the state's energy department will know about any green power-purchasing incentives that are paid directly to the purchaser. For more information about available incentives, visit the Database of State Incentives for Renewable Energy at www.dsireusa.org.

Even with these cost reduction techniques, green power often is more expensive than standard power. To justify this extra expense, it is important to consider the benefits of green power. After weighing all the benefits, many organizations decide that green power is an inexpensive way to help achieve various organizational goals.

Procurement methods

The best way to buy power depends on the green power options available to the organization as well as its procurement rules. Generally, the greater the load that the organization can bundle together in one purchase, the more attractive it will be to a supplier.

The following explains typical ways to buy green power. Federal agencies must work within the procurement rules applicable to the federal government, which are explained further in appendix A.

- **Negotiate with the utility.** Buying power is simple, though the choices are fewer, if the organization is served by a utility in a regulated market with only one supplier. If the local utility offers green power, the organization can collect information by visiting the utility's Web site and calling to discuss its interest. Perhaps the only issue is the quantity the organization wants to buy, but it may be able to negotiate a slight price break if it is making a large purchase. If the utility does not offer green power and the organization is a large, highly visible customer, it may be able to encourage the utility to offer green power by promising to buy a large amount. Likewise, the organization may be able to persuade the utility to seek third-party certification if its product is not currently certified.

- **Call several sellers.** An organization can keep the procurement process relatively simple by calling the few green power providers active in its area. An off-the-shelf product may meet its needs. If the organization wants something different and only one or two green power suppliers are in the area, it can call them to discuss the options and let them know the organization would be interested in a proposal. After a discussion, the organization may be ready to negotiate directly with one of the suppliers about product definition, certification, price, and terms. Or if the organization is planning a large purchase, the suppliers may be willing to tailor something to its needs.

- **Request proposals.** Large companies, and public institutions in particular, often issue a formal solicitation or request for proposals (RFP). An RFP requires more time and effort for preparation, evaluation, and negotiation, but it may be more suitable for a large purchase and when many green power options are available. With an RFP, it is important to understand the organization's own objectives and communicate them clearly in the solicitation. Third-party certification and verification can be specified in the RFP evaluation criteria.

  RFPs can be as simple as a letter sent to selected suppliers, describing the organization's objectives and asking for a bid. This would be appropriate if just a few suppliers are available. RFPs can also be more formal, casting a wider net through a broadly advertised solicitation. This requires more effort to prepare and evaluate responses. Government agencies must follow the procurement rules governing their agency.

A two-step process is possible, too, in which the organization first issues a request for qualifications (RFQ) and, based on the responses, sends a more detailed RFP to those suppliers that meet its general qualifications. The RFQ would be broadcast to a larger audience, not only to find out who meets the organization's qualifications, but also to gauge the amount of interest.

For large purchases, RFPs may be addressed to renewable power generators (wholesale) as well as retail suppliers. Buying directly from generators may lower the cost but probably will require a longer-term purchase commitment. The Green Power Partnership offers assistance to partners putting together a green power purchase RFP; FEMP provides the same service for federal agencies. For RECs, the World Resources Institute provides guidelines and a sample contract for an RFP (www.thegreenpowergroup.org/credits.html).

RFP procurement

The State of New Jersey is buying 10% of its energy load (54 million kWh/year) from new wind facilities in Pennsylvania. This purchase is consistent with a number of state environmental policies, but was complex because of the many agencies involved and tight state budgets. To find a supplier, New Jersey issued an RFP that gave greater weight to Green-e certified products and lower emissions, resulting in a wind-only purchase.

Special considerations for RECs

Certificates can be bought from REC marketers or sometimes directly from renewable energy generators. Several environmental brokers are active in REC markets, offering another approach to procurement that is increasingly being used by large purchasers. Brokers do not own the certificates but rely on their knowledge of the market to connect buyers and sellers for a small fee. They can help negotiate deals that take into account an organization's unique interests.

Several issues need to be addressed when buying certificates. The attributes that the certificate represents should be clearly stated in a contract. If the organization plans to claim credit for these attributes, the contract should express in writing that the purchaser will receive title to them. If attributes like a reduction in carbon emissions have been sold separately to another party, then the exceptions should be clearly stated. The organization should make sure that the attributes it buys have not been double-sold and claimed by another party. Green-e certification can help ensure that the benefits promised by the supplier are actually realized. In addition, RECs have separate markets, depending on whether the certificates will be used to comply with the state's renewable policy requirements or for voluntary reasons. Prices in voluntary markets are generally well below those in compliance markets.

An organization may want to buy certificates only from renewable energy generators or marketers that meet its specifications, so the same selection criteria mentioned earlier in this chapter should still be considered in the procurement process. In fact, because certificates can come from any geographic area, the location where the certificate was generated, and therefore where the environmental benefits are likely to accrue, can be an important factor to consider.

Chapter 7
Planning an On-site Renewable Generation Project

Depending on the size of the system, on-site power projects tend to take more steps than do power purchases because they require more external coordination with the organization's utility, local governments, and contractors. For this reason, it is helpful to enlist outside technical expertise and not underestimate the length of time needed for a project like this. The following steps, along with the resources listed in chapter 10, can help. In the end, the renewable system will generate power and other benefits for many years to come.

Screening the Technologies

Based on work done in the first steps (chapter 5), the organization should have a good idea of its energy needs and the renewable resources available at its site. The next step is to perform a screening analysis to find those options best suited to the site. This screening should evaluate the options being considered, comparing the cost-effectiveness of the organization's current energy situation with that of a renewable power system. This screening should be based on the financial assessment methods that the organization would normally use for any capital investment, such as life-cycle cost, rate of return, and simple payback. The analysis should account for state and federal financial incentives, interconnection rules (e.g., insurance requirements or standby charges), and net-metering laws that may apply to the facilities. The result of this screening will be a specific technology that meets the organization's energy needs.

For on-site renewable power, bundling energy efficiency with renewable power is a common practice. The organization's site-specific situation (e.g., whether the generation system is connected to a grid, the facility's load shape, the utility's rate structure) determines the appropriate efficiency measures to include. At this point, it is a good idea to consider whether energy efficiency projects should be implemented together with the renewable generation technologies being considered.

An economic analysis must consider the approximate size of the renewable power system that the organization hopes to install. The size can be driven by the load to be served by the system, the organization's capital budget, or physical constraints at the site (such as rooftop area for PV systems or the rate of biomass fuel production). One option is to install the system incrementally, purchasing what the organization can afford now and adding more capacity over time. The modular nature of PV technology makes it especially suited to this approach, although wind can also be installed in somewhat larger modules. A contractor or utility representative can help choose the right-size system. The organization can also use one of the software tools listed in chapter 10.

The economic analysis should also decide whether the on-site power system will be used to provide backup power during utility grid outages. If so, the system must be designed to disconnect from the utility grid when a power outage occurs. The organization also must decide whether the system will include energy storage or backup generation, in order to provide power when renewable resources are not available. This analysis will be affected as well by whether the renewable generation will be part of a combined heat and power system (applicable to systems involving fuel combustion, such as landfill gas and biomass).

Obtaining Resources and Assistance

If the organization chooses to own and operate an on-site power system, it has much to learn, but excellent information resources are available. Before making a purchase, the organization's project team should study the technology and understand what it wants and what questions to ask, in order to be able to write a procurement specification. At this point, it would be wise to call on outside experts who can help with the technical and financial aspects of a renewable power project. Technical assistance may be available through the local utility, the state energy office, energy service providers, energy service companies, consultants, manufacturers, and equipment vendors. In addition, FEMP offers technical assistance to federal agencies.

The financial details are usually what make or break a power project, so the project should collect information about incentives that could make the project more cost-effective. Some state programs may also require that only certified installers install systems. Many states offer financial incentives specifically for customers that install qualified renewable

Using Incentives to Finance an On-Site Generation System

The City of Portland, Oregon used a variety of funding mechanisms to pay for a $1.3 million methane-powered fuel cell. Portland received a $200,000 grant from the U.S. DOE and a utility rebate of $247,000 (essentially returning a green power premium that the City had earlier paid). To finance the remainder, it entered into a lease-purchase arrangement with Western Bank, which was able to qualify for a $224,000 state tax credit because it owned the facility. Western Bank returned much of the tax credit to the City in the form of advantageous lease terms.

generation systems. These incentives may take the form of direct payments (rebates), competitive solicitations, consumer financing, or lower taxes (either sales or property tax). In addition, the federal government offers an investment tax credit for solar and geothermal energy systems, among other incentives for renewable energy. For more information, visit the Database of State Incentives for Renewable Energy at www.dsireusa.org. The state energy office, local utility, or renewable-energy equipment vendor will also have information about which incentive programs apply to its situation.

Utility rate impacts should also be investigated carefully. The organization should check with the local utility to see whether on-site generation would lower its demand charges or generate electricity at a time of day when prices are higher. Facilities with their own generation systems sometimes also qualify for reduced "self-generation" rates.

Creating a Project Plan

Once the organization has decided on a specific technology, it is time to conduct a detailed feasibility study. This study will quantify all the costs and benefits of the project to evaluate its cost-effectiveness. The study should be based on inputs that are as specific as possible to the organization's situation, such as quoted prices from vendors.

If the project appears feasible, the project team can then decide on a plan to have the renewable power system financed, built, and installed. Financing is a critical aspect of the project, and it should account for any federal and state incentives for which the organization's system is eligible. Make sure that the system is designed to meet the requirements of the incentive program.

In addition, some renewable resources, such as biomass, will probably require air permits from the local air resources control board. The project plan should account for the time and expense of acquiring these permits. As with any other type of facilities project, the team must secure the necessary land-use and building permits and variances required for the project. The team also will need to apply for interconnection with the local electric utility (for grid-connected systems), which can be a complex and time-consuming process.

Procurement strategy

Purchases for on-site generation differ from power purchases. In many cases, an organization may buy, own and operate its own generation equipment. In some circumstances, though, it can enter into a power purchase agreement to buy the electricity generated by a renewable energy system installed on its property without actually owning the system. This approach may not be widely available in states that allow electricity to be purchased only from a qualified utility.

The procurement options for on-site generation generally fall into the following categories:

- **Act as the general contractor.** If the organization has design engineers on staff, they can draw up the specifications and then solicit bids for equipment and installation. This arrangement works well if the organization wants to do some of the work in-house. Keep in mind, however, that if the organization has no experience with renewable energy systems, it runs the risk of ending up with a poorly performing system.

- **Hire a general contractor for a turnkey system.** An organization probably will use an RFP to select an equipment manufacturer, a system designer, or a system installer to help design the system to its needs, to buy the materials, to arrange for installation, and to commission the system. Note that some companies (particularly in the PV industry) are vertically integrated, from manufacturing, to design and installation, to operations and maintenance.

- **Hire an energy services company (ESCO).** The ESCO will be responsible for design, installation, maintenance, and financing. This differs from a turnkey project in that ESCOs typically work under performance contracts, meaning that they are paid according to how well the project is carried out. Usually this is through energy savings, but success can also be based on the amount of power generated or the system's reliability. ESCOs also often provide at least part of the project financing, which can be very helpful for organizations—such as government agencies—with very limited capital budgets. Usually, ESCO projects need to be large, or part of a larger contract, in order to justify the transaction costs.

- **Buy power from an independently owned system.** When considering on-site green power, some companies decide not to install solar PV systems because of the high capital investment, maintenance costs, and financial returns that fall short of company standards. To overcome these barriers, an organization can host an on-site generation system and agree to buy the power without actually owning the equipment. This approach is known as a *services model*, and it can greatly simplify the process of installing on-site renewable power. As with other types of green power purchases, make sure that the contract also transfers the environmental and other benefits of the green power, in order to claim full credit for the organization's purchase.

Procuring On-Site Generation Through a Services Model

In 2004, Staples initiated a solar services project for its location in Rialto, CA. The project developer, SunEdison, Inc., arranged for financing, design and construction of a 260 kW solar array. In return, Staples signed a 10-year power purchase agreement (PPA) with SunEdison, with the option to renew for 5-year intervals. The solar PV system will provide benefits of peak load shaving and reduced GHG emissions. Further, Staples will avoid all capital and maintenance costs. The price for power in the contract is competitive with local commercial rates, and the PPA has a fixed cost structure that acts to hedge against price volatility in retail electricity.

Choosing a vendor

When choosing a vendor, it generally is a good idea to get more than one bid, so the first step is to find several possible vendors for a given project. The Web sites for the major trade groups in this area—the Solar Energy Industries Association and the American Wind Energy Association—offer information about their members' expertise and interests, and chapter 10 lists more sources.

When choosing a vendor, the organization should obtain comparative information from the companies it is considering, usually through either a request for qualifications (RFQ) or a request for proposals (RFP). An RFP is appropriate if the organization already has a detailed system design and simply wants a vendor to implement that design. An RFQ is better for comparing vendors' qualifications and experience, to select one to both design and implement the system. Because the design of on-site renewable systems tends to be site specific and because design details are often resolved differently by different vendors, the RFQ approach often leads to the system best tailored to the organization's needs.

Some factors to consider when choosing a provider of on-site generation are the following:

- **Experience.** The vendor's experience and familiarity with the type of system the organization is considering is extremely important. Also determine the vendor's experience with interconnection issues (if the system will be connected to the grid). A quick way to judge a vendor's experience is the length of time it has been in business and the number of similar systems it has installed.

- **Performance history.** It is very important to check references from previous customers, preferably for systems similar to the one the organization is considering. Another important factor is whether there are any judgments or liens against the vendor, which would indicate problems with previous projects.

- **Licenses and certification.** To be eligible for state incentives, some states require that the system be installed by a licensed contractor, whereas other states certify installers that have received the relevant training. As with any other capital project, licenses and certification are an indicator of a contractor's qualifications.

- **Liability and professional insurance.** If any problems arise with the system during installation or operation, it is important that the contractor have adequate insurance to protect the purchasing organization from liability. The contractor should also be responsible for any problems with interconnecting to the grid.

Anticipating Possible Barriers

When implementing a renewable generation project, the organization must work with various entities to obtain permits, connect to the utility system, and perform other activities external to the facility. Some of these steps will end up requiring more time, effort, or money than originally anticipated and may pose barriers that must be overcome.

Generally these barriers fall into two categories: technical and regulatory. Most technical barriers pertain to the local utility's electrical interconnection requirements. Other technical barriers are fuel availability and storage; space limitations; power-quality impacts; fire, safety, and zoning requirements; and operations and maintenance issues. Regulatory barriers pertain mainly to the required permits and approvals, such as air emissions permits, utility standby charges, exit fees, regional transmission charges, and land-use permits.

Often the contractor for the project can be made responsible for overcoming these barriers as they arise. If this seems like a good option, the project team should explore it with the contractor when writing the RFP and reviewing the proposals. The FEMP guide to distributed energy resources offers many tips for resolving any problems that may arise when implementing a renewable power project.

Installing and Operating an On-Site Renewable Generation System

Once the organization's on-site generation system has been designed, it is time to put the contracts in place and begin construction. As with any capital project, it is important to stay involved during the construction to resolve any problems that might arise.

When the construction has been completed, the project team should monitor and verify the system's energy performance. Does everything work as planned? What is the system's actual energy production? If it is not as estimated, what can be done to improve the system's performance? Information about system performance is useful in communicating the benefits of the project to internal and external audiences.

Measurement and validation generally proceed in two steps. The first is the postconstruction evaluation (or commissioning), in which a contractor's work is inspected and the system is tested to make sure that it meets regulatory and design specifications. The second step is monitoring and verifying the system's performance over a longer period, such as the first year of operation (although continuous monitoring is necessary to catch any performance problems that arise). It is important to plan for this stage at the early phases of the project, in order to design a useful data acquisition system.

Finally, all renewable power systems require periodic maintenance in order to perform as intended. The organization must decide whether its staff has the expertise and time to do this or whether it should contract with the equipment vendor or a service company to maintain the system.

On-Site Photovoltaic System

Johnson & Johnson's corporate environmental goals include a goal to reduce its energy-related emissions of carbon dioxide. To help meet these goals, the company opted to purchase renewable power, specifically an on-site solar photovoltaic (PV) system at its Janssen Pharmaceutica facility in Titusville, New Jersey. A state rebate eventually paid for 57% of project costs, and additional federal incentives will allow for accelerated depreciation of the equipment. Even with these subsidies, the project did not rise to the company's minimum rate of return for capital expenditures. The solar PV project had support from senior management, though, because of its positive environmental benefits. This high-level support was vital to project approval. Based on initial data, the 500 kW system will generate about 500,000 kWh per year and can handle about 10% of the facility's load at peak times. Johnson & Johnson is evaluating numerous solar PV projects in addition to the three systems it currently owns.

Chapter 8
Capturing the Benefits of the Purchase

After buying or installing green power, the organization should consider various promotional strategies and marketing to generate measurable, positive publicity and public relations benefits. To maximize the positive publicity, both inside and outside the organization, the purchase of green power should be made part of the organization's comprehensive environmental management efforts. The organization's achievements should be significant and well documented so that claims made to the public are credible.

The Environmental Benefits

When an organization highlights the benefits of its purchase of green power, it is important that it know the quantity of emissions avoided. These emissions can be greenhouse gases (GHGs), primarily carbon dioxide, as well as other significant pollutants that affect the environment and human health, such as sulfur dioxide, nitrogen oxides, and mercury. A buyer of green power can calculate its reduction of emissions and count them toward an environmental or energy goal. To help with these calculations, analysis tools are available from the EPA Green Power Partnership (www.epa.gov/cleanenergy/powerprofiler.htm) and the World Resource Institute's Green Power Market Development Group (www.thegreenpowergroup.org/gpat/).

The concern about climate change, and GHGs in particular, has prompted many organizations to make a GHG emissions inventory. An inventory is a detailed list of emissions by source and type of greenhouse gas, usually expressed in metric tonnes of carbon dioxide equivalent (CO_2e).

An inventory serves many purposes, including

- Identifying opportunities for reduction and managing GHGs.
- Participating in public reporting and voluntary reduction initiatives.
- Participating in mandatory government-reporting programs.
- Trading in GHG emissions markets.
- Providing recognition for early voluntary action.

Using an inventory to record changes in GHG emissions sets the foundation for companies, organizations, and others to benefit from buying green power in future climate change policy frameworks. An inventory also allows organizations to record their emissions information in an official registry with a government agency. Several GHG registry programs have been established to record GHG reductions, including the California Climate Action Registry, Wisconsin's Voluntary Emissions Reduction Registry, the U.S. Department of Energy's 1605b Voluntary Greenhouse Gas Reporting program, and the Regional Greenhouse Gas Registry being developed by the Northeast States for Coordinated Air Use Management.

For more information, see the GHG accounting standards developed by the GHG Protocol Initiative at www.ghgprotocol.org.

Internal Promotion

One of the benefits of buying green power is improving employees' morale. To capitalize on this, companies and organizations often choose to promote their purchase or installation internally using the following methods:

- **Include "energy news" in internal publications.** Internal publications, such as newsletters, are valuable ways of communicating information to an organization's employees, stakeholders, and affiliates and also helps support the organization's mission, growth, and development.
- **Establish a staff adoption and recognition program.** Such a program encourages employees to buy green power through an organization-wide program. A staff adoption program should create incentives, provide information, set milestones for staff purchases over time, and recognize individual achievements.

External Promotion

Strategic external public relations maximize the positive publicity surrounding an organization's purchase of green power. In addition to the public relations benefits, the purchase can motivate additional purchases by the general public, the organization's customers, and its affiliates, thereby extending the impact of the initial purchase.

- **Construct a public relations plan.** Construct a plan to publicize to target audiences the organization's purchase or installation. The plan should include strategies for using existing distribution channels such as e-mail, Web sites, and direct mail to promote the organization and its commitment to renewable energy. An organization can create special print materials and press releases for distribution, and conduct e-mail campaigns that distinguish it as an innovative leader. Retail companies sometimes circulate special offers and coupons and even host events—such as renewable energy celebrations—at stores to attract new customers and communicate the benefits of the organization's green power purchase.

- **Use media contacts and press.** An organization may wish to write a press release describing its purchase, and circulate it to local and national media outlets. The organization can also research and contact local environmental writers and publications to encourage feature stories about the organization and its commitment to improve the environment.

- **Train staff to promote the organization's purchase.** Purchasers can instruct their staff about the details of the organization's purchase and the best ways to highlight it to customers in daily sales interactions. Also teach them how to answer general questions about renewable energy.

- **Take advantage of all opportunities to promote the purchase.** Effective organizations use strategic business engagements and speaking events as well as existing interactions with the public to talk about the organization's environmental commitment and promote its purchase of green power. This may include marketing the organization's purchase on its products and encouraging its suppliers and affiliates to follow its lead and buy green power.

Using Green Power for Promotion and Branding

Hayward Lumber powers part of its manufacturing facility in Santa Maria, California with a 118 kW rooftop photovoltaic system. The PV system, which produces 45% of the facility's electric load, now serves as a brand name—Solar Truss—for the components that are produced at the plant. By branding their trusses, Hayward Lumber is educating contractors and architects that its trusses are built using renewable energy sources.

- **Work with third-party organizations.** Third-party organizations can help provide credibility to green power purchases that meet minimum purchasing benchmarks. These organizations also offer publicity channels that promote renewable energy and highlight environmental commitment. All the organizations sponsoring this guidebook help their partners and companies publicize their achievements in buying green power. Members of the EPA's Green Power Partnership and those who purchase Green-e certified products can also use these logos in their promotional activities.

- **Create marketing partnerships with green-power suppliers.** Offer retail customers the opportunity to sign up for green power, and reward them with benefits such as gift or discount cards, merchandise, or collateral products (e.g., T-shirts, hats) that tout the company's image as an environmental leader.

Chapter 9
Conclusion

Purchasers of electricity can have a significant impact on the way that power is produced, both now and in the future. Businesses, governments, and nonprofits have an unprecedented and increasing range of options for buying green power. In those states that have restructured their electricity markets, retail access allows customers to choose their electricity supplier and, by extension, how their electricity is produced. In regulated markets, utility green-pricing programs enable customers to support the addition of renewable energy to the grid without leaving their current utility. Renewable energy certificates and on-site renewable generation allow organizations everywhere to achieve the benefits of green power. Organizations that act in their own—and society's—best interests can take advantage of the strategies outlined in this guidebook to help move the United States toward a more sustainable energy future.

Chapter 10
Resources for Additional Information

U.S. Department of Energy

- Federal Energy Management Program (FEMP)
  www.eere.energy.gov/femp
- Green Power Network
  www.eere.energy.gov/greenpower
- FEMP Renewable Power Purchasing
  www.eere.energy.gov/femp/technologies/renewable_purchasepower.cfm
- FEMP Distributed Power
  www.eere.energy.gov/femp/technologies/derchp.cfm

U.S. Environmental Protection Agency

- Clean Energy
  www.epa.gov/cleanenergy
- Green Power Partnership
  www.epa.gov/greenpower
- Energy Star
  www.energystar.gov
- Landfill Methane Outreach Program
  www.epa.gov/lmop
- EGRID database
  www.epa.gov/cleanenergy/egrid
- Power Profiler
  www.epa.gov/cleanenergy/powerprofiler.htm

World Resources Institute

- World Resources Institute home page
  www.wri.org
- GHG Protocol Initiative
  www.ghgprotocol.org
- Green Power Market Development Group
  www.thegreenpowergroup.org

Green-e Renewable Energy Certification Program

The Green-e Renewable Energy Certification Program is the nation's leading voluntary certification and verification program, designed to help businesses and households compare and select clean renewable energy options. Green-e sets consumer protection and environmental standards for energy products and verifies that Green-e certified products meet those standards. Energy products that meet the Green-e standards are identified by the Green-e logo.

Certification ensures the quality of renewable energy products. All Green-e-certified products meet stringent requirements for air emissions, energy from new renewable facilities, and truth in advertising. These strict standards are set through a collaborative process with environmentalists, consumer advocates, marketers, and energy experts. Green-e's annual verification process and marketing compliance review ensure that providers meet these standards. By requiring these consumer and environmental safeguards, Green-e builds consumer confidence in renewable energy products, which helps expand the market for high-quality products.

Green-e provides clear information about energy options to enable purchasers to make informed decisions. Green-e works with companies and organizations purchasing certified green power to highlight their purchase and educate consumers about the benefits of buying renewable energy. Green-e also conducts public education and outreach campaigns in regions across the nation to inform consumers about their options and build demand for renewable energy. The Green-e Web site, www.green-e.org, and toll-free number (888-63-GREEN) are widely used resources that allow consumers to compare certified products in any region and to select the superior green power option that meets their needs.

Green-e also identifies products manufactured by companies that buy certified green power, bringing renewable energy to the attention of millions of diverse consumers across the nation. Through Green-e's product labeling initiative, claims such as "Made with Certified Renewable Energy" and "We Buy Certified Renewable Energy" may now appear on consumer products, accompanied by the Green-e logo and Web site. These labels appear on products in grocery stores, carpet labels, and even on bottles of wine in restaurants. The initiative advances renewable electricity use as a new type of environmental performance indicator for consumer products, similar to other consumer labels for recycled products, organic food, fair trade practices, and energy efficiency.

Green-e is a program of the Center for Resource Solutions. For more information, visit www.green-e.org or www.resource-solutions.org.

Additional Resources

Overview

Developing a strategic energy management plan:
ENERGY STAR for business: www.energystar.gov, follow the links to "Business Improvement" then "Guidelines for Energy Management".

Electricity restructuring:
FEMP's restructuring Web site:
pnnl-utilityrestructuring.pnl.gov.

Current state of green power markets:
Bird, Lori, and Blair Swezey. 2003. *Estimates of Renewable Energy Developed to Serve Green Power Markets in the United States*. Golden, CO: National Renewable Energy Laboratory, February (www.eere.energy.gov/greenpower/resources/tables/new_gp_cap.shtml).

Benefits of Green Power

Public support for renewable energy:
Farhar, Barbara C., and Ashley H. Houston. 1996. *Willingness to Pay for Electricity from Renewable Energy*. Golden, CO: National Renewable Energy Laboratory, September.

Motivations for purchasing green power:
Holt, E., R.Wiser, M. Fowlie, R. Mayer, and S. Innes. 2000. *Understanding Non-Residential Demand for Green Power*. Prepared for the American Wind Energy Association and the National Wind Coordinating Committee (www.nationalwind.org/pubs).

Economic development and job creation:
National Wind Coordinating Committee. 2003. *Assessing the Economic Development Impacts of Wind Power*. March (www.nationalwind.org/pubs).

Environmental Law and Policy Center. *Job Jolt: The Economic Impacts of Repowering the Midwest: The Clean Energy Development Plan for the Heartland* (www.repowermidwest.org/Job%20Jolt/JJfinal.pdf).

Environmental benefits:
Serchuck, Adam. 2000. *The Environmental Imperative for Renewable Energy: An Update*. College Park, MD: Renewable Energy Policy Project (REPP), University of Maryland. April (www.repp.org/repp_pubs/articles/envImp/envImp.pdf).

EPA's Global Warming Web site:
www.epa.gov/globalwarming.

Emissions credits:
Wooley, David R. 2000. *A Guide to the Clean Air Act for the Renewable Energy Community*. College Park, MD: Renewable Energy Policy Project (REPP), University of Maryland. Issue Brief no. 15. February (www.repp.org/repp_pubs/articles/issuebr15/caaRen.pdf).

National Wind Coordinating Committee. 2002. *Credit Trading and Wind Power: Issues and Opportunities*. May (www.nationalwind.org/pubs/).

Renewable Energy Certificates (RECs)

Hamrin, Jan, and Meredith Wingate. 2003. *Regulator's Handbook on Tradable Renewable Certificates*. San Francisco: Center for Resource Solutions. May (www.resource-solutions.org/RegulatorHandbook.htm).

EPA's Green Power Locator: provides links to retail and wholesale marketers of renewable energy certificates: www.epa.gov/greenpower/locator.htm.

The Green Power Network lists brokers and wholesale marketers: www.eere.energy.gov/greenpower/markets/certificates.shtml.

Green-e lists certificate marketers and brokers that offer certified products: www.green-e.org.

The World Resources Institute offers a sample REC contract: www.thegreenpowergroup.org/Sample_REC_Contract.doc.

Hanson, Craig, and Vince Van Son. 2003. *Renewable Energy Certificates: An Attractive Means for Corporate Customers to Purchase Renewable Energy*. Washington, DC: World Resources Institute (www.thegreenpowergroup.org/Installment5.pdf).

Utility Green-Pricing Programs

Holt, Edward, and Meredith Holt. 2004. *Green Pricing Resource Guide*. 2nd ed. Washington, DC: American Wind Energy Association.

Lieberman, Dan. 2002. *Green Pricing at Public Utilities: A How-to Guide Based on Lessons Learned to Date*. Center for Resource Solutions and Public Renewables Partnership. October. (www.resource-solutions.org/PRP.htm).

Green Power Product Lists

The Green Power Network maintains lists of products offered in each state: www.eere.energy.gov/greenpower.

The EPA Green Power Partnership supports a Green Power Locator: www.epa.gov/greenpower/locator.htm.

Green-e maintains a list of certified products offered in each state: www.green-e.org/your_e_choices/pyp.html.

On-Site Renewable Generation

FEMP. 2002. *Using Distributed Energy Resources: A How-to Guide for Federal Facility Managers*. Washington, DC: U.S. Department of Energy, Federal Energy Management Program. DOE/GO-102002-1520. May (www.eere.energy.gov/femp/technologies/derchp_resources.cfm).

Massachusetts DOER. 2001. *Renewable Energy & Distributed Generation Guidebook: A Developer's Guide to Regulations, Policies and Programs That Affect Renewable Energy and Distributed Generation Facilities in Massachusetts*. Massachusetts Division of Energy Resources. April (www.state.ma.us/doer/pub_info/guidebook.pdf).

California Energy Commission: www.energy.ca.gov/renewables/index.html.

Pennsylvania Department of Environmental Protection. 2003. *Small Wind Electric Systems: A Pennsylvania Consumer's Guide* (www.dep.state.pa.us/dep/deputate/pollprev/energy/wind/small_wind_pa.pdf).

New York State Energy Research and Development Agency: www.nyserda.org/energyresources/photovoltaics.html and www.nyserda.org/energyresources/wind.html.

Government incentives for renewable energy:

The Database of State Incentives for Renewable Energy includes information about capital cost incentives as well as net-metering laws: www.dsireusa.org.

Clean Energy States Alliance: www.cleanenergystates.org.

The American Wind Energy Association lists states' incentives for small wind installations: www.awea.org, follow links to "Small Wind Systems" then "State by State Information".

Bolinger, Mark, Ryan Wiser, Lew Milford, Michael Stoddard, and Kevin Porter. 2001. *Clean Energy Funds: An Overview of State Support for Renewable Energy*. Berkeley, CA: Lawrence Berkeley National Laboratory. LBNL-47705. April (http://eetd.lbl.gov/ea/EMS/reports/47705.pdf).

Interconnection with the utility grid:

In 2003 the Federal Energy Regulatory Commission (FERC) issued standard procedures and a standard interconnection agreement for the interconnection of generators larger than 20 megawatts. FERC also proposed a rule to apply to the interconnection of small generators no larger than 20 megawatts: www.ferc.gov/industries/electric/indus-act/gi.asp.

California Rule 21: standards for interconnection of distributed energy resources: www.energy.ca.gov/distgen/interconnection/california_requirements.html.

Standards Board of the Institute for Electrical and Electronics Engineers, Inc. (IEEE). Standard 1547: "Standard for Interconnecting Distributed Resources with Electric Power Systems": grouper.ieee.org/groups/scc21/dr_shared.

DOE Distributed Power program: www.eere.energy.gov/distributedpower

FEMP Interconnection and Permitting Guide: www.eere.energy.gov/femp/technologies/derchp_ipg.cfm.

Larsen, C., B. Brooks, and T. Starrs. 2000. *Connecting to the Grid: A Guide to PV Interconnection Issues*. 3rd ed. Interstate Renewable Energy Council (http://irecusa.org/connect/library.html).

Measurement and verification of system performance:

FEMP. 2000. *M&V Guidelines: Measurement and Verification for Federal Energy Management Projects, version 2.2*. Section VIII of these guidelines covers renewable energy projects. (www.eere.energy.gov/femp/financing/superespcs_measguide.cfm).

PVWATTS is a calculator to estimate the output from photovoltaic solar installations. The model calculates monthly and annual energy production in kilowatt-hours and monthly savings in dollars. See http://rredc.nrel.gov/solar/calculators/PVWATTS.

For more information about PV systems, see:

American Solar Energy Society: www.ases.org.

Solar Electric Power Association: www.solarelectricpower.org.

Solar Energy Industries Association: www.seia.org.

North Carolina Solar Center: www.ncsc.ncsu.edu.

California Energy Commission. 2000. *Buying a Photovoltaic Solar Electric System: A Consumer Guide*. April (www.energy.ca.gov/reports/500-99-008.PDF).

California Energy Commission. 2001. *A Guide to Photovoltaic (PV) System Design and Installation*. June (www.energy.ca.gov/reports/2001-09-04_500-01-020.PDF).

Renewable energy trade associations:

American Bioenergy Association: www.biomass.org.

American Solar Energy Society: www.ases.org.

American Wind Energy Association: www.awea.org.

Biomass Energy Research Association: www.bera1.org.

Geothermal Energy Association: www.geo-energy.org.

Geothermal Resources Council: www.geothermal.org.

Interstate Renewable Energy Council: www.irecusa.org.

Low Impact Hydropower Institute: www.lowimpacthydro.org.

National Hydropower Association: www.hydro.org.

Solar Electric Power Association: www.solarelectricpower.org.

Solar Energy Industries Association: www.seia.org.

Utility Wind Interest Group: www.uwig.org.

Windustry: www.windustry.com.

On-site renewable generation financial analysis tools:

Each of the many available tools offers different features, which should be examined closely to determine whether they are appropriate to the particular situation.

ProForm
Developer: Lawrence Berkeley National Laboratory
Allows an integrated environmental and financial prefeasibility analysis of on-site renewable energy and energy efficiency projects. http://poet.lbl.gov/Proform

RETscreen International
Developer: Natural Resources Canada's CANMET Energy Diversification
Research Laboratory (CEDRL)
Assesses the economics of various renewable energy installations. www.retscreen.net

RETFinance
Developer: Energy Analysis Team at NREL
Simulates a 30-year nominal dollar cash flow for renewable projects, including earnings, debt payments, levelized cost-of-electricity, after-tax internal rate of return, and debt service coverage ratio (net operating income divided by total debt service). http://analysis.nrel.gov/retfinance

Clean Power Estimator
Developer: Clean Power Research
Offers a quick cost-benefit analysis for photovoltaics, solar thermal, wind, and energy efficiency for both residential and commercial buildings.
www.clean-power.com/software.ht.
A version for California facilities is offered by the CEC.
www.consumerenergycenter.org/renewable/estimator.

Federal Renewable Energy Screening Application (FRESA)
Developer: U.S. Department of Energy, Energy Efficiency and Renewable Energy
Compares opportunities for renewables and conservation at federal facilities.
www.eere.energy.gov/femp/information/download_software.cfm

Hybrid Optimization Model for Electric Renewables (HOMER)
Developer: NREL
Compares the cost-effectiveness of off-grid renewables with grid extensions or stand-alone generators.
www.nrel.gov/homer.

Real Options Analysis Center
Developer: NREL
Provides online models for the valuation of renewable energy R&D and the valuation of distributed generation assets.
www.nrel.gov/realoptions

FATE-2P (Financial Analysis Tool for Electric Energy Project)
Developer: NREL
A power plant project finance model for calculating the cost of energy or the internal rate of return for alternative energy projects.

Greenhouse Gas Resources

Hanson, Craig, and Janet Ranganathan. 2003. *Corporate Greenhouse Gas Emissions Inventories: Accounting for the Climate Benefits of Green Power.* Washington, DC: World Resources Institute (www.thegreenpowergroup.org/Installment3.pdf).

U.S. Department of Energy's voluntary GHG registry: www.eia.doe.gov/oiaf/1605/frntvrgg.html.

U.S. Environmental Protection Agency's Climate Leaders, a voluntary government-industry partnership: www.epa.gov/climateleaders.

World Wildlife Fund's (WWF) Climate Savers: www.worldwildlife.org/climate/projects/climate_savers.cfm.

Climate Neutral Network: www.climateneutral.com.

States that have or are developing climate registries:

The California Energy Commission has summarized state activities related to greenhouse gas inventories www.energy.ca.gov/global_climate_change/summary.html.

The California Climate Action Registry: www.climateregistry.org.

Wisconsin Voluntary Emission Reductions Registry Advisory Committee: www.dnr.state.wi.us/org/aw/air/hot/climchgcom/.

New Hampshire: www.des.state.nh.us/ard/climatechange/ghgr.htm

Glossary

This glossary defines some of the important terms used in this guide. More definitions can be found at www.epa.gov/cleanenergy/glossary.htm.

Annual consumption. Annual consumption refers to the amount of electricity used by a consumer in one year and is typically measured in kilowatt-hours (kWh). This information can be acquired from your electricity bill or by contacting your energy provider.

Carbon dioxide. Burning fossil fuels releases into the atmosphere carbon that has been stored underground for millions of years. During the combustion process, the carbon in these fossil fuels is transformed into carbon dioxide, the predominant gas contributing to the greenhouse effect. Increases in the emissions of carbon dioxide and other gases, such as methane, due to the burning of fossil fuels and other human endeavors, accelerate heat-trapping processes in the atmosphere, gradually raising average temperatures worldwide. Carbon dioxide is absorbed and released at nearly equal rates by natural processes on the earth, an equilibrium that is disrupted when large amounts of carbon dioxide are released into the atmosphere by human activities, such as the burning of fossil fuels.

Combined heat and power (CHP). Combined heat and power (CHP) is an electricity generation technology, also known as *cogeneration*, that recovers waste heat from the electric generation process to produce simultaneously other forms of useful energy, such as usable heat or steam. On average, two-thirds of the input energy used to make electricity is lost as waste heat. In contrast, CHP systems are capable of converting more than 70 percent of the fuel into usable energy.

Commodity electricity. Commodity electricity is generic electricity not associated with a particular power generation source.

Competitive markets. Until recently, most consumers received generation, transmission, and distribution services from one local utility company. As a regulated monopoly, the utility was given an exclusive franchise to provide electricity to consumers in a particular community. Rates were set, and consumers had little choice but to pay the rate for their area. In recent years, however, many states have restructured their electricity industry and are now allowing consumers to choose from among competing electricity suppliers.

In states permitting retail competition, sellers of electricity obtain power by contracting with various generation sources and setting their own price. Consumers in these states have the opportunity to choose their energy provider and purchase products based on the price or type of power supplied to their home or business. Some consumers are exercising this choice and switching to accredited "green power" resources. In states that have not restructured their electricity markets, consumers interested in purchasing renewable energy now have the option to participate in green-pricing programs offered by their local utility.

Conventional power. Conventional power is power produced from nonrenewable fuels such as coal, oil, natural gas, and nuclear fuels. These fuels are a finite resource that cannot be replenished once they have been extracted and used.

Distributed generation. Distributed generation refers to small, modular, decentralized, grid-connected, or off-grid energy systems located in or near the place where energy is used.

Electricity supplier. As states restructure their electricity markets, more and more customers will be able to choose from a range of energy suppliers that market different types of power products, including green power from renewable energy. Restructured local utilities offer electricity products generated exclusively from renewable resources or, more frequently, electricity produced from a combination of fossil and renewable resources. In states without restructured electricity markets, local utilities may offer green-pricing programs, in which customers may elect to have their utility generate a portion of their power from renewable sources.

Energy efficiency. Energy efficiency refers to products or systems using less energy to do the same or a better job than conventional products or systems can. Energy efficiency saves energy, saves money on utility bills, and helps protect the environment by reducing the amount of electricity (and associated environmental impacts) that needs to be generated.

Fossil fuels. Fossil fuels are the United States' principal source of electricity. The popularity of these fuels is due largely to their low cost. Fossil fuels come in three main forms: coal, oil, and natural gas. All three were formed many hundreds of millions of years ago before the time of the dinosaurs, hence the name *fossil fuels*. Because fossil fuels are a finite resource and cannot be replenished once they have been extracted and burned, they are not considered renewable.

Global climate change. For most of human history, changes in the earth's climate resulted from natural causes that took place over thousands of years. But today, human activities are beginning to affect our climate in serious and immediate ways by rapidly adding greenhouse gases to the atmosphere. These gases trap heat close to the earth that would otherwise escape into space, intensifying a natural phenomenon called the *greenhouse effect*. Over the next century, scientists project that global temperatures will rise two to six degrees Fahrenheit as a result of rising concentrations of greenhouse gases. Scientists also believe that this rate of global warming will be unprecedented compared with that of the past 10,000 years. Global warming could result in a rise in sea levels, changes in patterns of precipitation, more variable weather, and many other consequences. These changes threaten our health, agriculture, water resources, forests, wildlife, and coastal areas. For more information on the science and impacts of global climate change, visit the EPA's Global Warming Web site (www.epa.gov/globalwarming).

Greenhouse effect. The greenhouse effect is produced as greenhouse gases allow incoming solar radiation to pass through the earth's atmosphere, while preventing part of the outgoing infrared radiation from the earth's surface and lower atmosphere from escaping into outer space. This process occurs naturally and has kept the earth's temperature about 59 degrees Fahrenheit warmer than it would otherwise be. Current life on the earth could not be sustained without the natural greenhouse effect.

Greenhouse gases (GHG). Gases in the earth's atmosphere produce the greenhouse effect. Changes in the concentration of certain greenhouse gases, due to human activities such as the burning of fossil fuels, increase the risk of global climate change. Greenhouse gases include water vapor, carbon dioxide, methane, nitrous oxide, halogenated fluorocarbons, ozone, perfluorinate carbons, and hydrofluorocarbons.

Green power. Electricity that is generated from renewable energy sources is often marketed as "green power," a term that implies a smaller environmental impact from electricity generation. The resources that qualify as green power vary depending on the state or organization. For more details, see chapter 2.

Green power marketers. Energy suppliers operating in states that permit retail competition in the electricity markets are usually referred to as *green power marketers*. This term can also include utilities that offer green power options under what are typically referred to as *green-pricing programs*.

Green power products. Green power products refer to electricity generated exclusively from renewable resources or from a combination of fossil and renewable resources.

Green pricing. Green pricing is an optional service offered by regulated utilities to allow customers to support a greater level of utility investment in renewable energy by paying a premium on their electric bill. Usually green pricing is offered in areas that do not allow retail competition.

Interval meter. An interval meter is an electricity meter that measures a facility's energy usage in short increments (typically 15 minutes). These meters are useful for determining electricity demand patterns and participating in real-time pricing programs.

Kilowatt-hour (kWh). A kilowatt-hour is the basic unit for measuring the generation and consumption of electrical energy. A *megawatt-hour (MWh)* of electricity is equal to 1,000 kilowatt-hours. A *kilowatt* and a *megawatt* are units of generation capacity.

Low-impact hydropower. Low-impact hydropower is hydroelectric power generated with fewer environmental impacts, by meeting criteria such as minimum river flows, water quality, fish passage, and watershed protection. These hydropower facilities often operate in a "run of the river" mode, in which little or no water is stored in a reservoir.

Net metering. Net metering is a method of crediting customers for electricity that they generate on-site. Customers generating their own electricity offset what they would have purchased from their utility. If they generate more than they use in a billing period, their electric meter turns backward to indicate their net excess generation. Depending on the individual state or utility rules, the net excess generation may be credited to their account (in many cases at the retail price), carried over to a future billing period, or ignored.

New renewable generation. New renewable generation facilities are those built in the recent past or will be built to meet the growing market demand for green power. For Green-e certification, new generation must have come online since the late 1990s (depending on the region; see the Green-e Web site for more details).

On-site renewable generation. On-site renewable generation refers to electricity generated by renewable resources using a system or device located at the site where the power is used.

Peak demand. Peak demand is the maximum power consumption for a facility, measured over a short time period such as 15 minutes or an hour.

Power marketer. A power marketer is an entity that buys and sells power generated by others. A green power marketer is an electricity supplier that offers a green power product.

Renewable electricity. Renewable electricity is power generated from renewable resources and delivered through the power grid to end users.

Renewable energy certificate (REC). A renewable energy certificate (REC), also known as a *green tag* or *tradable renewable certificate*, represents the environmental, social, and other positive attributes of power generated by renewable resources. For example, RECs may represent the emissions avoided by renewable power generation compared with those of conventional sources. RECs can be purchased separately from electricity service.

Renewable energy resources. Renewable energy sources, such as wind, solar, geothermal, hydropower, and various forms of biomass, are continuously replenished on the earth. Some definitions also include municipal solid waste as a renewable resource.

Renewable portfolio standard (RPS). A renewable portfolio standard (RPS) is a regulatory mandate or target stating that a minimum percentage or amount of each electricity supplier's resource portfolio must come from renewable energy.

Appendix A
Green Power Considerations for Federal Agencies

Purchasing green power means making a difference by changing the way we select basic commodities. For the federal government, the largest consumer of electricity in the United States with an annual electricity bill of approximately $3.5 billion, the ability to make a difference is enormous. This appendix discusses considerations specific to federal agencies that buy green power.

When green power first became available, federal agencies were uncertain about what authority they could use to justify paying a premium for these products. Now, however, this uncertainty has largely been dispelled, for several reasons. First, Executive Order 13123 (see text box below) clarifies the federal government's interest in renewable energy by directing agencies to "strive to expand the use of renewable energy within its facilities and in its activities by . . . purchasing electricity from renewable energy sources." Second, as directed by Executive Order 13123, through a collaborative process, the Secretary of Energy set a goal for the federal government to meet the equivalent of 2.5 percent of its facilities' electricity consumption with new renewable energy sources by 2005.[1] Finally, the authority for purchasing renewable energy has been incorporated into the Federal Acquisition Regulations (FAR, subpart 23.2), carrying the force of law (see www.arnet.gov/far).

Executive Order 13123

Sec. 204. Renewable Energy. Each agency shall strive to expand the use of renewable energy within its facilities and in its activities by implementing renewable energy projects and by purchasing electricity from renewable energy sources.

Sec. 301. Annual Budget Submission. Each agency's budget submission to OMB shall specifically request funding necessary to achieve the goals of this order.

Sec. 404. Electricity Use. To advance the greenhouse gas and renewable energy goals of this order, and reduce source energy use, each agency shall strive to use electricity from clean, efficient, and renewable energy sources.

(b) Reduced Greenhouse Gas Intensity of Electric Power....Agencies shall consider the greenhouse gas intensity of the source of the electricity and strive to minimize the greenhouse gas intensity of purchased electricity.

(c) Purchasing Electricity from Renewable Energy Sources.

(1) Each agency shall evaluate its current use of electricity from renewable energy sources and report this level in its annual report to the President. Based on this review, each agency should adopt policies and pursue projects that increase the use of such electricity. Agencies should include provisions for the purchase of electricity from renewable energy sources as a component of their requests for bids whenever procuring electricity. Agencies may use savings from energy efficiency projects to pay additional incremental costs of electricity from renewable energy sources.

Sec. 406(c) Retention of Savings and Rebates. Agencies granted statutory authority to retain a portion of savings generated from efficient energy and water management are encouraged to permit the retention of the savings at the facility or site where the savings occur to provide greater incentive for that facility and its site managers to undertake more energy management initiatives, invest in renewable energy systems, and purchase electricity from renewable energy sources.

Sec. 605. Amendments to Federal Regulations. The Federal Acquisition Regulation and other Federal regulations shall be amended to reflect changes made by this order, including an amendment to facilitate agency purchases of electricity from renewable energy sources.

[1] New renewable energy covers any renewable energy acquired by the federal government after 1990 (www.eere.energy.gov/femp/technologies/renewable_fedrequire.cfm).

As a result of these developments, a number of agencies have successfully bought green power in most regions of the country. These purchases account for approximately 50 percent of the total federal renewable energy use, with the remainder consisting of on-site renewable power, thermal generation, and biofuels (summarized in table A-1). Considering all sources, as of July 2004 the federal government had fulfilled more than 80 percent of its 2005 renewable energy goal. By reading this guidebook and taking advantage of the technical support provided by the Department of Energy's (DOE) Federal Energy Management Program (FEMP), energy managers are taking an important step in helping the federal government achieve its renewable usage goals.

Agencies that are interested in participating in procurements run by the General Services Administration (GSA), the Defense Energy Support Center (DESC), or the Western Area Power Administration (Western) should read the section "Procurement Approaches to Renewable Electricity and Certificates" in this appendix.

Federal Definitions of Renewable Energy

In order to meet the federal 2005 renewable use goal, Executive Order 13123 (sec. 710) and FAR subpart 2.1 define renewable energy as "energy produced by solar, wind, geothermal, and biomass power." DOE's definition of biomass resources, as defined under the Biomass Research and Development Act of 2000, is "organic matter available on a renewable or recurring basis, including agricultural crops and trees, wood and wood wastes and residues, plants (including aquatic plants), grasses, residues, fibers, and animal wastes, municipal wastes, and other waste materials."

FEMP provides guidance on renewable resource definitions and other issues relating to Executive Order 13123's renewable use goal on its Web site (www.eere.energy.gov/femp/technologies/renewable_energy.cfm). Note that FEMP guidance is subject to change.

Table A-1: Federal Renewable Technologies and Purchases, July 2004

Source	Annual Energy Contribution (GWh)
Biomass fuels	106
Biomass power	92
Biomass thermal	108
Green power purchases	668
Ground-source heat pump	179
Photovoltaics	28
Solar thermal	10
Wind	19
Total	1210

Source: DOE/FEMP.

Federal Motivations for Green Power Purchases

Owing to the large volume of electricity consumed by the federal government, even a slightly greater percentage of green power can have a large benefit for the environment and the overall green power market. In addition to the benefits discussed earlier in this guidebook, green power purchases by federal agencies provide benefits specific to federal customers.

Benefits accruing directly to a federal agency from a renewable energy purchase include

- **Compliance with federal goals.** Executive Order 13123 and the resulting federal renewable energy directive have three energy management goals: energy efficiency, greenhouse gas reduction, and the use of renewable energy. Purchasing green power or installing on-site generation can help an agency meet all three of these goals.
- **Increased visibility.** Presidential awards are given to those agency energy management teams that strive to comply with Executive Order 13123. Energy scorecards for each agency are tallied to gauge the degree of compliance. Members of the EPA's Green Power Partnership also are eligible for awards.
- **Accomplishment of an agency's organizational mission.** Many in the federal government understand the government's overall mission to include a commitment to environmental protection. Beyond that general obligation, individual agencies, such as the EPA, have the specific mission of protecting the environment. Renewable energy purchases are one way to help fulfill both goals.
- **Demonstrate responsiveness and leadership.** The purchase of renewable energy represents a clear demonstration of the agency's responsiveness to its customers (or citizens), the majority of whom, according to several surveys, favor renewable energy. The federal govern-

ment has shown that it can be a leader in the area of green power and renewable energy.

Social benefits of federal purchases include the following:

- **National security.** National security is one of the principal responsibilities of the federal government. By purchasing domestically produced renewable energy, all federal agencies can contribute to the nation's energy security. Because of the special role of government facilities in national security, the use of distributed, on-site power generation resources at these facilities enhances the country's overall security.

- **Market transformation.** Given the size of the federal government's utility bill, significant purchases of green power by federal agencies would stimulate the overall green power market. A strong federal demand would demonstrate that switching to renewable energy was a national priority, would call attention to green power's societal and customer benefits, might increase the availability of renewable power products, and might help reduce their cost. The size of the federal government amplifies any benefits resulting from a purchase of green power.

Sources of and Limits to the Federal Authority to Purchase Green Power

Executive Order 13123

Executive Order 13123 provides the fundamental authority for federal agencies to buy green power. The goals of this order have been incorporated into the FAR.

FAR Part 23

FAR part 23 seeks to minimize the environmental impacts of federal purchases. Subpart 23.2 addresses energy and water efficiency and renewable energy and has been modified to incorporate much of Executive Order 13123. This subpart states, "The Government's policy is to acquire supplies and services that promote energy and water efficiency, advance the use of renewable energy products, and help foster markets for emerging technologies." Subpart 23.7 directs agencies to contract for environmentally preferable and energy-efficient products and services. "Environmentally preferable" is defined by FAR subpart 2.101 to mean "products or services that have a lesser or reduced effect on human health and the environment when compared with competing products or services that serve the same purpose. This comparison may consider raw materials acquisition, production, manufacturing, packaging, distribution, reuse, operation, maintenance, or disposal of the product or service."

Cost Minimization and Best Value

The FAR has traditionally focused on minimizing the government's costs by strongly favoring the procurement of the least expensive goods and services, often leaving contracting officers little room to consider value. Procurement reform during the 1990s, however, more closely aligned federal acquisition procedures with the commercial sector's practices through a stated preference for commercial products and the adoption of commercial business practices.

In addition, the traditional focus on least cost procurement has shifted to obtaining the best value (FAR part 1.102[a]). In determining best value, contracting officers can consider an array of factors besides cost, such as environmental and energy efficiency (FAR part 8.404[b][2]). As formally defined in the FAR (part 2.101), best value means "the expected outcome of an acquisition that, in the Government's estimation, provides the greatest overall benefit in response to the requirement."

Specification of Requirements

Part 11 of the FAR, "Describing Agency Needs," states that environmental objectives, including the purchase of products and services that use renewable energy technologies, must be considered when specifying requirements (FAR part 11.002[d]). Requirements for renewable energy should be specific enough to limit the number of factors in competing offers to be evaluated but general enough so as not to jeopardize the product's status as a "commercial item." In general, as the requirements become more specifically defined, the importance of price relative to other considerations increases (FAR part 15.101).

Commercial Items

In restructured electricity markets, the most direct path to a renewable energy purchase is to make use of the "commercial items" provisions in FAR part 12. Commercial items are broadly defined as goods and services sold competitively in the commercial marketplace in substantial quantities (FAR subpart 2.101). Since an active competitive market reduces procurement risks, agencies are strongly encouraged to favor the purchase of commercial items, through both specific language to that effect and the authorization to use less stringent acquisition procedures.

With large volumes being commercially traded in public markets each day, electricity is undisputed as a standard commercial item. But as a specific type of electricity, renewable

energy's status as a commercial item is slightly less certain. Support for such a designation is aided by the ongoing development of active renewable energy exchanges in which commercial entities buy and sell renewable energy in large quantities.

Even in the absence of an active renewable energy market, agencies may specify a requirement for electricity (the standard commercial item) generated from renewable resources (a specification in addition to the standard commercial item). In most cases, the favorable contracting procedures afforded to commercial items would still be applicable. While the boundary between what is and is not considered a commercial item is often case specific, in general an agency should be wary of specifying any requirement beyond what is currently commercially available.

In addition, certification efforts by state and nongovernmental organizations are helping establish renewable energy as a commercial item by establishing a brand name. Third-party certification provides additional value to the federal government because of functions such as verification and annual audits to ensure no double counting. When buying green power for federal agencies, the GSA and DESC routinely use the commercial item designation and require third-party verification.

Innovative Purchase Opportunities

Even though the procurement of green power has become common enough that it is generally not "innovative," in some situations the methods just outlined do not apply, and so innovative methods are needed to implement a purchase. The Federal Acquisition Streamlining Act of 1994 and the Federal Acquisition Reform Act of 1996 encourage contracting officers to take initiative and pursue opportunities that they believe to be in the best interests of the government (FAR 1.102[d]).

Procurement Approaches to Renewable Electricity and Certificates

Restructured/Competitive Markets

In a competitive market, agencies must use competitive acquisition procedures to "shop" for renewable energy from a variety of providers. Since an agency will be evaluating competing offers, normal solicitation procedures must be followed. Federal agencies should follow one of two solicitation approaches: using designated contracting agencies, such as the GSA, the DESC, or, in some cases, Western; or serving as the contracting agency themselves. Although serving as the contracting agency offers more control and flexibility, the designated contracting agencies have gained significant expertise in the area of competitive electricity power procurement, including renewables.

Fully Regulated Markets

Where retail competition is not available, federal agencies may be able to buy green power through a green-pricing program offered by their local utility. If such a program exists, agencies should find out the specific enrollment or sign-up procedures. If a GSA areawide contract (AWC) is already in place with this utility, the agency should complete the utility's green-pricing contract, as well as the AWC Exhibit A contract. A competitive solicitation is not required, since it is a utility service.

Renewable Energy Certificates

Federal agencies can buy green power through renewable energy certificates throughout the country and in some foreign locations. Since a variety of suppliers offer RECs, normal solicitation procedures must be followed. Both GSA and DESC have experience with REC procurements.

Using GSA or DESC

GSA Power Procurement Services

GSA has assisted many federal agencies in the procurement of green power, and its ability to aggregate renewable requirements for many agencies may result in lower prices.

In restructured electricity markets, GSA helps identify federal facilities that use large amounts of electricity in a manner that is regarded favorably by the competitive energy service providers. For these customers, GSA seeks specific prices for those facilities and works with the facility managers to devise strategies that may result in lower long-term electricity prices in the restructured marketplace. Using these strategies, GSA has also made significant progress in making renewable energy available at competitive market prices for both renewable electricity and REC products. In addition, GSA is developing a variable-priced REC product that may provide additional financial value to purchasers.

One of the easier ways for federal agencies to buy green power is through the GSA's federal supply schedules (FSS), multiple award schedules. Green power and renewable energy have been added to the federal supply schedule under three different special item numbers (SINs). SIN 871-204 addresses "Managing the Procurement and Use of Electricity," which includes electricity from both renewable and nonrenewable sources. SIN 871-203 addresses "Managing the Procurement and Use of Natural Gas," which includes gas from both renewable and nonrenewable sources. SIN 871-299 covers

New Products/Services. The last supply schedule would be applicable to on-site generation resources that use renewably generated methane gas (such as landfill gas). Renewable energy certificates are also being added to the schedule under SIN 871-204 and SIN 871-299.

Supply schedules have several features that make them particularly well suited to serve the needs of those buying electricity in a restructured market:

- Multiple award schedules (MAS) list competing contractors offering comparable products and services. MAS contracts are awarded to all companies offering commercial items whose price has been determined by the GSA to be fair. The use of MAS is considered a competitive procedure under FAR 6.102[d][3].
- Maximum order limitations have been removed and replaced with maximum order thresholds, beyond which an agency is required to seek a price reduction from the contractor (FAR 8.404[3]).
- MAS contracts are priced on a most-favored commercial customer basis, and a price reduction clause requires the contractor to lower the agency's price in accordance with any corresponding price reductions to its most-favored commercial customer.

For the latest information on Federal Supply Schedules, go to www.gsa.gov/energyservices.

For details on the schedules just described, go to www.gsaelibrary.gsa.gov and search for the special item numbers listed above.

DESC Power Procurement Services

Under the DESC Electricity Program, solicitations may be issued for competitive power and/or RECs in states that have approved and implemented deregulation/restructuring and for RECs in states that have not implemented retail access.

DESC:

- Procures electricity for Department of Defense and federal civilian activities.
- Uses aggregation to attract market interest without customer cross-subsidization.
- Works with customers to identify risk preferences and risk-mitigation plans.
- Tailors each solicitation to market conditions and customer requirements.
- Conducts "best value" acquisitions.
- Competitively buys RECs in accordance with federal acquisition regulations.
- Contracts for Economic Load Response Services.
- Uses various pricing methods: fixed price, index, and Locational Marginal Pricing.
- Has more than six years of experience procuring power for the federal government.
- Performs contract administration functions.

DESC's program uses commercial practices for its solicitations and procurement strategy, which has been central to successfully engaging the market. In addition, DESC's program is flexible enough to support unusual and/or "out of the box" customer requests and requirements while complying fully with applicable procurement regulations. To view ongoing DESC solicitations or to find contact information for DESC's electricity acquisition team, go to www.desc.dla.mil.

Western Green Power Products

Western offers two types of renewable products to federal agencies. Facilities located in Western's 15-state western service territory can buy renewable electricity directly from Western even if they are not currently Western allocation customers. Regardless of location, federal agencies can purchase renewable energy certificates[2] from Western. For more information about these programs, see the Western's Web site at www.wapa.gov/powerm/pmrenpro.htm.

Agency Procurement

If an agency does not deem it advantageous to request assistance from the GSA, DESC, or Western, it may contract separately for electric service. In this case, the purchase should meet the requirements of FAR part 12 as described in the section "Commercial Items."

[2] These certificates are a type of REC but cannot be traded because they are available only to federal customers.

Federal Assistance for On-Site Renewable Generation Projects

On-site renewable generation projects face different issues than do power purchases, which may hinder their implementation. To help federal agencies tap the renewable resources that are available at their facilities, FEMP offers several programs to assist with on-site generation projects.

Renewable Resource Assessment

To help facility managers assess the quality of renewable energy resources at their location, FEMP is working with resource assessment specialists to draw renewable resource maps for several different renewable energy technologies (available on FEMP's Web site).

The maps show where each renewable technology is cost-effective for federal facilities under differing assumptions about electricity prices and renewable system prices. For example, the maps for solar water heating indicate that at current electricity rates, more than 60 percent of the federal facilities in the nation could install a cost-effective solar system, whereas at electric utility rates of $0.10/kWh or more, solar water-heating systems would be cost-effective for almost any kind of federal facility.

Design Assistance and Training

FEMP can also help design renewable energy projects, especially those designated as Federal Energy Saver Showcases. This design assistance includes reviewing plans and specifications, developing product specifications, sizing systems, and drawing up guidelines for a project's costs. Some services are available on a for-fee basis.

FEMP also offers two renewable-energy training courses:

- "Implementing Renewable Energy Projects" is an overview of the technologies, covering costs and other factors to consider when selecting a system.
- "Design Strategies for Low-Energy, Sustainable, Secure Buildings" focuses on whole-building designs that integrate daylighting, energy-efficient equipment, and passive solar strategies for new federal buildings.

Funding Assistance

Financing can be a problem when appropriations for new projects are limited. Once a year, FEMP announces a "call for projects," in which federal agencies participate in a competitive selection process for technical assistance on their renewable energy projects. This funding is not for system purchases, but FEMP does help some project teams acquire additional project financing if needed.

In its annual Distributed Energy Resources (DER) call for projects, FEMP offers funds for technical assistance. Both on-grid and off-grid renewable energy systems qualify as DER technologies.

Agencies also may participate in FEMP's alternative financing programs, through which the contractor pays the up-front costs of an energy efficiency or renewable energy project and is repaid over the term of the contract from the agency's guaranteed energy cost savings. Agencies can obtain financing for biomass fuels, geothermal heat pumps, parabolic-trough solar collectors, and PV systems through these contracting vehicles.

Facilitated Projects

FEMP also encourages agencies to facilitate large projects that serve the needs of federal agency customers and that count toward the federal renewable energy goal. An example is a large renewable energy project on the tribal land of Native Americans served by the Bureau of Indian Affairs. Currently, the federal government has implemented 2 GWh of facilitated renewable energy projects, and about 740 GWh are pending.

Facilities in western states should contact the Bureau of Land Management (BLM) about opportunities to collaborate on a facilitated renewable energy project on federal land. FEMP and BLM recently identified those federal lands with the best potential for renewable energy projects (this study is available from FEMP's Web site). Because these projects are usually much larger than on-site projects, their contribution to the federal goal can be significant. However, facilitated projects do not require the direct federal purchase of renewables and therefore may be subject to different treatment in the future under the renewable purchase goals.

Key Elements of a Successful Procurement or On-site Installation

Based on several years of experience buying green power and installing on-site renewable energy systems, certain lessons for federal agencies have emerged.

Stakeholder Involvement

Green power advocates must get agreement in advance from stakeholders such as comptrollers, energy managers, and key decision makers. The stakeholders must participate in the

decision process and make reasoned, balanced decisions. It is important to be honest and clear about the project's renewable sources and benefits.

Cost Control

Executive Order 13123 specifically allows the savings from energy efficiency to be used to pay for renewable energy. Agencies are encouraged to consider using some of the savings from Energy Savings Performance Contracts (ESPC) or Utility Energy Service Contracts (UESC) to buy renewable power. Buying RECs is generally the least expensive way to purchase green power, but agencies should consider making at least a small purchase through their local utility if they have a program. Agencies should submit a budget request to cover any remaining cost premium (per E.O. 13123, sec. 301).

Developing an Effective Solicitation

An agency's electricity consumption data should be part of any RFP and are required by the GSA, DESC, and Western when they help with the procurement. The purchasing agency should notify renewable power suppliers of the RFP and hold a preproposal meeting with prospective suppliers if the procurement is not standard.

Load Aggregation

Combining several facilities into one acquisition can lead to big purchases, but it is best to target these aggregation efforts only to big users. Trying to aggregate many smaller users can be difficult. It also is best to keep the procurement simple.

Supplier Relations

Utility green pricing should be seen as a partnership in which the utility and the federal purchaser work together to construct a program that meets both their needs. Investor-owned utilities are usually not able to launch their own green power programs without PUC approval. However, a large federal customer could help persuade a utility to develop a new program that would then be made available to other customers. For all electricity suppliers, federal agencies should consider requesting a customized product, in order to take advantage of large purchasing volumes.

Capturing the Benefits of the Purchase

After successfully completing a green power purchase, a federal agency usually wants to publicize its efforts. In addition to the publicity messages available to other institutions, federal agencies can spread the word that the agency is working to fulfill its part of the federal renewable energy goal. Agencies with exemplary energy management programs are eligible for FEMP awards, which enhance an agency's image both inside and outside the government.

Federal agencies are required to report annually on their progress toward meeting their energy management goals. FEMP has published guidelines for counting green power purchases and on-site renewable energy toward an agency's energy management goals (www.eere.energy.gov/femp/technologies/renewable_fedrequire.cfm).

Information for Potential Suppliers to the Federal Government

All federal government procurements are made competitively unless there is a compelling reason for a sole-source contract. FEMP maintains a renewable supplier list used for renewable electricity procurement notifications. Renewable energy suppliers should contact Chandra Shah, listed in the resources section of this appendix, to be added to this list. The GSA (Ken Shutika) and the DESC (John Nelson) also maintain notification lists, which are important because the GSA and DESC make most of the electricity and renewable procurements for federal sites.

Prospective suppliers are asked to provide information about their company such as completed, in progress, and planned renewable projects (type, location, size, third-party certification, etc). Suppliers also should include additional information about any projects that they believe justify a sole-source contract.

Summary of Green Power Opportunities for the Federal Government

The benefits of renewable energy are enormous, and as the nation's largest purchaser of electricity, the federal government can have a significant impact on the way that power is produced now and in the future. Federal agencies already have an unprecedented and growing range of options for purchasing renewable energy, and Executive Order 13123 directs federal agencies to increase their use of renewable energy. With more emphasis on "best value" purchasing and the explicit consideration of environmental characteristics, contracting officers now have more options than ever before to buy renewable energy. Acting in the government's—and society's—best interests, federal agencies can take advantage of

the strategies outlined in this guidebook to help move the United States toward a more sustainable energy future.

Federal Resources for Green Power Information

For federal agencies buying green power, assistance is available from the following federal agencies and national labs:

DOE Regional Office FEMP representative:
www.eere.energy.gov/femp/about/regionalfemp.cfm.

Green Power Network:
www.eere.energy.gov/greenpower.

FEMP Web sites:

Renewable energy: www.eere.energy.gov/femp/technologies/renewable_energy.cfm.

Renewable purchasing: www.eere.energy.gov/femp/technologies/renewable_purchasepower.cfm.

Design assistance: www.eere.energy.gov/femp/services/projectassistance.cfm.

Training: www.eere.energy.gov/femp/technologies/renewable_training.cfm.

Financing:
www.eere.energy.gov/femp/services/project_facilitation.cfm.

For assistance with program resources:

Department of Energy, Federal Energy Management Program
David McAndrew, Renewable Purchasing (202) 586-7722
Anne Sprunt Crawley, Technical Assistance (202) 586-1505

For assistance issuing solicitations:

General Services Administration
Ken Shutika (202) 260-9713
ken.shutika@gsa.gov

Defense Energy Support Center
John Nelson (703) 767-8669
john.nelson@dla.mil

Western Area Power Administration's Federal Renewable Program
www.wapa.gov/powerm/pmrenpro.htm
Mike Cowan (720) 962-7245
cowan@wapa.gov

For technical assistance, including market intelligence, market rules, and the development of requirements and statements of work, contact

Lawrence Berkeley National Laboratory
William Golove (510) 486-5229
WHGolove@lbl.gov

National Renewable Energy Laboratory
Chandra Shah (303) 384-7557
chandra_shah@nrel.gov

For more information or assistance in developing a plan to enhance the security of federal facilities through the use of renewable energy, contact

John Thornton
Energy Assurance R&D Coordinator
homelandsecuritycoordinator@nrel.gov (303) 384-6469

Nancy Carlisle
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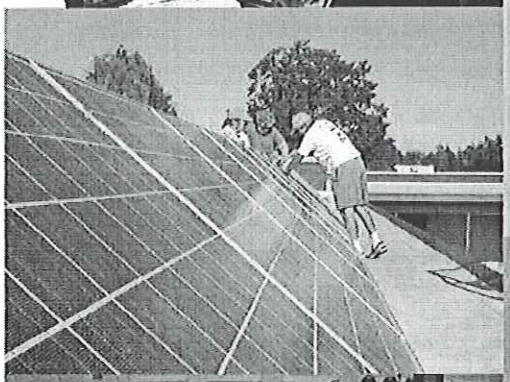

CORVALLIS sustainability COALITION

Community Sustainability Final Action Plan

Focus on the *future*
Action in the *present*

December 15, 2008

ACKNOWLEDGEMENTS

Corvallis Sustainability Coalition

Steering Committee

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Annette Mills*, Co-Facilitator	League of Women Voters
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Karl Walker**	CH2MHill
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Jason Yaich**	Seventh Generation Green Building Guild

*** Executive Committee**
****Former Steering Committee Members**

Corvallis City Council Liaisons

Dan Brown
Trish Daniels

ACKNOWLEDGEMENTS (continued)

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Education	Larry Plotkin and Kari vanZee
Energy	Theresa Gibney, Betsy Glenn, Ryan Harbert and Jim Phelps
Food	Anna Cates and Barbara Grant
Health & Human Services	Cheryl Good
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Transportation	Jim Gouveia and Mark Kacmarcik
Waste	Bill Fleck and Paul Tostberg
Water	John McEvoy and Jay Thatcher

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- Nancy Marshall, Graphic Designer

AXIS Performance Group
- Marsha Willard, Ph.D, CEO

Zero Waste Alliance
- Dorothy Atwood, Project Manager

The Performance Group
- Walt Roberts, Keypad Polling

Primary Sponsor (see Appendix B for other sponsors)

City of Corvallis

The Corvallis Sustainability Coalition wishes to extend a special thanks to the many citizens of Corvallis and Benton County who gave their time and energy to this process.

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FOREWORD

We live at a pivotal moment in the story of humankind. For thousands of years, we have utilized the earth's abundant resources to meet our needs. But now, nearly 300 years into the Industrial Revolution, we are starting to see the limits of what the earth can provide. The signs are all around us. We can choose to ignore these signs and wait until we are forced to react. Or we can seize this opportunity to work together to create a sustainable world.

This action plan represents the decision on the part of hundreds of residents and dozens of organizations in Corvallis, Oregon to choose the path toward a sustainable future. No one knows for sure what a sustainable world will look like. But the promise of low-impact, high-quality lives for our children and grandchildren is too important an opportunity to ignore.

At the Town Hall meeting on March 31, 2008, that launched this community-wide effort, Corvallis Mayor Charlie Tomlinson challenged an audience of over 600 area residents to join this quest:

"This is the most difficult thing, the most important thing that our community will embark upon over the next number of years – to create a plan that envisions a sustainable Corvallis, a community that understands its impact in the world, a community that understands that it can be a role model for communities across America and across the world."

And the participants responded to his call with enthusiasm, energy, and a willingness to put in long hours and hard work. The result is an impressive collection of long-range, visionary goals paired with practical strategies that will help move us toward those goals.

For the past several years, Corvallis has established itself as a leader in sustainability. The City has received numerous awards for its efforts in this area. This action plan seeks to build on all of the great work that has already been done.

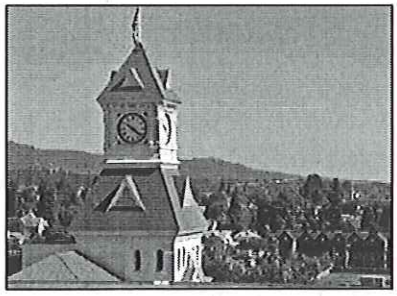
Betty Griffiths, Co-facilitator
Corvallis Sustainability Coalition

Annette Mills, Co-facilitator
Corvallis Sustainability Coalition

EXECUTIVE SUMMARY

The Corvallis Sustainability Coalition (Coalition) was formed in 2007 to bring together businesses, non-profits, faith communities, educational institutions, and government entities in the Corvallis/Benton County area to accelerate the creation of a sustainable community – one that values environmental quality, social equity, and economic vitality. Participation in the Coalition is open to local organizations and individuals who support its vision, mission, goals and guiding objectives. As of December 2008, the Coalition has 135 partner organizations.

The Coalition uses a concept of sustainability that views the economic and social realms as fully embedded in and limited by the natural world. The Coalition has adopted four guiding objectives based on the Natural Step framework. These objectives provide a comprehensive systems approach to decision making. Sustainable decisions do not allow trade-offs between economy, society and the environment, but rather create multiple benefits.



The Coalition's work follows a tradition of sustainability efforts by the City of Corvallis and other community groups. Gathering public input and involving community members in the development of this Action Plan were central elements of the 2008 action planning process, which engaged hundreds of community members and volunteers in exploring what is required to create a sustainable community.

The Sustainability Coalition sponsored three Town Hall meetings over eight months to engage a broad base of citizens. Town Hall attendance ranged from 350 to 600 participants. A variety of communication tools were used to actively engage Coalition partners and the broader community.

Over 200 community volunteers served as Work Group members who worked intensively between Town Halls. These groups were formed after the first Town Hall and were organized around 12 topic areas based on "The Corvallis 2020 Vision Statement". Work Groups developed visionary goals and strategies and received feedback at the following two Town Halls.

The Coalition's Action Plan, organized by these 12 topics, describes *what* needs to be done, *when* and *whose participation is needed* to achieve these goals and strategies. The plan is intended to lay the groundwork for the next several years of Coalition and community work by identifying actors and timelines for each action.

Plan implementation is being led by the Coalition. Action Teams will implement actions by working collaboratively with other teams and other organizations to further the goals. The Steering Committee will provide Coalition leadership, identify stable funding sources, coordinate annual Town Hall meetings, and publish annual updates.

This Action Plan is a "living document". It is intended to be refined and improved over time. The community will be invited to participate in modifying the plan as progress is made towards the goals.

INTRODUCTION

This Action Plan reflects a "bottom-up", community-based process in which a diverse group of residents worked together to identify our greatest challenges and the best means to address them. It is a proactive effort to address current challenges, including climate change, rising energy costs, social inequity and economic instability. This plan is the result of volunteer efforts by the Corvallis Sustainability Coalition, its partner organizations and hundreds of community members. It provides a record and description of the Coalition's work to date and outlines the goals, strategies, and actions developed. These Action Plan elements are a blueprint for a more sustainable and vibrant community.

Funding of the community-wide sustainability initiative has been provided by Coalition partners who have served as "sponsors." The City of Corvallis is the Coalition's primary sponsor. Other highly-valued partner organizations and individuals who have supported the action planning process are listed in Appendix C.

CONTEXT

"Whatever befalls the earth befalls the people of earth. The earth does not belong to man, man belongs to the earth. All things are connected like the blood which unites one family. Man did not weave the web of life; he is merely a strand in it. Whatever he does to the web, he does to himself."
Chief Seattle

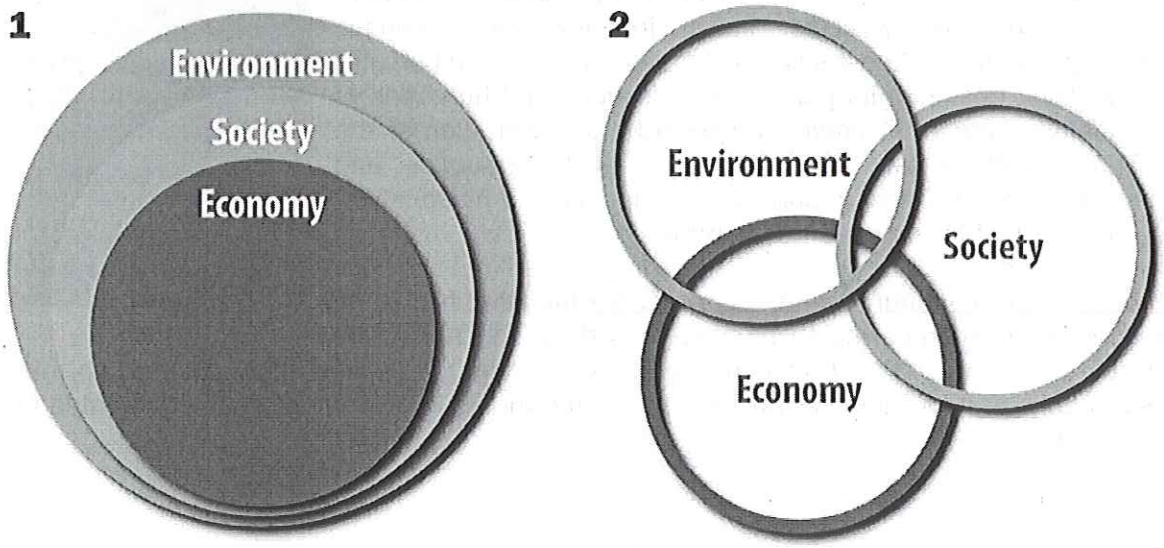
What Is Sustainability? Environment, Society and Economy

The word "sustainability" is being used more frequently, but is still not commonly understood. Sustainability has been described in many ways:

- "Meeting the needs of the present without compromising the ability of future generations to meet their own needs," *The Brundtland Commission, World Commission on Environment and Development, 1983.*
- "Living well within the limits of nature," *Mathis Wackernagel, author of Sharing Nature's Interest.*
- "Using natural, financial and human resources in a responsible manner that meets existing needs without compromising the ability of future generations to meet their own needs," *City of Corvallis.*

Regardless of the definition, sustainability encompasses three realms—environmental, social and economic. Instead of allowing trade-offs between these realms, (jobs or the environment; economic growth or environmental health, development or habitat), sustainability aims to optimize all three. These three are inter-related and inter-dependent. For example, without a healthy environment, we deplete the resources upon which our economy depends and contribute to human illness. Without a healthy economy, unemployment will be high, leading to a host of social problems.

The two graphics below illustrate different ways of looking at the same approach.



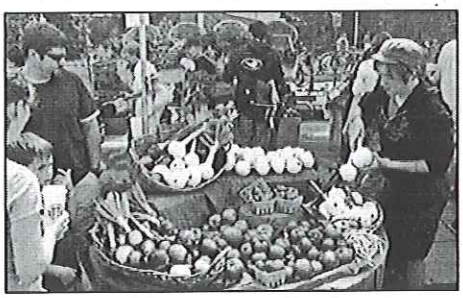
The approach that the Coalition emphasizes (the three nested circles in graphic 1) does not imply that the environment is the most important element; rather it is intended to reflect the following relationship. The economy is a human construct that was created to enable and facilitate certain social functions, primarily trade and the provision of basic human needs. An economy is a system of rules and agreements designed to allow us to do business with each other. It serves a larger social need, as shown by the circle residing within the larger circle labeled society.

Society is the collection of values, laws, cultural distinctions and other norms that define, facilitate, and govern our human interactions. Humans developed these to enable us to live and thrive in harmony.

Both of these areas – our economy and society – exist within the natural realm. Everything we do, make, touch or use comes directly or indirectly from nature. Nature defines the limits and laws within which we have to operate. A basic premise of sustainability is that the economy is a "wholly owned subsidiary" of nature, since it must operate within nature's laws.

The model showing three equal, overlapping circles inadvertently reinforces the misconception that the laws of nature are subordinate to our human laws and constructs

(society and economy). The embedded circles reinforce that human society is subordinate to nature. Optimal decision-making is based on accurately understanding the relationships between the three.



At its most basic level, sustainability means we need to live in a manner that meets our current needs without jeopardizing our children's and their children's ability to meet their needs. Sustainability is not just an environmental issue; it is the recognition of the connections between our environmental health, our social well-being, and our economic viability. Decisions and actions that sacrifice one or two of these for another are simply not sustainable.

By using a sustainability-based systems approach, we can:

1. Share a mental model of how the world works based on scientific principles.
2. See the world more holistically.
3. Consider how actions can provide multiple benefits – not just winners and losers.
4. Broaden community engagement because everyone has a stake in sustainability.
5. Develop innovative solutions to the challenges we face as a community and as a civilization.
6. Encourage new enterprises, products and services that address the challenges of becoming more sustainable.

The Natural Step Framework and Guiding Objectives

The Coalition has adopted four guiding objectives as the basis for its vision of a sustainable community. The guiding objectives are based on The Natural Step's four system conditions. The Natural Step is a comprehensive framework that identifies unsustainable aspects of human behavior and prescribes the conditions that we need to meet in order to return to a sustainable relationship with the earth and society. It is important to note that these guiding objectives are not edicts, but guides that help us redesign our activities to be in alignment with the laws of nature. The four guiding objectives adopted by the Coalition are listed below.

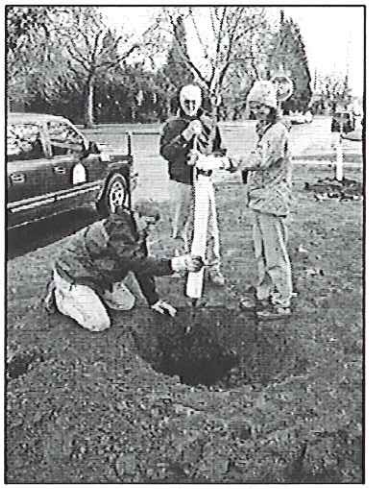
1. Reduce and ultimately eliminate our community's contribution to fossil fuel dependence and wasteful use of scarce metals and minerals. Use renewable resources whenever possible.
2. Reduce and ultimately eliminate our community's contribution to dependence upon persistent chemicals and wasteful use of synthetic substances. Use biologically safe products whenever possible.
3. Reduce and ultimately eliminate our community's contribution to encroachment upon nature, e.g., land, water, wildlife, forests, soil, ecosystems. Protect natural ecosystems.
4. Support people's capacity to meet their basic needs fairly and efficiently.

BACKGROUND

The City of Corvallis has laid the foundation for moving towards becoming a more sustainable community. In 1998, "The Corvallis 2020 Vision Statement" was adopted following a community-wide visioning process. In 2003, the City Council adopted an overarching goal of sustainability and the following year adopted a sustainability policy. In 2005, the City Council adopted a goal to enhance organizational sustainability efforts and hired a consultant to help develop a strategy to implement this goal. In 2006, the Council approved funding to hire a sustainability coordinator to develop a sustainability management plan for city government. During this time, residents have increased their knowledge of the relationship between our environment, society and economy and have increased their concern regarding the long-term impacts of our decisions. This has led to the awareness of the need for coordinated community-based actions to address the issues of environmental protection, social equity and economic stability.

The impetus for this Action Plan came from the Corvallis Sustainability Coalition, a local grassroots organization formed in 2007 that operates under the auspices of the Oregon Natural Step Network. The Coalition is a network of partner organizations working together to accelerate the creation of a sustainable community. As of December, 2008, there were 135 partner organizations. See Appendix D for detailed Coalition background.

The Coalition asked the 2007-2008 Corvallis City Council to adopt a goal related to community sustainability, and the Council responded by adopting a goal to "Enhance organizational sustainability efforts and begin to develop a community-wide sustainability initiative." The Coalition was identified as the group to partner with the City of Corvallis on implementation of this Council goal. The partner agreement between the City of Corvallis and the Coalition stipulates that "To best position Corvallis to begin implementing Vision 2020, the partners will work together to develop a Sustainability Action Plan targeted for completion by December 2008." This Action Plan builds upon "The Corvallis Vision 2020 Statement" which draws a picture of the desired Corvallis community in the future. Though Vision 2020 does not refer to "sustainability", many of its objectives relate directly to goals encompassed within the context of sustainability. The partnership agreement acknowledges that progress toward a more sustainable community may only be achieved through collective and focused action.



During 2008, the Coalition with the assistance of consultants from Cogan Owens Cogan led an action planning process to establish a comprehensive action strategy that is integrated across environmental, social and economic spheres of our community. Key elements of this planning process have been community participation, assessment of current conditions, and establishing specific goals, strategies and actions that can be monitored and reported. This plan is the result of this process.

PROCESS

Principles of Coalition Process

The process of developing a Sustainability Action Plan for Corvallis was envisioned as an inclusive, community-wide initiative involving a broad cross-section of the community. Representatives of diverse organizations collaborated to organize and implement a democratic, highly-participatory, transparent public planning process focused on three Town Hall meetings and interim Work Group efforts. Hundreds of area residents were involved in this process, which was led and staffed by community volunteers who contributed thousands of person-hours to the effort. See Appendix E for process diagrams.

Outreach and Engagement

Gathering public input and involving community members in the development of the Action Plan were crucial elements of the action planning process. To create awareness and interest in the Town Hall meetings, a Communications Plan was developed by the Coalition's Communications Committee that targeted partner organizations, youth and the community-at-large. The Communications Committee developed a variety of promotional messages, tailoring them to target audiences, and utilized the following tools:

- Website – The Coalition's website (www.sustainablecorvallis.org) outlined the logistics and purpose of the Town Hall meetings and provided a means for community members to register for the meetings.
- Google Group Announcements – Announcements were sent to hundreds of partner representatives and interested community members who are part of the Sustainable Corvallis Google group.
- *E-Update* – An electronic newsletter providing news of the Town Hall meetings and other events was e-mailed to Google group members every two weeks.
- Posters – Full-color posters, in English and Spanish were posted throughout the community.
- Mini-flyers – Thousands of quarter-page flyers were distributed at community events, City Board and Commission meetings, service club meetings, and classes, and were placed at the public library and Senior Center.
- Quarterly Gatherings – Quarterly meetings of the Coalition partners in January, June and September 2008 provided an opportunity to report on plans, generate excitement, solicit input and distribute promotional materials for the Town Hall meetings. Organizational representatives were encouraged to distribute mini-flyers and to utilize articles provided by the Coalition in their newsletters.

- Presentations – Communications Committee members made announcements and/or presentations at meetings of the City Council, boards and commissions, service clubs, business and civic organizations, and high school classes.
- Public Service Announcements (PSAs) – PSAs were mailed to local radio and TV stations. In addition, announcements were posted electronically throughout the Oregon State University (OSU) community.
- Press Releases – Press releases were sent to local newspapers, including the OSU *Barometer*, and Coalition leaders met with the staff of the *Corvallis Gazette-Times* prior to each Town Hall meeting.
- Personal Contacts - One hundred discussion leaders and recorders who were recruited for the first Town Hall meeting helped spread the word through their personal and professional networks.
- Public Access TV - Coalition partner Willamette Watershed Productions organized volunteer film crews to document each of the three Town Hall meetings on a DVD. These videos have been repeatedly broadcast on local cable access channels 21 and 29.

Promotional efforts were enhanced by the Coalition's involvement in the Corvallis Energy Challenge, a partnership with the Energy Trust of Oregon, which was launched the first week of March 2008. Media focus on the Energy Challenge provided opportunities to build awareness about the community sustainability action planning process.

Town Halls and Work Groups

Since soliciting and documenting public input was an important part of the first Town Hall meeting, Steering Committee members recruited and trained 50 discussion leaders and 50 recorders. The initial objective was to have 500 people attend the first Town Hall meeting on March 31, 2008. This meeting attracted over 600 participants. During the meeting, discussion leaders encouraged participants to share their ideas for long-range goals and broad strategies and facilitated the generation of ideas for specific actions to help achieve those goals. Appendix F contains participant input from Town Hall 1. At the close of the Town Hall meeting the Coalition asked for volunteers. More than 200 people responded by joining Work Groups focused on 12 different topic areas:

- Community Inclusion
- Economic Vitality
- Education
- Energy
- Food
- Health and Human Services
- Housing
- Land Use
- Natural Areas and Wildlife
- Transportation
- Waste and Recycling
- Water

These topic areas were selected by the Steering Committee based on categories identified in the *Corvallis 2020 Vision Statement,* as well as responses of participants at Town Hall 1. Two or more facilitators were recruited to lead each Work Group. They attended an orientation session to receive training in facilitation and information regarding Work Group timeline and objectives. Work Groups met between the first and second Town Hall meetings. Their first tasks were to review the vision statements from the *Corvallis 2020 Vision Statement* and to select long-range, visionary goals for their topic area. In addition,

they reviewed the sustainability efforts already being pursued by different groups in the Corvallis community, as well as initiatives and programs in other communities.

The second Town Hall meeting on June 25, 2008, was attended by approximately 350 community members. Work Groups shared their proposed goals with Town Hall participants and solicited input to determine whether their Work Groups were moving in the right direction. Town Hall participants also brainstormed actions and indicated those they might be willing to commit to carrying out. Appendix G contains participant input from Town Hall 2.

Work Groups continued to meet between the second and third Town Hall meetings. Based on input from the second Town Hall meeting, they revised their goals and began the process of selecting actions to meet those goals. Each Work Group was asked to develop no more than three goals and to determine how each goal would be measured. Where possible, Work Group members gathered baseline metrics. For each goal, they selected up to three strategies and for each strategy, three actions. The Work Groups also reviewed related efforts currently under way in the community and acknowledged those efforts in their recommendations. Timeframes (0-2 years, 3-5 years, or 6-10 years) were designated for each action and potential key organizations were listed next to each action.

The third Town Hall meeting on October 7, 2008, was attended by approximately 400 people. The purpose was two-fold: to present the Work Group proposals and to engage attendees in committing to action. Upon entering the Town Hall meeting, each participant received a comprehensive reference guide listing the goals, strategies and actions that had been developed for the 12 topic areas.

Electronic keypad polling was utilized to introduce participants to the topic area goals, gather some demographic information and to register participants' opinions regarding which goals from each topic area should be addressed first by the community. The keypad polling information helped stimulate and inform the table conversations during the remainder of the meeting. The results of the keypad polling provided an interesting snapshot of participants and their preferences. For example, 63% of the participants were between the ages of 36 and 65 and in the areas of Food, Economic Vitality, and Land Use, participants showed a strong preference for the goals related to local products and businesses. The keypad polling at Town Hall 3 was not a scientific public opinion survey; however, it provided valuable information that will be considered by Action Teams as they determine what they will work on in 2009. See Appendix H for the complete results of the polling.

During the second part of the meeting, participants were given an opportunity to consider what actions they would commit to at home or work. Participants moved to topic area tables of their choice, reviewed the proposed strategies and actions for that topic area, and wrote them on individual "passports" they could take with them and post as a reminder of their

commitment. This was called the "Corvallis Compact". Topic area posters were posted on the walls and participants then placed dots next to those actions that they had selected. See Appendix I for results. In addition, participants were invited to sign up for topic area Action Teams to indicate their interest in collaborating with others on implementation of the Action Plan.

ACTION PLAN

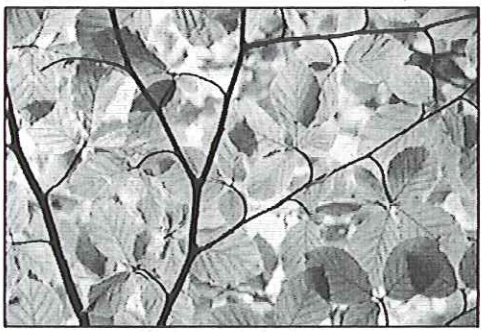
Blueprint for a Sustainable Corvallis

Action plans describe *what* needs to be done, *who* will do the work, and *when* the established goals will be achieved. This Community Sustainability Action Plan is based on the work of the 12 Coalition Work Groups and is organized by topic area. It is intended to lay the groundwork for the next several years of Coalition and community work by identifying long range goals, strategies and actions to achieve them, key organizations to work on plan implementation, and timelines for each action. Details regarding how the plan will be accomplished are included in the implementation section of this report.

This plan is a living document. It will be refined and improved over time and modified as progress is made towards the goals. The Coalition will be responsible for yearly updates to the Action Plan.

Elements of the Plan

The action plan that is outlined on the following pages includes these elements.



- *Vision*: An image or description of what the community desires to become in the future.
- *Goals*: Descriptions of the "end state" we would like to achieve. Goals are accomplished through implementation of strategies and actions.
- *Strategies*: Statements of approach or method of attaining goals and resolving specific issues. Strategies begin to answer the question, "How will we go about accomplishing our goals?" Strategies describe a general approach or method.
- *Actions*: The projects, plans or activities, ideally prioritized annually, which must be accomplished in order to achieve a stated goal. Individuals or organizations are sponsors of actions and responsible for their advancement.
- *Metrics*: A unit of measurement used to help track progress towards a goal.
- *Baseline*: The current situation or the initial set of metrics used for comparison over time.

- *Potential Key Organizations:* Organizations and/or agencies that have been identified by the Work Groups as potential implementers of the strategies that have been proposed. These lists are not exhaustive and will be modified during the course of plan implementation. The organizations that are in bold text are those that have confirmed that they wish to be listed in this plan as key organizations that are already working on or are interested in working on the strategies.

- *Timeline*: Anticipated implementation date, selected from 0-2 years, 3-5 years and 6-10 years. The elements of the plan that had not been defined as of December 15, 2008 are intentionally blank.

TOPIC AREA: COMMUNITY INCLUSION

VISION: We envision that in 2020 Corvallis will be a community that has a priority of integrating diversity; that works actively against prejudice, bigotry, and hate; that promotes social justice; and celebrates the talents and cultures of the people who live here.				Potential Key Organizations (bold = confirmed)	Timeline
Goal 1: Describe who is here in Corvallis and facilitate communication with the whole community by 2010.	Metrics:	Strategy 1: Map the community: develop a complete and accurate description of who lives here and where.	Action 1: Summarize existing data.	Health Equity Alliance; Solar Summit; Census Bureau; Benton County; Multicultural Literacy Center	
			Action 2: Inventory entities that interact with diverse populations.		
			Action 3: Contact entities for additional data and add in.		
	Baseline:	Strategy 2: Describe communication networks: understand how people get information about our community.	Action 1: Contact marketing professionals regarding known media outlets.	Corvallis Benton Chamber Coalition; Health Equity Alliance; Solar Summit; Digital City Guide; T. Gerding Construction; Timberhill Athletic Club; OSU Depts. of Anthropology and Sociology; City of Corvallis; Benton County	
			Action 2: Collect local printed materials (e.g. brochures, posters) and contact producers regarding intended audiences and to identify possible media outlets outside of the mainstream.		
			Action 3: Contact cultural organizations regarding communication networks and successful communication methods.		
		Strategy 3: Create avenues for communicating with community at large.	Action 1: Create and maintain an on-line community calendar. *(Similar to visitcorvallis.com at Corvallis Tourism.)*	Corvallis Benton Chamber Coalition; FireWorks Restaurant; First Alternative Co-op; First United Methodist Church, Corvallis; Health Equity Alliance; Solar Summit; T. Gerding Construction	
			Action 2: Create a guide for marketing community activities and make it available to organizations interested in reaching the whole community.		
			Action 3: Compile a resource directory including service providers and cultural resources. *(Similar to county-wide resource directory produced by LOVE Inc. or Community Consortium)*		
Goal 2: Foster understanding and respect for all members of our community through new community events by 2010.	Metrics:	Strategy 1: Develop an annual multicultural bazaar.	Action 1: Indentify organizations interested in collaborating.	First United Methodist Church, Corvallis; Solar Summit; LBCC Diversity Engagement Council; OSU Office of Community and Diversity; ASOSU, OSU Cultural and Resource Centers; City of Corvallis; Benton County; Multicultural Literacy Center; Community Alliance for Diversity; Employer Diversity Partnership	
			Action 2: Plan funding and logistics.		
	Baseline:	Strategy 2: Coordinate a high-profile series of events around a "culture of the month theme. *(Similar to OSU Life-long Learners Program and Montessori international curriculum)*	Action 1: Contact potential participating organizations such as: storytellers, art organizations, local performance groups (theater and music), restaurants, public library, lifelong learners, OSU organizations (student, faculty, alumni), youth organizations, business organizations, faith organizations, GT.	FireWorks Restaurant; Solar Summit; Timberhill Athletic Club; LBCC Diversity Engagement Council; OSU Office of Community and Diversity; ASOSU, OSU Cultural and Resource Centers; City of Corvallis; Benton County; Multicultural Literacy Center; Community Alliance for Diversity; Employer Diversity Partnership	
			Action 2: Create organizing committee and generate a calendar/poster.		
			Action 3: Advertise widely including high-quality poster and on-line calendar.		

TOPIC AREA: ECONOMIC VITALITY

VISION: Corvallis is home to a vibrant, diverse and sustainable economy anchored by a broad spectrum of local, environmentally-friendly businesses.				Potential Key Organizations (bold = confirmed)	Timeline
Goal 1: Buy Local: By 2015, 50 percent of Corvallis residents, organizations, government and businesses will buy local first. (Buy Local First = when there is a reasonable local choice of product or service, it will be taken)	Metrics:	Strategy 1: Promote a community-wide buy local campaign that encompasses all local businesses.	Action 1: Start supporting CIBA's buy local campaign in 2009.	CIBA; Corvallis Benton Chamber Coalition; Cycle Solutions; FireWorks Restaurant; First Alternative Co-op; Oregon Natural Step Network, Corvallis Chapter; Corvallis HOURS Exchange; First United Methodist Church, Corvallis; T. Gerding Construction; Timberhill Athletic Club; Downtown Corvallis Association; OSU; Benton County	
			Action 2: Establish an annual Buy Local First Day, commencing in 2009.		
			Action 3: Meet in 2009 with institutional buyers to Increase their purchasing of local goods and services. (Examples of institutions include: OSU, City of Corvallis, Benton County, Samaritan Health Services, and Corvallis School District)		
	Baseline:	Strategy 2: Local currencies will compose one percent of the local economy by 2020.	Action 1: Host a public outreach forum to take place by February 2009.	Abundant Solar; Corvallis Benton Chamber Coalition; Corvallis HOURS Exchange; Cycle Solutions; FireWorks Restaurant; Emerald Forest Architecture; Solar Summit; Citizens Bank; OSU Credit Union	
			Action 2: Form an alliance of issuers of local currencies during 2010.		
			Action 3: By 2014, enlist at least one local bank or credit union and at least one business with at least 30 employees in a local currency program.		
Goal 2: Invest Local: By 2020, increase local investing in locally owned, traded-sector businesses, emphasizing "green" enterprises, to one percent of annual payroll (about $13 million).	Metrics:	Strategy 1: Establish a Qualified Investor Sustainable Investment Fund.	Action 1: Establish a study group to commence in May 2009 and form an operating agreement by November 2009.	Oregon Natural Step Network, Corvallis Chapter; Abundant Solar; Corvallis Benton Chamber Coalition; Digital City Guide; Emerald Forest Architecture; Solar Summit; T. Gerding Construction	
			Action 2: Launch fund by May 2010.		
			Action 3:		
	Baseline:	Strategy 2: Establish a peer-based sustainable business loan program	Action 1: Form a study group to identify features of existing programs (i.e. prosper.com) and design a local peer lending program (loans up to 25K) by November 2009.	FireWorks Restaurant; Abundant Solar; CIBA; Corvallis Benton Chamber Coalition; Emerald Forest Architecture; First United Methodist Church, Corvallis; Solar Summit; T. Gerding Construction	
			Action 2: Identify fifty people willing to invest $1000.00 each by March 2010.		
			Action 3: Grow the fund to $500,000 by 2018.		
		Strategy 3: Host an Angel Investing Conference in 2009.		Corvallis Benton Chamber Coalition; Abundant Solar; Emerald Forest Architecture; Solar Summit; T. Gerding Construction	
Goal 3: Produce Local: Increase local production by locally owned businesses, both for export and for local use, emphasizing "green" enterprises; add 1,000 such jobs by 2020.	Metrics:	Strategy 1: Process and package 10 percent of raw, locally grown agricultural products by 2020	Action 1: In 2009, arrange a series of meetings among sustainability and local agricultural interests to determine the best course of action.	Corvallis HOURS Exchange; FireWorks Restaurant; Oregon Natural Step Network, Corvallis Chapter; CIBA; Corvallis Benton Chamber Coalition; Ecumenical Ministries of Oregon; Solar Summit	

TOPIC AREA: ECONOMIC VITALITY					
Goal 3 continued.	Baseline:	Strategy 2: Support the efforts of the Prosperity That Fits committee that is working to establish "green" business clusters in Corvallis and vicinity.	Action 1: Blend the efforts of the Prosperity That Fits committee with those of the economic vitality action committee that emerges from community sustainability plan.	Corvallis Benton Chamber Coalition; Oregon Natural Step Network, Corvallis Chapter; CIBA; Cycle Solutions; Ecumenical Ministries of Oregon; Energy Trust of Oregon; Health Equity Alliance; Solar Summit; Timberhill Athletic Club; City of Corvallis; Benton County	
			Action 2: Work with the Prosperity That Fits committee to develop clusters of locally owned businesses in the fields of green building, clean technology, and alternative energy.		
			Action 3: Work with the City and County to revise and create government regulations, codes, and policies in order to encourage the establishment of sustainable business clusters.		

TOPIC AREA: EDUCATION

VISION: To become better stewards of our environment and responsible world citizens, everyone in our community is educated in how to engage in sustainable practices by 2015. Everyone understands fundamental life-support systems, feels connected to environment, and has high awareness of environmental footprint and what it takes to balance economic, environmental, and community needs while building opportunities for future generations to meet their own needs.				Potential Key Organizations (bold = confirmed)	Timeline
Goal 1: Area school districts and private schools will integrate sustainability concepts into their curricula and adopt and model sustainable practices in 100% of their facilities by 2015. *Interim Goal: School district will integrate sustainability concepts into single grade level by 2011. 1st teacher in-service day by 2010. 50% of district teachers receive sustainability concept training by 2012.*	Metrics: % K-12 schools adopting comprehensive sustainability plan and integrating concepts in operations and curriculum.	Strategy 1: Develop a District/ School Sustainability Plan. Form a Sustainability Advisory Team that may include community experts, administrators, teachers, facilities staff, board members and students by September 2010.	Action 1: School boards adopt sustainability as a priority focus area and form district or school Sustainability Advisory teams to develop comprehensive sustainability plan.	**Corvallis School District 509J; First Alternative Co-op; Science Education Partnerships Program; Solar Summit; Allied Waste of Corvallis; Corvallis Environmental Center; Corvallis Public Schools Foundation; Health Equity Alliance; Institute for Applied Ecology; OSU Extension, Benton County; T. Gerding Construction; private schools, including Santiam Christian School, Ashbrook Independent School, Zion Lutheran School, Corvallis Montessori School, Waldorf School, charter schools**	0-2 years
			Action 2: Designate/hire Sustainability Coordinator by 2010.		0-2 years
			Action 3: Prioritize, integrate and model sustainable practices, such as alternative energy use in school, use of sustainable materials in construction, use of environmentally friendly products.		3-5 years
	Baseline: Waldorf and Montessori have sustainability built into their curriculum. Montessori has it within its mission statement. Other area schools, including 509J schools, have not adopted comprehensive sustainability plans. Some teachers are teaching sustainability concepts and some schools are already modeling some sustainable practices.	Strategy 2: Integrate sustainability concepts into curriculum at every (100%) grade level by 2015.	Action 1: Determine how sustainability can be integrated into existing state standards and current educational offerings K-12. Identify funding needs.	**Corvallis School District 509J; Benton Soil and Water Conservation District; Corvallis Environmental Center; Greenbelt Land Trust; Corvallis Public Schools Foundation; First United Methodist Church, Corvallis ; Institute for Applied Ecology; OSU Extension, Benton County; Science Education Partnerships Program; Solar Summit**	0-2 years
			Action 2: Establish Sustainability lesson plans. Identify curriculum resource materials.		3-5 years
			Action 3: Maintain and increase support for natural resource education and funding (e.g., Outdoor School). For example, develop comprehensive plan to seek funds through "No Child Left Inside" (if passed).		3-5 years
		Strategy 3: 100% of district teachers and staff will receive sustainability concept training.	Action 1: Offer teacher in-service days on sustainability topics.	**Benton Soil and Water Conservation District; Institute for Applied Ecology; Corvallis Environmental Center; Corvallis Public Schools Foundation; First Alternative Co-op; Emerald Forest Architecture; Oregon Natural Step Network, Corvallis Chapter; OSU Extension, Benton County; Science Education Partnerships Program; Solar Summit**	0-2 years
			Action 2: Adopt requirement that teachers attend professional development workshop on sustainability to maintain certification. Continuing education requirement.		6-10 years
			Action 3: Develop sustainability education forum for private school teachers to attend.		3-5 years

TOPIC AREA: EDUCATION					
Goal 2: Area institutions of higher education make a sustainability course required for graduation by 2012 (a variety of courses will meet this requirement) and expand course offerings to the community.	Metrics: 1. Number of courses that satisfy this requirement. 2. Number of students meeting the requirement.	Strategy 1: Encourage, train, and engage students in sustainable practices through courses, mentoring, and service-based projects.	Action 1: Identify sustainability concepts that all students should understand. Identify and develop courses that currently meet the requirement. Seek national funding to develop sustainability leaders training programs.	Allied Waste of Corvallis; ASOSU Environmental Affairs Task Force; Benton Habitat for Humanity; Benton Soil and Water Conservation District; Chintimini Wildlife Center; Corvallis Environmental Center; Emerald Forest Architecture; First Alternative Co-op; First United Methodist Church, Corvallis; Marys Peak Natural Resources Interpretive Center; Solar Summit; Student Sustainability Initiative; Willamette Disc Golf Club; Cycle Solutions; Oregon Natural Step Network, Corvallis Chapter; OSU Campus Recycling; OSU Extension, Benton County; T. Gerding Construction; OSU; LBCC	3-5 years
			Action 2: Connect OSU with community to promote sustainability through mentoring programs (college to K-12; youth projects) and internships with organizations and businesses.		3-5 years
			Action 3: Develop graduate and undergraduate degrees or certificates in sustainability; include a community outreach sustainability component such as internships and mentoring programs.		6-10 years
	Baseline: OSU: 10-20 courses have a strong tie to sustainability; 20-30 current OSU staff and faculty "formally and adequately" trained in sustainability; 15-20 presentations each term that relate somehow to sustainability (est. Brandon Trelstad, OSU Sustainability Coordinator). LBCC: LBCC does not have a sustainability coordinator and has not yet adopted a comprehensive sustainability plan. To the best of her knowledge, LBCC does not have courses in sustainability yet. Approx 10 faculty/staff attended a NW Earth Institute training session. (Communicated by Megan Pickens, LBCC Facilities Staff.)	Strategy 2: Publicize sustainability approaches, courses, and groups at OSU and LBCC: Operations, Events, Outreach, Planning and Policy, Research, Student Resources, and Transportation.	Action 1: Integrate sustainability focus at career fair; invite 'key note' speaker to talk about sustainability topic.	Allied Waste of Corvallis; ASOSU Environmental Affairs Task Force; Benton Soil and Water Conservation District; Corvallis Environmental Center; Corvallis NW Earth Institute; Marys Peak Natural Resources Interpretive Center; OSU Campus Recycling; Solar Summit; Student Sustainability Initiative; Benton Habitat for Humanity; Cycle Solutions; Natural Choice Directory; Oregon Natural Step Network, Corvallis Chapter; OSU Extension, Benton County	0-2 years
			Action 2: Have sustainability clubs hold events to promote new requirement.		3-5 years
			Action 3: Develop and encourage sustainability training for staff and faculty.		3-5 years
		Strategy 3: Develop sustainability courses targeted at individuals and businesses/organizations through OSU Extension and/or LBCC.	Action 1: Develop guidelines for sustainability program like the Master Gardeners program and identify workshops and training sessions that already meet these guidelines.	Benton Soil and Water Conservation District; Corvallis NW Earth Institute; First Alternative Co-op; OSU Extension, Benton County; Timberhill Athletic Club; Allied Waste of Corvallis; Benton Habitat for Humanity; Cycle Solutions; Emerald Forest Architecture; Oregon Natural Step Network, Corvallis Chapter; Solar Summit	0-2 years
			Action 2: Develop guidelines and sustainable Leadership Training Program for businesses and organizations.		0-2 years

TOPIC AREA: EDUCATION					
Goal 3: Sustainability information from various sources, including Corvallis Sustainability Coalition Work Groups, partner organizations, and external resources, is available to all members of the community, e.g.: businesses, government entities, general public by 2012.	Metrics: 1. Number of sustainability-focused articles in 'The City'. 2. Clearing houses for sustainability information. 3. Percent of people taking the 'green tour' 4. Number people taking NWEI courses.	Strategy 1: Establish permanent "sustainability center" for coordinating and disseminating sustainability education to all sectors of the community by 2010.	Action 1: Identify location and funding for potential sustainability center sites	Benton Soil and Water Conservation District; Corvallis Environmental Center; Ecotecture Publications; Allied Waste of Corvallis; Benton Habitat for Humanity; Corvallis NW Earth Institute; Institute for Applied Ecology; Marys Peak Natural Resources Interpretive Center; Natural Choice Directory; Oregon Natural Step Network, Corvallis Chapter; Solar Summit; Timberhill Athletic Club; City of Corvallis; Benton County	0-2 years
			Action 2: Develop, hold, and promote training, courses, talks, workshops on all aspects of sustainability, including green tours of city sites (landfill, waste treatment plant, water treatment plant, and watershed).		0-2 years
			Action 3: Develop creative array of community media resources to reach all community members, such as website, kiosk, riverfront display, sustainability beaver column in GT, resource guide for sustainable products, programming for public access TV, and radio, incentive campaigns, and neighborhood leaders program.		0-2 years
	Baseline: 1. OSU Sustainability Club membership. 2. # Partners in Corvallis Sustainability Coalition. 3. 25 course/year; average of 10 per course, 250. NWEI TNS training 23 attending, and talks, presentations throughout the year with usually around 60.	Strategy 2: City, county, and organizations, such as schools, faith-based communities, businesses, and nonprofits, actively communicate how they utilize sustainable practices.	Action 1: Work in conjunction with Corvallis Sustainability Center to communicate goals and achievements.	Allied Waste of Corvallis; Benton Habitat for Humanity; Corvallis Environmental Center; First Alternative Co-op; First United Methodist Church, Corvallis; Corvallis NW Earth Institute; Ecumenical Ministries of Oregon; Institute for Applied Ecology; Marys Peak Natural Resources Interpretive Center; Oregon Natural Step Network, Corvallis Chapter; Solar Summit; Timberhill Athletic Club	3-5 years
			Action 2: Publically display progress toward sustainability coalition goals such as kiosk, riverfront display, publish goal, progress reports including info on all community partners.		0-2 years
		Strategy 3: Businesses actively communicate how they are using sustainable practices.	Action 1: Develop criteria and guidelines for what a sustainable business is, like "LEED" certification for building.	Abundant Solar; Allied Waste of Corvallis; Corvallis Environmental Center; Cycle Solutions; Emerald Forest Architecture; First Alternative Co-op; Natural Choice Directory; Solar Summit; Willamette Disc Golf Club; Benton Habitat for Humanity; Corvallis NW Earth Institute; Marys Peak Natural Resources Interpretive Center; Oregon Natural Step Network, Corvallis Chapter	0-2 years
			Action 2: Hold sustainable business and products fair to showcase.		0-2 years
			Action 3: Publicize 'supply chain' of everyday products and foods.		3-5 years

TOPIC AREA: ENERGY

VISION: By 2020, Corvallis has achieved energy security and net zero greenhouse gas emissions.

				Potential Key Organizations (bold = confirmed)	Timeline
Goal 1: By 2020, Corvallis will reduce per capita consumption of energy in buildings by 50% using energy conservation. Remaining energy for buildings will be supplied using renewable energy. ***Interim Goal: By 2014, Corvallis will reduce its per capita greenhouse gas emissions from energy use and production by 50%.***	Metrics: % reduction in total Corvallis energy usage per capita from 2008 baseline, % energy supplied using renewable energy.	Strategy 1: Organize and train volunteers to assist citizens in implementing conservation recommendations from Energy Trust audits and renewable energy for buildings.	Action 1: Volunteers contact citizens to arrange energy audits for 100% of homes & businesses, serve as partners/advisors for citizens during energy audits, assist citizens in implementing audit recommendations, and assist with grant or tax credit paperwork or with renewable energy purchases.	**Abundant Solar; ASOSU Environmental Affairs Task Force; OSU Extension, Benton County; Student Sustainability Initiative; Corvallis Environmental Center; Solar Ki;** City of Corvallis; developers; builders; contractors; individuals; utilities; website designers; engineers	0-2 years and ongoing
			Action 2: Volunteers technicians/engineers to assist citizen in implementing renewable energy for their buildings including: augmenting energy audits with a first pass audit/estimate for renewable energy installations, assisting in contractor selection, carrying out technical advising for self-installers, and writing grant proposals or setting up tax credit paperwork.		0-2 years and ongoing
			Action 3: City of Corvallis advertises that conservation will be the highest priority effort in energy sustainability grants.		0-2 years and ongoing
	Baseline: Blue Sky = 12.5% of Corvallis energy purchases 9.5% of Corvallis customers enrolled Existing solar hot water capacity (Linn and Benton) 17.5 M kwhr Light: Compact fluorescent 11% Heat: Homes with heat pumps 14% Hot water: High efficiency water heaters 40% Washing: Energy Star (2007) washing machines 51% Dryer: % with clotheslines unknown Thermostats: at least 35% mechanical (un-programmable) Wall insulation >R21 17% Spa-bathtub 16% Single-pane windows 17% < 1.8 gps showerheads 50% < 1.8 gps sink aerators 52%	Strategy 2: Grow professional conservation & renewable energy installation capability to meet demand.	Action 1: Efficient lighting, solar hot water & heat pumps are the most cost effective efficiency improvements; develop plan to grow this installation capability as a priority.	**Abundant Solar; Solar Summit; Energy Wise Lighting; Integrated Resource Management; International Brotherhood of Electrical Workers LU 280; OSU Hydrogen Club; T. Gerding Construction; Energy Trust of Oregon;** City of Corvallis; developers; large land owners; large building owners; utilities; individual PV power purchasers; Economic Vitality Partnership	0-2 years
			Action 2: LBCC/509J/OSU to establish courses in renewable energy installation and focus hands on internships in renewable energy installation on low income properties. Focus to be on solar hot water and geothermal heat pumps.		2-4 years
			Action 3: City of Corvallis will add a position for training local builders/remodelers in Corvallis sustainable building incentives.		3-5 years
		Strategy 3: Provide incentives for new/existing construction to meet net zero energy criteria.	Action 1: Adopt Portland Sustainability Department proposals for construction incentives.	**Energy Trust of Oregon; Solar Summit; Corvallis Benton Chamber Coalition; Emerald Forest Architecture; OSU Hydrogen Club; Seventh Generation Building Guild;** City of Corvallis; professional consultants; OSU professionals; utilities; Preservation WORKS; Economic Vitality Partnership	3-5 years
			Action 2: Establish criteria for net zero energy/sustainable building practices that are eligible for financial incentives. Criteria to include quality control processes that must be in place to be eligible for these incentives.		0-2 years
			Action 3: City of Corvallis to provide an annual 10% property tax reduction or equivalent payment (for tax exempt buildings) for building that achieve net zero energy use.		3-5 years

TOPIC AREA: ENERGY					
Goal 2: By 2025, Corvallis becomes a net energy producer with 100% of all energy produced being renewable energy. *Interim Goal: By 2014, Corvallis will reduce per capita consumption of energy by buildings by 25% using energy conservation. 50% of remaining energy requirements for buildings will be met using renewable energy.*	Metrics: % of Corvallis energy used produced in Benton County.	Strategy 1: Facilitate installation of small scale grid tied photovoltaic systems (less than 5kw).	Action 1: Offer financial incentives (see Goal 3, strategy 3, action 1 for funding source) to encourage PV installation on new and existing structures. Provide local installation rebates in addition to current state and federal rebates.	Abundant Solar; Energy Trust of Oregon; International Brotherhood of Electrical Workers LU 280; Solar Ki; Solar Summit; Emerald Forest Architecture; City of Corvallis; developers; builders; contractors; individuals; utilities; engineers; PreservationWORKS; website designers	0-2 years
			Action 2: For all new residential construction, require compliance with portions of adopted sustainable building standards that specify renewable energy production. This may include technology other than PV.		2-4 years
			Action 3: Establish a photovoltaic's group as part of the resource center discussed in Goal 3, strategy 3, action 1.The PV group at the resource center would offer services including, but not limited to the following: -Performs site visits that evaluate site PV potential. -Provides cost and incentive information. -Provides technical data for PV systems. -Lists of qualified installers. -Provides assistance with grant/rebate/incentive applications. -Maintain a website with information and a mechanism that allows people to ask questions of the resource center. -Provides links to pertinent websites.		0-2 years
	Baseline: 0.822 M kwh from PV (in Linn and Benton County) 3.9 M ft3 Methane used as fuel at Corvallis Wastewater Treatment Plant (24.0 M ft3 released) 623 M ft3 of methane used as fuel at Coffin Butte Landfill (371 M ft3 released)	Strategy 2: Facilitate installation of large scale grid tied photovoltaic systems (greater than 5kw).	Action 1: Encourage installation of large PV systems by offering greater incentives (see Goal 3, strategy 3, Action 1 for funding source) to individuals who have the highest potential for PV at their site.	Energy Trust of Oregon; International Brotherhood of Electrical Workers LU 280; Solar Ki; Solar Summit; Abundant Solar; First United Methodist Church, Corvallis; Seventh Generation Building Guild; T. Gerding Construction; City of Corvallis; developers; large land owners; large building owners; utilities; individual PV purchasers	2-4 years
			Action 2: Encourage large PV installations by creating a financial system where individuals can invest in offsite/remote systems.		2-4 years
		Strategy 3: Facilitate professional technical/economic evaluation of potential local renewable energy sources (other than photovoltaics).	Action 1: Investigate local potential for wind power and three forms of hydropower: Wave, in-stream hydro, and dammed (or potential energy) hydro. Consider land in the coast range that may be viable due to water rights issues. Consider the nearby Oregon coast for wave power projects.	Energy Trust of Oregon; International Brotherhood of Electrical Workers LU 280; OSU Hydrogen Club; Solar Summit; Abundant Solar; Corvallis Benton Chamber Coalition; T. Gerding Construction; City of Corvallis; professional consultants; local university experts; utilities; Economic Vitality Partnership	3-5 years
			Action 2: Attract renewable energy manufacturing and servicing to Corvallis in order to localize production of renewable energy and create new industry/jobs, thus strengthening energy security.		0-2 years
			Action 3: Investigate local potential for biological sources of electrical energy production: Consider waste gas from dairies, landfills, and water treatment plants. Consider biomass (waste grass, woody debris) energy.		3-5 years
Goal 3: By 2020, Corvallis will eliminate its net per capita greenhouse gas emissions from energy use and production. *Interim Goal: By 2016, Corvallis produces 50% of its energy requirements, all of which is renewable energy.*	Metrics: Net emissions of CO2, NOX, Methane, and CF-12 (to equal zero after emissions reduction and sequestration in place).	Strategy 1: Offset greenhouse gas emissions from energy use in buildings & businesses, through agricultural methods of carbon sequestration.	Action 1: Establish a managed, forested greenbelt and network of high diversity native species "grasslands" that sequesters 100% of remaining greenhouse gas emissions from energy use and production for Benton County (those expected after Goal #1 & #2 are accomplished.). After Town Hall #3, scrub/validate baseline data versus EPA website to validate acreage requirements.	OSU Extension, Benton County; Solar Summit; Benton County; City of Corvallis; OSU Department of Forestry; Sustainable Forests Partnership; local businesses	0-2 years (develop plan & mechanisms), 2-12 years (manage)
			Action 2: OSU Department of Forestry/McDonald-Dunn Forest develops plan to focus on management for greenhouse gas sequestration, alongside existing lumber management.		0-2 years (develop plan & mechanisms), 2-12 years(manage)

TOPIC AREA: ENERGY					
Goal 3 continued.			Action 3: County forests and grasslands develop plan to manage for greenhouse gas sequestration, alongside recreation and habitat preservation.		0-2 years (develop plan & mechanisms), 2-12 (manage)
	Baseline: Numbers need further stud to explain differences: Range of 11330 kg CO2/year per average US home (source EPA websites) which reduces to 1785 kg CO2/year/household (after conservation & renewables) requiring .4 acres per household, 9300 acres, or 2.2% of land area in BC (for 2020 County population) per EPA sequestration data & Energy Workgroup Analysis UP TO EWG baseline data of 777 kg CO2/year per citizen (for both household and commercial/industrial use), which requires .18 acres per person, 16390 acres, or 3.8% of land area in BC (for 2020 County population) per EPA sequestration data & Energy Workgroup Analysis Baseline Sequestration capacity: Existing forests in Benton County are a minimum of 11k acres; grasslands eligible for high species diversity plantings have not been catalogued.	Strategy 2: Offset greenhouse gas emissions from energy use in buildings & businesses, through agricultural methods of carbon sequestration.	Action 1: Make greenhouse gas elimination more affordable by using Western Climate Initiatives or other cap and trade dollars to subsidize local efforts. This assumes we best WCI/other standards for GHG elimination; the basis for cap and trade.	**Solar Summit**; City of Corvallis; GECO; local businesses; local public organizations	3-5 years
			Action 2: Track greenhouse gases from all activities (energy, waste, etc) through methods leveraged from WCI or Portland Sustainability Office.		0-2 years (baseline), 2-12 ongoing
			Action 3: Increase forested greenbelts, grassland sequestration, and sequestration outside-of-Benton-County (if necessary) to cover greenhouse gas emissions of Transportation, Waste Generation, etc. After Town Hall #3, launch study of additional acreage needed.		0-2 years (study, collect funds) 3-5 years (purchase/plant)
		Strategy 3: Make GHG sequestration more comprehensive and more affordable by coordinating with other Oregon sustainability initiatives.	Action 1: Establish Corvallis surcharges on energy utilization to pay for GHG elimination. Create a multi-tiered surcharge that progressively increases the per unit cost of power as more power is used. Investigate the best systems for fund collections (utilities or City collection) and the rates required to bring about GHG targets/timelines.	**Cycle Solutions; OSU Hydrogen Club; Solar Summit; Willamette Disc Golf Club**; City of Corvallis; Benton County; Pacific Power; Consumers Power; NW Natural, GECO	0-2 years
			Action 2: Establish grant programs for GHG projects. Coordinate surcharge revenue estimates, proposal processes, and grant criteria across GHS elimination strategies: reduction (conservation), renewable energy purchases (from outside Benton County), local renewable energy (solar hot water, geothermal wells, PV, etc), and land purchase/planting for greenhouse gas sequestration.		0-2 years
			Action 3: Structure a resource center for Energy Sustainability to provide citizens and volunteers-in-training with information on conservation, renewable energy and GHG sequestration. Include data bases enabling citizens to choose among products based on life cycle energy and GHG emissions.		0-2 years

TOPIC AREA: FOOD

VISION: We are fed primarily by food which is locally produced, using practices that renew and enrich the land and community.				Potential Key Organizations (bold = confirmed)	Timeline
Goal 1: By 2020, 60% of the food consumed by the Corvallis population is grown or produced in Benton, Linn, Lincoln, or Lane county.	Metrics: 1) $ spent on local food divided by total $ spent on food (local and non-local); 2) Comparison between current acreage used for food production and acreage amounts in 2014 and 2020.	Strategy 1: Increase local demand for locally grown foods.	Action 1: Create an ad campaign to bolster awareness and use of existing initiatives that promote local food consumption.	**Ten Rivers Food Web; Corvallis Environmental Center; Corvallis HOURS Exchange; Corvallis NW Earth Institute; Corvallis-Albany Farmers' Markets; Cycle Solutions; Ecumenical Ministries of Oregon; FireWorks Restaurant; First Alternative Co-op; First United Methodist Church, Corvallis; Health Equity Alliance; Natural Choice Directory; OSU Extension, Benton County; Timberhill Athletic Club;** Slow Food Corvallis, Economic Vitality Partnership; local restaurants; grocery stores; OSU; OSU Food Group; OSU Housing and Dining Services; Willamette Food and Farm Coalition	0-2 years
			Action 2: Facilitate the practice of labeling local food products at businesses (food stores, restaurants), institutions (schools, LBCC, OSU, hospital), and events where food is sold and/or served.		0-2 years
			Action 3: Link food purchasers from local institutions (school system, LBCC, OSU, hospital) and businesses (restaurants, food stores) with local food producers.		3-5 years
	Baseline: Approximately 2% of food consumed here is grown here. (Source: Larry Lev, OSU)	Strategy 2: Increase amount of local land used for food production (includes agricultural land, private property, and public property).	Action 1: Provide education and support to increase the number of farmers and farm workers in the community.	**Ten Rivers Food Web; Benton Habitat for Humanity; First Alternative Co-op; Greenbelt Land Trust; Student Sustainability Initiative; Corvallis-Albany Farmers' Markets; Ecumenical Ministries of Oregon; Health Equity Alliance; Solar Summit;** LBCC; OSU; local farmers; local community gardens; OSU Organic Growers Club; City of Corvallis; Benton County; Willamette Valley Bean & Grain Project; Economic Vitality Partnership; Willamette Food & Farm Coalition	0-2 years
			Action 2: Create government incentives that encourage property owners to use their land for food production. (Includes both urban agriculture and conversion of agricultural land from non-food production to food-based uses.)		3-5 years
			Action 3: Model and promote edible landscaping and home food production.		0-2 years
		Strategy 3: Increase capacity for local food processing, storage, and distribution.	Action 1: Develop and implement neighborhood-based food processing, storage, and distribution.	**Ten Rivers Food Web; Corvallis HOURS Exchange; Ecumenical Ministries of Oregon; FireWorks Restaurant; First United Methodist Church, Corvallis; Corvallis-Albany Farmers' Markets; Emerald Forest Architecture; Health Equity Alliance; Solar Summit; T. Gerding Construction;** North College Hill Neighborhood Association; Southtown Neighborhood Food Group; Economic Vitality Partnership; private investors; City of Corvallis; Benton County	3-5 years
			Action 2: Facilitate the creation of commercial and cooperative local food processing, storage, and distribution facilities.		6-10 years
Goal 2: By 2020, all Corvallis residents will have access at all times to enough food for an active and healthy life.	Metrics: % of population which is food insecure.	Strategy 1: Support existing emergency food programs and other food assistance programs.	Action 1: Expand efforts to get fresh produce to food banks.	**Corvallis Environmental Center; Corvallis-Albany Farmers' Markets; Ecumenical Ministries of Oregon; Ten Rivers Food Web; Emerald Forest Architecture; FireWorks Restaurant; First United Methodist Church, Corvallis; Health Equity Alliance; OSU Campus Recycling; T. Gerding Construction; Allied Waste of Corvallis; Timberhill Athletic Club;** South Corvallis Food Bank; St. Vincent de Paul; Gleaners; Linn-Benton Food Share; Fresh Alliance; HEAL (Healthy Eating and Active Living Community Initiative); local gardens; Comidas Latinas	0-2 years
			Action 2: Help existing food programs reach minority populations by providing culturally sensitive food and utilizing volunteers with necessary language skills.		0-2 years
			Action 3: Assist existing food programs with community education and outreach efforts.		0-2 years

TOPIC AREA: FOOD					
Goal 2 continued.	Baseline: 13.95% of Benton County residents were food insecure in 2000. (Grussing)	Strategy 2: Increase access to and demand for nutritious food produced using biologically safe products.	Action 1: Improve nutrition of food in schools, institutions and public events by implementing programs featuring a variety of fruits, vegetables, whole grains and lean proteins.	Corvallis Environmental Center; Ecumenical Ministries of Oregon; FireWorks Restaurant; First Alternative Co-op; Ten Rivers Food Web; Health Equity Alliance; Oregon Natural Step Network, Corvallis Chapter; Timberhill Athletic Club; Good Samaritan Hospital; Benton County Healthy Weight and Lifestyle; Benton County TROCD; Comidas Latinas; grocery stores	3-5 years
			Action 2: Conduct low and no-cost nutrition classes in the community and at schools.		3-5 years
			Action 3: Provide workshops for food markets (supermarkets, co-ops, farmer's markets) how to buy and promote nutritious food produced with biologically safe products.		6-10 years
		Strategy 3: Increase affordability of nutritious food produced using biologically safe products.	Action 1: Develop education campaign on buying nutritious food on a budget.	Corvallis Environmental Center; Ecumenical Ministries of Oregon; FireWorks Restaurant; First Alternative Co-op; First United Methodist Church, Corvallis; Ten Rivers Food Web; Health Equity Alliance; Timberhill Athletic Club; Benton County; Benton County Healthy Weight and Lifestyle; Benton County TROCD; City of Corvallis; Westside Community Garden; local gardeners; community gardens	3-5 years
			Action 2: Expand current and start new low-income community gardens.		0-2 years
			Action 3: Facilitate low-cost seasonal food preservation sessions in a community kitchen.		0-2 years
Goal 3: By 2020, 80 percent of all local land area in family and community food-producing gardens and in small and mid-sized farms will be managed using accepted practices for "Sustainable Food Growing."	Metrics: Land area devoted to sustainable food production.	Strategy 1: Encourage residents to eat healthful foods that are grown by sustainable methods.	Action 1: Educate family and friends that quality of life, particularly health, can be substantially increased by consuming recommended amounts of a variety of healthful foods that are grown through sustainable practices.	Ten Rivers Food Web; Corvallis Environmental Center; Corvallis NW Earth Institute; Ecumenical Ministries of Oregon; Emerald Forest Architecture; FireWorks Restaurant; First Alternative Co-op; First United Methodist Church, Corvallis; Natural Choice Directory; OSU Extension, Benton County; Health Equity Alliance; Solar Summit; Timberhill Athletic Club; individual residents; Corvallis Clinic; Good Samaritan Hospital; Sustainable Food Garden Club	0-2 years
			Action 2: Join and support Master Gardeners, Northwest Earth Institute, Ten Rivers Food Web, and other similar organizations to learn about sustainable food growing and to teach others about the importance and methods for doing so.		0-2 years
			Action 3: Join, help organize and support the Sustainable Food Garden Club (SFGC) whose members will assist families, schools and other organizations in planting sustainable gardens.		0-2 years
	Baseline:	Strategy 2: Encourage owners of local farms to produce healthful foods using sustainable agricultural practices.	Action 1: Purchase as much food as practicable from those local farmers who are utilizing sustainable agricultural practices and from grocers who market and identify these products.	Ten Rivers Food Web; FireWorks Restaurant; First Alternative Co-op; First United Methodist Church, Corvallis; OSU Extension, Benton County; Ecumenical Ministries of Oregon; Health Equity Alliance; Oregon Natural Step Network, Corvallis Chapter; Cycle Solutions; Emerald Forest Architecture; Timberhill Athletic Club; individual residents; Willamette Valley Bean and Grain Project; local agricultural researchers; professors and instructors; Oregon Tilth; local grocers	0-2 years
			Action 2: Educate farmers to utilize sustainable agricultural practices.		0-2 years
			Action 3: Implement a rating system that labels the degree to which sustainable practices are used.		3-5 years
		Strategy 3: Support and expand ongoing efforts to develop, store and exchange seeds of food crops that are the most consistently productive for sustainable food growing in this area.	Action 1: Help engage ongoing plant development programs in a cooperative effort involving family and community gardeners and local farmers in sustainable plant development for this area. Use these resources to teach techniques for sustainable plant development.	Ten Rivers Food Web; FireWorks Restaurant; Ecumenical Ministries of Oregon; Health Equity Alliance; Solar Summit; Timberhill Athletic Club; local agricultural researchers; professors and instructors; Sustainable Food Garden Club	3-5 years
			Action 2: Help prepare and execute a plan to utilize volunteer gardeners and students in developing best plant varieties for local sustainable food. Include an annual, judged contest to be a featured as part of the Benton County Fair and other venues year round.		3-5 years
			Action 3: Prepare and execute a plan to collect, develop and store diverse seed collections of sustainable food plant varieties for local use and to exchange seeds for trials and production.		3-5 years

TOPIC AREA: HEALTH AND HUMAN SERVICES

VISION: All residents have the opportunity to enjoy a positive state of health including physical, mental and social well-being and not merely the absence of disease or infirmity.				Potential Key Organizations (bold = confirmed)	Timeline
Goal 1: By 2025 reduce the death and disability from chronic disease (e.g. heart disease, stroke, cancer, chronic lower respiratory disease diabetes, tobacco-related diseases) among Corvallis residents by 25%. *Interim Goal: By 2015, increase the percentage of non-smokers to 93%. By 2015, increase the percentage of adults meeting the CDC recommendations for physical activity to 65%. By 2015, decrease the percentage of adults classified as obese to 11%.*	Metrics: # of people who have chronic diseases or have died from chronic disease; # of obese people; # of smokers; # of people meeting Center for Disease Control's recommendations for physical activity.	Strategy 1: Promote healthy lifestyles in multiple settings (e.g. community, schools, worksites, health system policy) by adopting policies, creating environments and programs that support healthy behavior.	Action 1: By 2012, create access for all Corvallis residents to environments that support healthy behavior (e.g. access to tobacco-free environments, healthy food choices, and physical activity opportunities).	**Ecumenical Ministries of Oregon; Emerald Forest Architecture; First Alternative Co-op; Health Equity Alliance; OSU Extension, Benton County; Timberhill Athletic Club; Willamette Disc Golf Club; Solar Summit;** Benton County Health Dept. (Community Health Advisory Council, Tobacco-Free Advisory Group, Healthy Eating Active Living Council); City of Corvallis; OSU Public Health Program; Corvallis Clinic; Samaritan Health Services; United Way of Benton County; Heartspring Wellness Center	0-2 years
			Action 2: By 2010, Corvallis residents have optimal availability of and access to evidenced-based chronic disease self-management programs in English and Spanish (e.g. Living Well, Tomando Control de Su Salud, Meals Made Easy, Platos Saludables, Breathe Well, Live Well).		3-5 years
			Action 3: By 2013, conduct a collaborative community assessment to determine the health status, including measures of physical, mental and social well being, of Corvallis residents. Conduct every 5 years.		6-10 years
	Baseline: Benton County Death Rates*+:Heart Disease (169.3), Stroke (65.1), Cancer (156.3), CLRD (39.1), Diabetes (25.5), Tobacco-related Diseases (139.7) Benton County Chronic Conditions**+: Arthritis (24%), Asthma (9%), Heart Attack (3%), Coronary Heart Disease (4%), Stroke (2%), Diabetes (5%), High Blood Pressure (20%), High Blood Cholesterol (28%) Benton County Modifiable Risk Factors***+: 13% of adults smoke cigarettes, 58% of adults meet the CDC recommendations for physical activity, 16% of adults are classified as obese. * Age-adjusted death rates per 100,000 population, 2000-2004 **Age-adjusted prevalence among adults, 2002-2005 ***Age-adjusted prevalence of adults, 2002-2005 +source Keeping Oregonians Healthy, 2007	Strategy 2: Support statewide and national healthcare reform initiatives that allow access for everyone that wants coverage as well as secure help for residents with advocacy for billing issues and denied care.	Action 1: In 2009, The City newsletter prints information about the work of the healthcare reform groups in our area.	**Health Equity Alliance; League of Women Voters of Corvallis; Timberhill Athletic Club; First United Methodist Church, Corvallis;** City of Corvallis; Physicians for a National Health Plan; Interfaith Health Care Network; Mid-Valley Health Care Advocates; Healthcare for All – Oregon	0-2 years
			Action 2: By 2011, compile and publicize a resource list of health insurance assistance programs, noting gaps in services offered.		3-5 years
			Action 3: Regularly provide education to all Corvallis residents and businesses about facts of healthcare reform especially in preparation for the next legislative opportunity.		0-2 years
		Strategy 3: Set-up up local clinics which are non-insurance based, low cost, for everyone, for less-critical care and focused on education and improving health.	Action 1: By 2011 Set up a task force to outline in detail the infrastructure ("who, what, where, funding and how's") for additional health clinics in Corvallis.	**Health Equity Alliance; Timberhill Athletic Club; Solar Summit;** Benton County Health Dept. (ad hoc volunteer committee); Downtown Corvallis Association; Good Samaritan Health Services; Corvallis Clinic	0-2 years
			Action 2: Work with civic groups and local businesses to establish their own on-site healthcare services for members/owners/employees.		3-5 years
Goal 2: By 2025, eliminate our community's discharge of persistent, bio-accumulative and/or toxic pollutants into the local biosphere.	Metrics: % in storm water; % in waste water; and % in air	Strategy 1: By 2010, establish a framework that requires a systematic study of health impacts for new projects, products or policies in the Corvallis area; (such as Natural Step, Precautionary Principle, Heath Impact Assessments).	Action 1: By 2009, assign an appropriate task force to evaluate existing strategies.	**Health Equity Alliance; Oregon Natural Step Network, Corvallis Chapter; Timberhill Athletic Club;** City of Corvallis; Benton County	0-2 years
			Action 2: By 2010, the above taskforce drafts legislation requiring the consideration of health impacts on Corvallis projects or policies.		0-2 years
			Action 3: Provide training and/or information of chosen framework.		3-5 years

TOPIC AREA: HEALTH AND HUMAN SERVICES					
Goal 2 continued. *Interim Goal: By 2015, reduce by 50% our community's discharge of persistent, bio-accumulative and/or toxic pollutants into the local biosphere.*	Baseline: Governor's Exec Order 99-13 assigned ODEQ to lead a statewide effort to eliminate release of persistent, bio-accumulative and toxic chemicals by 2020 to outline a range of approaches that could be taken to ID, track and eliminate. California's Proposition 65 (The Safe Drinking Water and Toxics Enforcement Act of 1986) and Eugene's Right to Know policy require notification. 2009 p Oregon legislation proposed to disallow herbicides in schools (currently banned in Eugene and Portland).	Strategy 2: By 2020, develop and identify safe alternatives to regularly used toxics that are discharged into the local biosphere.	Action 1: Adopt policies for 1) building maintenance and operations at publicly-owed facilities that are aligned with LEED for existing buildings , and 2) new construction and remodels of publicly-owed buildings that meet LEED standards 3) eliminating pesticide/herbicide spraying on publicly-owned property.	Corvallis NW Earth Institute; City of Corvallis; OSU; LBCC; all public private & charter schools; Oregon Toxics Alliance	0-2 years
			Action 2: By 2015, develop legislation that focuses on incentives for residential land owners, businesses, and institutions that have found alternatives to using or releasing toxic chemicals.		3-5 years
			Action 3: Establish an institution (or a connection with an existing institution), such as Toxics Use Reductions Institute in Mass, to help industries identify alternatives to toxic chemicals.		6-10 years
		Strategy 3: Provide education on toxics, their effects and viable alternatives for all ages and cultural groups in Corvallis.	Action 1: By 2010 Advertise OEC's Tiny Footprint materials (Green Cleaning Guide, Family Pledge, Sage toys, etc) and "No Idling/No Topping Off" benefits in the City Newsletter, local school programming and through other family awareness avenues.	Corvallis NW Earth Institute; Emerald Forest Architecture; First Alternative Co-op; Natural Choice Directory; Willamette Disc Golf Club; First United Methodist Church, Corvallis; Timberhill Athletic Club; City of Corvallis; Corvallis Clinic; Samaritan Health Services; Women in Agriculture; National Coalition Against Pesticides; Organic Consumers Association	0-2 years
			Action 2: Provide comprehensive education of alternatives to toxic agricultural chemicals aimed at conventional agriculture farmers in the area.		3-5 years
			Action 3: By 2015, require "Right To Know" notification in stores that sell products with chemicals known to cause cancer, birth defects or reproductive harm and restrict discharge of these chemicals in a manner that could end up in drinking water.		6-10 years
Goal 3: By 2025, 50% of Corvallis residents volunteer in the community, resulting in 1) dedicated citizens, 2) healthier and happier residents 3) inclusion of diverse groups and 4) sharing of expertise to help meet the needs of the community.	Metrics: % of Corvallis population aged 16 years and older volunteering at least 1 hour a year.	Strategy 1: By 2012, educate the Community on the value of and long-term benefits of volunteering for one's community.	Action 1: Start tracking volunteer rates for City of Corvallis for all age groups.	Benton Habitat for Humanity; First Alternative Co-op; Natural Choice Directory; Timberhill Athletic Club; Willamette Disc Golf Club; First United Methodist Church, Corvallis; Health Equity Alliance; Benton County; City of Corvallis; RSVP; Love, Inc.; United Way of Benton County; Living Wage Resource Center	0-2 years
			Action 2: Determine funding for a volunteer advocate position.		3-5 years
			Action 3: Develop a city-wide Volunteer Advocate position to: 1) educate on the value of and ethics of volunteerism in Corvallis, 2) help organization to link diverse groups together to meet needs (elderly with students, etc) 3) track volunteer rates and opportunities 4) create solutions to "lack of time" obstacles (e.g. coordinate volunteer efforts).		6-10 years
	Baseline: Oregon ranks number 15 among the 50 states and District of Columbia in volunteer intensity, with 33.3% aged 16 years or older volunteering. Rank number 19 in baby boomer volunteer rate of 36.4% (highest state Nebraska at 49%). Also ranked #19 for young adult volunteer rate of 29% (highest is Utah at 39%). The volunteer rate of college age students was #22 at 32.1% (2nd highest was Idaho at 48%). The volunteer rate increased .5% from 2002-2006, whereas some states increased by 1-2% Oregon ranked number 6 in average volunteer hours per state resident per year at 50.3.	Strategy 2: By 2020, address costs of living, financial needs and other obligations that inhibit some residents from having time to volunteer (e.g. adopt a living wage including health insurance, 35hr work week, family volunteer opportunities, etc).	Action 1: Arrange an educational forum with local businesses for introduction to living wage (reasons, calculations and strategies) and to identify solutions to roadblocks.	First United Methodist Church, Corvallis; Timberhill Athletic Club; Living Wage Resource Center; Community Outreach	0-2 years
			Action 2: Arrange task force to explore solutions for supporting local businesses in providing a living wage or "paying" for volunteerism (reduced FT workweeks, etc).		3-5 years
		Strategy 3: By 2025, rethink "welfare" type programs to be volunteer-based to help those in need get connected to sources to help them meet their own needs.	Action 1: Evaluate city-wide recognition events (Celebrate Corvallis, etc) to ensure ALL community members, including those at risk, have opportunities for recognition of contributions to our community.	Ecumenical Ministries of Oregon; First United Methodist Church, Corvallis; Community Services Consortium; United Way; Community Action Partnership of Oregon; Assistance League of Corvallis	0-2 years
			Action 2: Create an efficient network of social and government agencies able to identify necessary resources and opportunities to community members in need. Action 3:		6-10 years

TOPIC AREA: HOUSING

VISION: All residents will have access to affordable housing options. Housing will be energy efficient, provide a healthy living environment, reduce waste through recycling and preservation, and all new construction will minimize impacts on our resources and environment.				Potential Key Organizations (bold = confirmed)	Timeline
Goal 1: By the year 2020 all residents/ households will have access to affordable housing options. *Interim Goal: By the year 2015, 65% of residents/households will have access to affordable housing options.*	Metrics: To achieve goal of providing affordable housing for all households by 2020, need approximately 300 additional housing units for very low income renters (income less than 30% of median) per year. 30% of MFI = $20,450/yr 30% of this income = $511/month. As these renters move into new apts. rehab existing stock for very low income (50% of median) and low income (80% of median) renters. Currently few rentals costing $500/month exist. According to current stats, these units must be 500sf or less.	Strategy 1: Change land use laws to incorporate "Inclusionary Zoning" to encourage affordable housing.	Action 1: Work with diverse constituent groups, affordable housing advocates, and others to develop language for a bill to support "Inclusionary Zoning" (requiring a percentage of developments over a certain size to include affordable units).	**Benton Habitat for Humanity; First United Methodist Church, Corvallis; League of Women Voters of Corvallis; Health Equity Alliance; T. Gerding Construction**	
			Action 2: Contact State Legislature to introduce "Inclusionary Zoning" bill.		
			Action 3: Lobby to pass "Inclusionary Zoning" bill.		
	Baseline: In 2008 there are approximately 5200 renter households and 1200 owner households that are making 80% or less of the Corvallis mean family income and paying more than 30% of their income for housing. (Con Plan, 5-08.)	Strategy 2: Promote higher density options.	Action 1: Incorporate housing into new/existing commercial building projects where related residential services are available.	**Benton Habitat for Humanity; League of Women Voters of Corvallis; Health Equity Alliance; T. Gerding Construction;** contractors; City of Corvallis; Benton County	
			Action 2: Convert underutilized/vacant structures and sites in downtown and other mixed-use sites into affordable housing where related residential services are available.		
			Action 3: Examine land use and building code to encourage reduced set-backs and reductions in minimum building size.		
		Strategy 3: Maintain/increase affordable housing stock.	Action 1: Establish design competition for small adaptable housing. The winners will obtain pre-approved city permits.	**Benton Habitat for Humanity; League of Women Voters of Corvallis;** State, HOME, HUD,CDBG and Municipal Bonds	
			Action 2: Protect expiring housing subsidies and increase community development block grant (CDBG) (and other leveraged funding) to retain/increase subsidies/rehab/sweat equity affordable housing.		
			Action 3: Encourage donation of properties/structures/land to local land trust for affordable housing.		
Goal 2: By 2020, all existing homes in Corvallis will be preserved, adaptively reused, or recycled. *Interim Goal: By the year 2015, at least 85% of existing homes in Corvallis will be preserved, adaptively reused, or recycled.*	Metrics: By the year 2016, the number of buildings demolished per year in Corvallis is reduced to 10. These buildings will be preserved, adaptively reused, or recycled.	Strategy 1: Reuse existing housing stock before building new homes. Encourage people to recycle or relocate a house vs. flat out demolition.	Action 1: Work with Habitat for Humanity to rehabilitate older, existing homes instead of building new homes (perhaps for homeless shelters).	**Benton Habitat for Humanity; Health Equity Alliance; Seventh Generation Building Guild; Solar Summit; Emerald Forest Architecture;** City of Corvallis and Fire Department	
			Action 2: Find alternative training for firefighters than doing "courtesy burns" of houses.		
			Action 3: Change the zoning laws to allow more homes on county land zoned EFU, UR, or RR (zoning designations – Exclusive Farm Use, Urban Residential and Rural Residential) if the homes are salvaged (relocated) homes at least 50 years or old or older.		
	Baseline: An average of 20 buildings per year are demolished in the city of Corvallis (not including those demolished due to natural fire). An average of three buildings are moved per year. In the past 16 years, four homes have been courtesy burned.	Strategy 2: Provide incentives for owners to maintain their historic homes in order to counter demolition by neglect.	Action 1: Develop workshops to educate owners on how to maintain their historic homes and educate builders on the art and craft of older homes; i.e., window tuning workshops.	LBCC; City of Corvallis; Benton County; Willamette Neighborhood Housing Services	
			Action 2: Redirect some housing funds to sensitive rehabilitation of structures over 50 years.		

TOPIC AREA: HOUSING					
Goal 2 continued.			Action 3: Establish a low or no interest revolving loan fund for rehabilitation linked to the Secretary of Interior's Guidelines for Historic Preservation.		
		Strategy 3: Deal with hazardous materials abatement in demolition or adaptive reuse.	Action 1: Change Chapter 2.9 of the Land Development Code (LDC) to include costs of hazardous materials abatement in consideration of demolition requests.	Allied Waste of Corvallis; First Alternative Co-op; Benton Habitat for Humanity; City of Corvallis	
			Action 2: Develop a clearinghouse or website to identify materials from deconstruction for new and remodeled development.		
Goal 3: By 2020, all housing in Corvallis will be energy efficient and provide a healthy living environment. By 2010, 100% of new construction will have minimal impact on resources and the environment.	Metrics: Reduce average energy used by households to 18,000 kwh/yr in 2012; 14,000 kwh/yr in 2016; and 9000 kwh/yr in 2020. By 2010 establish guidelines for VOC levels in homes, and minimum use of recycled and renewable construction materials. By 2016 these guidelines will be mandated, and all new homes will be in compliance.	Strategy 1: Minimize energy use in all homes using conservation measures.	Action 1: Monitor advances in residential construction technologies and materials that lead to improved efficiency.	Benton Habitat for Humanity; Ecotecture Publications; Emerald Forest Architecture; First Alternative Co-op; First United Methodist Church, Corvallis; League of Women Voters of Corvallis; Seventh Generation Building Guild; Sustainable Building Network	
			Action 2: Expand, strengthen Energy Challenge Project.		
			Action 3: Correlate energy costs ($/BTU or $/kwh) with energy use. (i.e. the more energy used the higher the rate.)		
Interim Goal: By the year 2015, 65% of all housing in Corvallis will be energy efficient and provide a healthy living environment. All new construction (as of 2010) will have minimal impact on resources and the environment.	Baseline: Average energy use per housing unit is approximately 23,000 kwh/yr. Currently there are no standards or guidelines for toxic VOC levels in living spaces. There are no guidelines or requirements for conservation (reuse/recycling) of building materials.	Strategy 2: Reduce size of homes and ecological footprint in order to conserve energy, land area and resources.	Action 1: Encourage modular and other green demonstration housing concepts.	Benton Habitat for Humanity; Ecotecture Publications; Emerald Forest Architecture; Seventh Generation Building Guild; Solar Summit; City of Corvallis	
			Action 2: Reduce permit costs and System Development Charges (SDC's) for smaller homes.		
			Action 3: Locate funding sources for eco-housing demonstration projects (i.e. minimize permit costs AND find logical connections between green methods and SDC fees for reducing SDC fees.		
		Strategy 3: Encourage more diverse housing options.	Action 1: Revise zoning laws to allow for more diverse neighborhoods, mixing small homes with larger, resource sharing.	Benton Habitat for Humanity; Emerald Forest Architecture; League of Women Voters of Corvallis; Health Equity Alliance; Seventh Generation Building Guild; Timberhill Athletic Club; Sustainable Building Network; local architects	
			Action 2: Develop educational programs to encourage sustainable building solutions. Institute monthly programs at public library that cover alternative housing, green materials, and right size options.		
			Action 3: Design competition for small adaptable housing.		
		Strategy 4: Ensure that all homes are non toxic and use recycled, renewable, and local materials as much as possible.	Action 1: Adopt "green" codes: for example-all new and remodeled homes shall comply with International Code Council (ICC)"Green Codes" (or Austin, Texas Codes: http://www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Participation/participationFormsAndGuides.htm prior to obtaining a permit. OR all those who do comply benefit via reduced permit fees.	Benton Habitat for Humanity; Emerald Forest Architecture; Health Equity Alliance; Seventh Generation Building Guild; Timberhill Athletic Club; Benton County; City of Corvallis	
			Action 2: Ban use of toxic building materials (esp. formaldehyde and volatile organic compounds (VOCs)).		
			Action 3: Encourage small local businesses (i.e. tax incentives) that fabricate green building materials.		
Goal 4: By 2020, chronic homelessness will be reduced by 75%.	Metrics: By the year 2012, chronic homelessness will be reduced by 35% from 120 homeless to 78.	Strategy 1: Locate/educate/assist potentially homeless persons and families prior to housing displacement.	Action 1: Provide information to employers, social service agencies, and the press about actions that families (who are on the edge of eviction) can take.	First United Methodist Church, Corvallis; Health Equity Alliance; City of Corvallis; Willamette Neighborhood Housing Services	
			Action 2: Provide and promote financial fitness classes to very low income groups.		
Goal 4 continued.			Action 3: Provide emergency rental assistance, including help with deposits and first and last month's rent payments.		

TOPIC AREA: HOUSING					
Interim Goal: By the year 2015, chronic homelessness will be reduced by 50%.	Baseline: On Sept 14, 2008 there were 120 homeless persons living on the streets, or in informal camps around the Corvallis community.	Strategy 2: Increase the number of affordable supported housing units suitable for the previously homeless.	Action 1: Identify the types and sizes of groups needing supported housing such as recovering alcoholics, survivors of domestic violence, the marginally mentally ill, mentally disabled adults, ex-convicts and physically disabled persons.	First United Methodist Church, Corvallis; Health Equity Alliance	
			Action 2: Work with the 10 year planning group to select priorities and identify resources to develop housing projects.		
			Action 3: Develop a mechanism to reserve some Section 8 vouchers for women and children coming out of Community Outreach.		
		Strategy 3: Enhance communication between the homeless and service providers in the community.	Action 1: Conduct a resource fair targeting the homeless twice a year to showcase services that are available.	First United Methodist Church, Corvallis; Health Equity Alliance	
			Action 2: Use the 10 year plan as a mechanism to improve the sharing of information.		
			Action 3: Urge agencies to tailor some services to meet the specific needs of the homeless and then to do vigorous outreach so that homeless groups know what services are available and what the eligibility requirements are.		

TOPIC AREA: LAND USE

VISION: Corvallis is a compact, mid-sized city with walkable neighborhoods, a vibrant downtown, and diverse natural areas interwoven in urban landscapes.				Potential Key Organizations (bold = confirmed)	Timeline
Goal 1: By 2040 80% of Corvallis will be a sustainable and compact city with walk-able, mixed-use neighborhoods, functioning neighborhood centers and a vibrant downtown. *Interim Goal: By 2020 50% of Corvallis will be a sustainable and compact city with walk-able, mixed-use neighborhoods, functioning neighborhood centers and a vibrant downtown.*	Metrics:	Strategy 1: By 2012 develop, coordinate, and implement land use planning policies, standards and processes that implement this goal.	Action 1: By the end of the term of the next Council, establish procedures, criteria and a schedule for redevelopment plans for everything inside the city limits.	**League of Women Voters of Corvallis; Corvallis Benton Chamber Coalition; Cycle Solutions; Health Equity Alliance; Emerald Forest Architecture;** City of Corvallis; neighborhoods; local professionals	
			Action 2: Inventory existing and planned neighborhoods for range of amenities and walkability, including those that are residential, mixed-use, commercial and industrial.		
			Action 3: Identify code changes needed to support transition to mixed-use neighborhoods while protecting quality of life and environment, and revise existing codes, regulations, and planning documents accordingly.		
	Baseline:	Strategy 2: By 2012 develop, coordinate, and implement land use strategies that support local business, green industry and downtown vitality.	Action 1: Define the intended role and purpose for downtown and for the neighborhood centers.	**League of Women Voters of Corvallis; T. Gerding Construction; Corvallis Benton Chamber Coalition; Cycle Solutions; Health Equity Alliance; Emerald Forest Architecture;** City of Corvallis; Downtown Corvallis Association; OSU; construction industry	
			Action 2: Immediately begin an assessment by staff with public input on what already exists to achieve these goals, and what needs to be changed in the planning rules or other government or private activities.		
			Action 3: Create incentives and policies that support downtown, locally owned, and green industry.		
		Strategy 3: By 2012 develop, coordinate, and implement land use strategies that balance compact, urban mixed use development with the enhancement of existing neighborhoods and green space.	Action 1: Inventory and develop incentives and regulations to protect, restore, and maintain historic and modernist neighborhoods, structures, landscapes, and trees to stop teardowns and to preserve a sense of place and uniqueness.	**League of Women Voters of Corvallis; Emerald Forest Architecture; Cycle Solutions; Health Equity Alliance; T. Gerding Construction; Timberhill Athletic Club;** City of Corvallis; Benton County; HRC; OSU; National Trust Regional Office; CBUF; PreservationWORKS; neighborhood associations; Parks, Natural Areas & Recreation Board	
			Action 2: Using neighborhood dialogue, review the code and City procedures which present obstacles to the accomplishment of this goal.		
			Action 3: Rezone where needed to distribute schools, mixed use neighborhood centers, green space and indoor and outdoor gathering spaces throughout the city.		
		Strategy 4: By 2012 develop, coordinate, and implement land use strategies to replace 50% of private motorized vehicle trips with human-powered and public transit	Action 1: Revise parking requirements to encourage the use of shared parking and alternative transportation including use of non-motorized vehicles and public transit.	**Cycle Solutions; Emerald Forest Architecture; Willamette Disc Golf Club; Corvallis Benton Chamber Coalition; Health Equity Alliance; Timberhill Athletic Club;** City of Corvallis; Downtown Corvallis Association; Parking Commission; Bicycle Advisory Group; Public Transit Commission; OSU and other major employers; state, federal, CAMPO, counties, cities, ODOT	
			Action 2: Create light rail with a station downtown to connect to Albany, Philomath, Salem and Eugene.		
			Action 3: Reduce the use of motorized transit by identifying 25% of roads for conversion to non-motorized transit only and by expanding the network of multimodal paths and public transit to connect all neighborhoods to neighborhood centers and downtown.		
Goal 2: By 2040, 90% of Corvallis will be a livable city with functional, integrated and diverse natural areas interwoven in urban landscapes.	Metrics:	Strategy 1: By 2012 develop, coordinate, and implement land use planning policies, standards and processes that implement this goal.	Action 1: Complete a survey to determine what areas already meet the natural area criteria, what areas already set aside need improvement to meet the criteria and what new areas offer opportunities for creating or restoring natural areas.	**Greenbelt Land Trust; Cycle Solutions; Health Equity Alliance; Native Plant Society of Oregon; T. Gerding Construction; Emerald Forest Architecture;** City of Corvallis; Benton County; watershed councils; OSU	
			Action 2: Coordinate all codes, regulations, and planning documents in GIS (mapping) layers to improve plan review process, assess cumulative impacts of new development, and enforce existing codes, regulations, and planning documents to protect natural areas.		
			Action 3: Building heights shall be positively coordinated with distance from the Willamette and Marys Rivers.		

TOPIC AREA: LAND USE					
Goal 2 continued. *Interim Goal: By 2020 70% of Corvallis will be a livable city with functional, integrated and diverse natural areas interwoven in urban landscapes.*	Baseline:	Strategy 2: By **2012** develop, coordinate, and implement land use strategies that protect and restore natural areas and native species.	Action 1: Review natural features inventories; prioritize, acquire and restore diverse areas throughout the UGB; arrange land swaps to protect most significant natural features, and promote use of native species (mandate planting of native species in all public projects, provide incentives for de-paving and offer incentives for native species planting in new developments).	**Audubon Society Corvallis; Emerald Forest Architecture; Institute for Applied Ecology; Native Plant Society of Oregon; Benton Habitat for Humanity; Cycle Solutions; League of Women Voters of Corvallis;** City of Corvallis; Benton County; Downtown Corvallis Association; Parking Commission; Bicycle Advisory Group; Public Transit Commission; OSU and other major employers	
			Action 2: Enforce dark sky compliant lighting of all streets, parking lots and buildings to protect circadian rhythms.		
			Action 3: Repeal the Minimum Allowed Development Area (MADA) provisions of the new Land Development Code (LDC).		
		Strategy 3: By **2012** have in place land use strategies that improve connections between neighborhoods and natural areas within and outside the city.	Action 1: Inventory urban tree species and percent canopy cover of urban forest, and develop and implement tree/urban forest protection program with incentives, regulations, and penalties for unauthorized removal of significant trees.	**Benton Habitat for Humanity; Cycle Solutions; League of Women Voters of Corvallis; Native Plant Society of Oregon; OSU Extension, Benton County; Emerald Forest Architecture; Willamette Disc Golf Club;** City of Corvallis; Civic Beautification & Urban Forestry Advisory Commission; OSU; PNRB; local planning professionals; developers; watershed councils; Benton County	
			Action 2: Protect significant natural areas from development, and ensure that any future development provides/maintains access from existing neighborhoods to developed parkland and undeveloped publicly accessible natural areas.		
			Action 3: Inventory and improve existing natural corridors and create a web of bio/modal connections throughout the city and connecting to outlying areas. These corridors will incorporate some natural or organic space: rivers and streams, forested strips, and/or areas of native or agricultural plantings as well as paths for pedestrians and non-motorized vehicles. Make it possible to travel from any park to any other along greenways.		
Goal 3: By 2040, 50% of Corvallis will be sustained by diverse local products (produced within 100 miles) from locally-owned businesses, family farms, forests, and urban gardens in a manner that protects all of its natural resources. *Interim Goal: By 2020 25% of Corvallis will be sustained by diverse local products (produced within 100 miles) from locally-owned businesses, family farms, forests, and urban gardens in a manner that protects all of its natural resources.*	Metrics:	Strategy 1: By **2012** develop, coordinate, and implement land use strategies that minimize loss of natural resource quality and quantity.	Action 1: Overlay existing natural resource inventories, environmental assessments and planning documents to assess cumulative impacts of previous development and any proposed development on natural environment and quality of life.	**Greenbelt Land Trust; Cycle Solutions; Health Equity Alliance; Institute for Applied Ecology; League of Women Voters of Corvallis; Timberhill Athletic Club; Emerald Forest Architecture;** City of Corvallis; EPA; OSU; natural resources professionals; state; Benton County; Downtown Corvallis Association; agricultural organizations; Dept. of Agriculture; watershed councils	
			Action 2: Modify local land use codes, including zoning, to support local businesses and organizations in developing ways local products can be produced and marketed locally more effectively. Advocate for state land use regulations to support this goal.		
			Action 3: Direct development to areas with least environmental impact and least ecological significance through education, regulations, enforcement, incentives, and land swaps.		
	Baseline:	Strategy 2: By **2012** develop, coordinate, and implement land use strategies that increase urban food production by **100%.**	Action 1: Identify farmable land within Urban Growth Boundary (UGB) to convert to community gardens and/or urban farms, remove and modify government and private restrictions that are barriers, and provide education and incentives for organic and sustainable food production.	**Ten Rivers Food Web; Ecumenical Ministries of Oregon; First Alternative Co-op; Cycle Solutions; First United Methodist Church, Corvallis; League of Women Voters of Corvallis; T. Gerding Construction; Emerald Forest Architecture;** watershed councils; City of Corvallis; state; Oregon Tilth; Benton County; agricultural groups; neighborhoods	
			Action 2: Promote conversion from grass seed farms to food production within the County.		
			Action 3: Include greenhouses, food preservation and food processing facilities within the neighborhood centers.		

TOPIC AREA: LAND USE					
Goal 4: By 2020, 100% of Corvallis and Benton County will use green building (LEED or a similar standard) practices in all renovation and new construction.	Metrics:	Strategy 1: By 2012 change and improve the Land Development Code and locally adopted building codes and policies to support this goal.	Action 1: Adopt LEED for Neighborhoods Standards that support sustainable communities and protection of natural features, and reject those that are in conflict.	Abundant Solar; League of Women Voters of Corvallis; Seventh Generation Building Guild; T. Gerding Construction; Emerald Forest Architecture; City of Corvallis; certified professionals; construction industry; local green building professionals; PreservationWORKS; Green Building Council	
			Action 2: Encourage renovation over new construction and direct new development first to the redevelopment of brownfields (areas in need of rehabilitation). Track and recognize renovation that uses green building standards.		
			Action 3: Modify code to allow renovation of existing buildings without having to comply with all current code.		
	Baseline:	Strategy 2: By 2012 develop, coordinate, and implement a comprehensive green building program for Corvallis and Benton County equivalent to 2030 Challenge, LEED or similar standards.	Action 1: Adopt measurable standards for city owned property such as LEED and Natural Step.	Abundant Solar; Benton Habitat for Humanity; League of Women Voters of Corvallis; Seventh Generation Building Guild; T. Gerding Construction; Emerald Forest Architecture; City of Corvallis; green building professionals; construction industry; state; PreservationWORKS; building products retailers; Green Building Council	
			Action 2: Provide incentives for green building and renovation which include streamlined permitting and reduced building and SDC fees (system development charges).		
			Action 3: Create re-building center for sorting usable waste for new construction materials. Include warehouse area for re-fabricating and re-designing materials.		
			Action 4: Utilize green building practices equivalent to LEED, 2030 Challenge, or similar standards.		
		Strategy 3: By 2012 establish target goals for percentages of new construction and renovations which meet an applicable LEED (or equal) certification standard.	Action 1: Sponsor design competition to clarify and inspire creative solutions to accomplish this strategy.	Emerald Forest Architecture; Abundant Solar; Seventh Generation Building Guild; T. Gerding Construction; local architects; Green Building Council; OSU, U of O; PSU; City of Corvallis; Downtown Corvallis Association; PreservationWORKS; construction industry	
			Action 2: Support urban renewal district to improve downtown renovations.		
			Action 3: Give incentives for the use of local contractors, suppliers, materials and labor.		

TOPIC AREA: NATURAL AREAS AND WILDLIFE

VISION: Our natural features, hillsides, floodplains, streams, wetlands and other open spaces natural areas are protected and treasured.				Potential Key Organizations (bold = confirmed)	Timeline
Goal 1: By 2030, increase the acreage of protected natural habitat by 50 percent to ensure the integrity and resilience of diverse, native ecosystems. *Interim Goal: By 2020, increase the acreage of protected natural habitat by 30 percent to ensure the integrity and resilience of diverse, native ecosystems.*	Metric: Acreage	Strategy 1: Initiate a comprehensive, long-range, natural area conservation plan.	Action 1: Convene a natural area conservation planning committee with public and private partners.	**Benton Soil and Water Conservation District; Chintimini Wildlife Center; Greenbelt Land Trust; Institute for Applied Ecology; Marys Peak Natural Resources Interpretive Center; Audubon Society Corvallis**; City of Corvallis; Benton County; US Fish and Wildlife Service; ODFW; USFWS; OSU; BLM; NRCS; State Parks; ODOT; TNC; USFS; City of Philomath; OSU; Starker Forests; Marys River Watershed Council	0-2 years
			Action 2: Adopt an integrated natural areas conservation plan, which includes acquisition criteria and priorities for acquisition, protection and active conservation management.		3-5 years
			Action 3: Agencies and non-profits implement conservation priorities under the plan.		4-10 years
	Baseline: Needs to be developed by joining together descriptive databases from City, county, state, feds, NGOs.	Strategy 2: Stable, long-term revenue sources for the acquisition; restoration and preservation of prime natural areas are in place.	Action 1: Identify potential, long-term funding sources.	**Greenbelt Land Trust; Marys Peak Natural Resources Interpretive Center**; City of Corvallis; Benton County	0-3 years
			Action 2: The fullest range of stable, long-term funding sources are in place.		3-6 years
			Action 3: Conservation funds are disbursed according to priorities established by the integrated, regional natural area conservation plan.		5-10 years
		Strategy 3: The monetary value of services provided by natural ecosystems guides and informs all land-use planning and development decisions.	Action 1: Initiate research to establish equivalent dollar values of the full range of natural ecosystem services such as weather and climate change buffering, water clarification, and pollination.	**Marys Peak Natural Resources Interpretive Center**; OSU Dept. of Agricultural and Resource Economics; City of Corvallis Parks & Recreation Dept.; Benton County Natural Areas & Parks; USFWS; Conservation Biology Institute	0-3 years
			Action 2: Amend local laws and development codes to take ecosystem service values into account.		3-5 years
			Action 3: Provide an extensive, publicly-accessible database of equivalent dollar values for services provided by our local ecosystem.		5-7 years
Goal 2. By 2030, 100 percent of public and private natural area acreage is being restored and managed under a set of best practices that optimizes their ecological integrity and resilience. *Interim Goal: By 2020, 75% of public and private natural area acreage is being restored and managed under a set of best practices that optimizes their ecological integrity and resilience.*	Metric: Acreage restored	Strategy 1: Adopt a restoration and management practices plan for all public natural areas.	Action 1: Develop restoration and management plans for areas within the cities, and newly acquired natural areas beyond city limits.	**Marys Peak Natural Resources Interpretive Center; Audubon Society Corvallis; Institute for Applied Ecology**; City of Corvallis Parks Dept.; Benton County Parks Dept.; other public landowners; ODFW; interested public and users groups	
			Action 2: Review and update existing natural area management and restoration plans in accordance with best management practices.		
	Baseline: Must be developed by Planning Committee in Goal 1.	Strategy 2: Promote habitat management and restoration on private land.	Action 1: Provide comprehensive education and training on sustainable restoration and management practices to private landholders.	**Benton Soil and Water Conservation District; Chintimini Wildlife Center; Greenbelt Land Trust; Institute for Applied Ecology; Marys Peak Natural Resources Interpretive Center; Student Sustainability Initiative; First United Methodist Church, Corvallis**; NRCS; Partners for Wildlife Program; USFWS; City of Corvallis; Benton County; National Wildlife Federation; nurseries; neighborhood associations; City of Philomath	0-3 years
			Action 2: Develop and promote backyard natural habitat programs.		1-4 years
			Action 3: Develop a wide range of incentive and recognition programs to encourage habitat restoration and management projects on private lands.		3-5 years

TOPIC AREA: NATURAL AREAS AND WILDLIFE					
Goal 2 continued.		Strategy 3: Promote community volunteer-supported restoration projects on public and accessible private natural areas.	Action 1: Establish a network and web presence for community natural areas conservation activities and volunteer opportunities.	Benton Soil and Water Conservation District; Emerald Forest Architecture; Greenbelt Land Trust; Institute for Applied Ecology; Marys Peak Natural Resources Interpretive Center; Student Sustainability Initiative; Willamette Disc Golf Club; First United Methodist Church, Corvallis; OSU Extension, Benton County; City of Corvallis; SOLV; USFWS; Benton County; cities; USFS; ODFW; ODOT	0-2 years
			Action 2: Coordinate volunteer conservation activities in the community.		0-2 years
			Action 3: Further develop and expand urban creek restoration and outreach program (UCROP), including development of urban creek watershed councils.		0-3 years
Goal 3: By 2030, 80 percent of community members actively participate in natural areas appreciation programs or restoration efforts. *Interim Goal: By 2020, 50 percent of community members actively participate in natural areas appreciation programs or restoration efforts.*	Metric: % of residents	Strategy 1: Increase the number and accessibility of conservation education and outreach programs.	Action 1: Outdoor classroom sites exist at all community K-12 schools.	Benton Soil and Water Conservation District; Chintimini Wildlife Center; Corvallis Environmental Center; Corvallis NW Earth Institute; First Alternative Co-op; Greenbelt Land Trust; Institute for Applied Ecology; Marys Peak Natural Resources Interpretive Center; OSU Extension, Benton County; Audubon Society Corvallis; public and private schools; Parent-Teacher organizations; public, private, and charter school boards; Oregon Trout; Oregon Natural Resource Education Program; Marys River Watershed Council; LBCC; OSU; City and County Parks Departments; Beth Young Garden Design	0-3 years
			Action 2: Locally-focused (place-based) natural history instruction is integrated into all K-12 school curricula.		3-5 years
			Action 3: Increase the number of and access to a wider range of natural history programs for adults.		0-2 years
	Baseline: Must be developed, perhaps through annual City survey, a web-based instrument, or reports from partner organizations.	Strategy 2: Increase recreation and access in public and private natural areas.	Action 1: Expand and improve opportunities and facilities for unstructured recreational opportunities such as hiking, fishing, bird watching, nature photography.	Benton Soil and Water Conservation District; Greenbelt Land Trust; Neighborhood Naturalist; Willamette Disc Golf Club; Marys Peak Natural Resources Interpretive Center; Timberhill Athletic Club; City and County Parks and Natural Areas Departments; LBCC; OSU; Oregon Trout; Trout Unlimited; Corvallis Mountain Bike Club; HOTV Runners; Northwest Youth Corps; Corvallis to the Sea; Bicycle Transportation Alliance; USFWS	0-3 years and ongoing
			Action 2: Create and maintain a functional network of paths and trails to and between natural areas.		3-5 years and ongoing
			Action 3: Create a City wide week of celebration and awareness around local natural areas.		0-3 years
		Strategy 3: Provide natural history and cultural information at natural areas.	Action 1: Natural history interpretive activities are available on public and private natural areas.	Chintimini Wildlife Center; Greenbelt Land Trust; Marys Peak Natural Resources Interpretive Center; Neighborhood Naturalist; Institute for Applied Ecology; OSU Extension, Benton County; City of Corvallis; Benton County; USFWS; Oregon Trout; Corvallis Waldorf School; Philomath School District; Wilderness Society	0-3 years
			Action 2: State-of-the-art, natural and cultural history interpretive tools, including signs, are in place at public natural areas.		3-5 years
			Action 3: A system of informative, interpretive signs on ecological topics along trails and paths helps the community appreciate the value and role of natural areas.		5-7 years

TOPIC AREA: TRANSPORTATION

VISION: In 2020 Corvallis will be a hub in a regional transportation system that includes sustainable transportation modes for people and goods that connect Linn and Benton Counties and provides a link to the north-south high-speed rail system.				Interim Goal:	Potential Key Organizations (bold = confirmed)	Timeline
Goal 1: Increase the alternatives for transportation and linkages to destinations beyond Corvallis so that by 2015 people have efficient options for travel throughout the region.	Metrics: Ridership on transportation systems. Number of connecting points between transportation systems. Number of locations and numbers of people served.	Strategy 1: Increase the use of existing transit options.	Action 1: Advertize existing connections.	People are aware of transportation options.	**Corvallis Benton Chamber Coalition; Emerald Forest Architecture; First Alternative Co-op; League of Women Voters of Corvallis; First United Methodist Church, Corvallis; Health Equity Alliance; Timberhill Athletic Club;** CAMPO; City of Corvallis	0-2 years
			Action 2: Create a regional map showing points of connection between transit systems and links to detailed maps of those systems.	People use the map when planning trips and can access it on paper or electronically.		0-2 years
			Action 3: Make the systems easier to use by decreasing wait times and coordinating fares.	People want to use the transportation systems because it is easier than driving.		3-5 years
	Baseline: Has not been measured yet.	Strategy 2: Strengthen transit connections to other communities by forming a more regional transportation district including as much of Western and Central Oregon as possible.	Action 1: Improve the timing of existing connections.	Ensure that the whole system can carry bikes.	**Corvallis Benton Chamber Coalition; Cycle Solutions; Health Equity Alliance; League of Women Voters of Corvallis;** CAMPO; City of Corvallis; City of Albany; Linn & Benton Counties; Albany Transit; CARTS; Lane Transit; Valley Retriever; Lincoln Transportation System; Portland Metro; other MPOs	0-2 years
			Action 2: Connect to every train (Albany).			0-2 years
			Action 3: Add routes and/or runs throughout the region.	People can travel between communities in less than twice the time it takes to drive.		3-5 years
		Strategy 3: Provide transport to recreational areas.	Action 1: Add scheduled stops at trailheads.	It is convenient to go hiking and camping without a car	**Willamette Disc Golf Club; Health Equity Alliance; League of Women Voters of Corvallis;** Valley Retriever and other bus systems; Peak Sports; ski areas, local transit systems; Corvallis Parks and Recreation Department; OSU Dixon Recreation Center	0-2 years
			Action 2: Increase use and frequency of ski busses.	It is more pleasant, cheaper and easier to take the bus skiing than to drive.		0-2 years
			Action 3: Increase the Parks and Recreation outings with shared or provided transportation.	People have many recreation opportunities with transportation included.		0-2 years
Goal 2: Motivate community members to reduce per-capita gasoline consumption by 50% by 2020.	Metrics: Gallons of gasoline used per capita per year.	Strategy 1: Offer public and private incentives to encourage employees, shoppers, and students to ride, cycle, or use mass transit.	Action 1: Expand hours, frequency, and range of city buses, and reduce or eliminate cost.		**Allied Waste of Corvallis; Cycle Solutions; First Alternative Co-op; League of Women Voters of Corvallis; Health Equity Alliance;** City of Corvallis; Corvallis Transit System; merchants and associations; DCA	0-2 years
			Action 2: Provide price break incentives at downtown businesses for bus/bike patrons.			0-2 years
			Action 3: Establish an organization based on Energy Trust model to provide free audits of transportation energy use and help people plan to meet their transport needs more efficiently.	People are more aware of the costs (direct and indirect) of their fuel use.		3-5 years
	Baseline: 180 gallons annually per capita in Corvallis.	Strategy 2: Offer incentives and disincentives to increase the miles per gallon (MPG) of the Corvallis fleet.	Action 1: Encourage purchase of more efficient vehicles through a state rebate program.		**Health Equity Alliance; Timberhill Athletic Club;** State of Oregon; City of Corvallis; Zipcar, Inc..	3-5 years
			Action 2: Have City show leadership by purchasing highly efficient vehicles.			3-5 years
			Action 3: Get fuel-efficient car share vehicles (e.g. Zip car) in every Corvallis neighborhood. Twenty-five people from a neighborhood have to sign up to get a car placed.			0-2 years

TOPIC AREA: TRANSPORTATION						
Goal 2 continued.		Strategy 3: Encourage and facilitate use of alternative fuels.	Action 1: Promote and encourage compressed natural gas (CNG) use in the private, public, and commercial sectors by tax credits.		**Abundant Solar; Cycle Solutions; First Alternative Co-op; League of Women Voters of Corvallis; Corvallis Benton Chamber Coalition; Health Equity Alliance;** Dept. of Energy; City of Corvallis; CTC; CAMPO; Dial-a-Bus; NW Natural; commercial stations; local installers of "at-home" CNG systems; local commercial fleet; Dept. of Energy; Energy Trust; local commercial producers of NEVs; power companies; OSU; DOE; DOT; grant-making organizations	0-2 years
			Action 2: Promote and encourage neighborhood electric vehicle (NEV) use by tax credits, priority parking, and availability of charging stations.			0-2 years
			Action 3: Fund alternative fuels research and development at OSU.			3-5 years
Goal 3: Decrease vehicle trips by 20% by 2020 through effective planning.	Metrics: Vehicle Trips	Strategy 1: Reduce single occupancy vehicle trips (Implement Transportation Demand Management or TDM).	Action 1: Mandate that employers have TDM program.	10% reduction in trips.	**Cycle Solutions; Emerald Forest Architecture; League of Women Voters of Corvallis;** City of Corvallis; major community employers; OSU; Benton County; Good Samaritan Medical Services; HP; Corvallis Clinic	3-5 years
			Action 2: Free expanded transit.			0-2 years
			Action 3: Install City-wide WiFi.			3-5 years
	Baseline: 515,000 vehicle trip ends in 1991.	Strategy 2: Redevelop property to higher densities per current Land Development Code (LDC) and Comp Plan.	Action 1: Develop a program of tax incentives.		**League of Women Voters of Corvallis;** City of Corvallis; Benton County	0-2 years
			Action 2: Develop a funding source.			3-5 years
			Action 3: Implement the program.			6-10 years
		Strategy 3: Put in place infrastructure to support neighborhood centers.	Action 1: Purchase properties to create neighborhood centers and in planned new neighborhoods.		**League of Women Voters of Corvallis; Health Equity Alliance;** new private non-profit/ Development Commission; City of Corvallis; private developer; neighborhood associations	6-10 years
			Action 2: Construct streets, water sewer.			6-10 years
			Action 3: Develop funding sources.			3-5 years

TOPIC AREA: WASTE

VISION: By 2030, Corvallis is a waste-free community.				Potential Key Organizations (bold = confirmed)	Timeline
Goal 1: By 2020, the recycling rate for the Corvallis community will be 75%. (The recycling rate includes cardboard, commingled materials, electronics, food waste, office paper, wood waste, and yard debris that have been recycled.) *Interim Goal: By 2014, the recycling rate for the Corvallis community will be 65%.*	Metrics: Tons recycled divided by total tons disposed less industrial tons.	Strategy 1: Collect all organic waste (yard debris and food waste) for alternative uses.	Action 1: Develop curbside pickup of food waste for residential and commercial collection programs. Concurrently, promote the use of compostable take-out containers and develop a timeline for prohibiting the use of expanded polystyrene (EPS) take-out containers at local food service businesses.	**Abundant Solar; Allied Waste of Corvallis; ASOSU Environmental Affairs Task Force; Cycle Solutions; Emerald Forest Architecture; FireWorks Restaurant; First Alternative Co-op; First United Methodist Church, Corvallis; League of Women Voters of Corvallis; OSU Extension, Benton County; Student Sustainability Initiative; Health Equity Alliance; OSU Campus Recycling;** City of Corvallis; Benton County; Benton County Solid Waste Advisory Committee; Oregon Soil Corporation; food service businesses; Downtown Corvallis Association; OSU Housing and Dining Services; neighborhood associations; Master Recyclers; Corvallis Gazette-Times; OSU	0-2 years
			Action 2: Create alternative, neighborhood-based composting programs.		3-5 years
			Action 3: Develop and implement a program to educate residents, businesses, and institutions about existing opportunities for composting and/or reuse of organic materials.		0-2 years
	Baseline: 45.2% recycling rate (2007).	Strategy 2: Divert construction wastes to existing or new facilities for recycling.	Action 1: Develop a program to educate building contractors and homeowners regarding existing opportunities for recycling and/or reuse of construction materials.	**Abundant Solar; Allied Waste of Corvallis; Benton Habitat for Humanity; Emerald Forest Architecture; FireWorks Restaurant; First Alternative Co-op; League of Women Voters of Corvallis; OSU Campus Recycling; T. Gerding Construction;** building contractors; Economic Vitality Partnership; City of Corvallis	0-2 years
			Action 2: Establish a private or public deconstruction operation.		3-5 years
		Strategy 3: Increase amount of recyclable material collected from businesses, residences, and institutions.	Action 1: Support and expand existing programs that offer waste audits for businesses, residences, and institutions.	**Allied Waste of Corvallis; Benton Habitat for Humanity; Corvallis NW Earth Institute; Cycle Solutions; Emerald Forest Architecture; FireWorks Restaurant; First Alternative Co-op; League of Women Voters of Corvallis; OSU Campus Recycling; Student Sustainability Initiative; First United Methodist Church, Corvallis;** Master Recyclers; City of Corvallis; St. Mary's Care for Creation Committee	0-2 years
			Action 2: Develop and implement a comprehensive recycling education program.		0-2 years
Goal 2: By 2020, there will be a 50% reduction in the per capita weight of landfill disposal (discards). *Interim Goal: By 2014, reduce per capita weight of landfill disposal by 25%.*	Metrics: Pounds per capita of landfill-bound waste.	Strategy 1: Increase education and promotion of existing waste reduction and reuse opportunities.	Action 1: Create a public outreach program that educates the community on waste reduction and reuse opportunities.	**Allied Waste of Corvallis; Benton Habitat for Humanity; Corvallis NW Earth Institute; EcNow Tech; Emerald Forest Architecture; First Alternative Co-op; League of Women Voters of Corvallis; OSU Campus Recycling; OSU Extension, Benton County; Student Sustainability Initiative; First United Methodist Church, Corvallis; Health Equity Alliance;** City of Corvallis; Master Recyclers; Benton Furniture Share; Downtown Corvallis Association; Scouts; OSU; LBCC; Mac Users Group; local appliance and HVAC businesses	0-2 years
			Action 2: Develop and implement a K-12 curriculum on waste reduction and reuse.		0-2 years
			Action 3: Increase the number and availability of technical education programs that teach repair skills at secondary and continuing education levels.		3-5 years

TOPIC AREA: WASTE					
Goal 2 continued.	Baseline: 1,496 lbs per person annually (2006)	Strategy 2: Increase opportunities for materials reuse.	Action 1: Create and distribute a directory of businesses and non-profits that will accept items for reuse.	Abundant Solar; Allied Waste of Corvallis; Benton Habitat for Humanity; EcNow Tech; Emerald Forest Architecture; First Alternative Co-op; OSU Campus Recycling; City of Corvallis; Master Recyclers; Downtown Corvallis Association; Vina Moses; local thrift stores; Benton Furniture Share; neighborhood associations; Scouts	0-2 years
			Action 2: Increase convenience of collecting reusable items from residential and commercial/industrial customers through curbside and on-site collection.		3-5 years
			Action 3: Facilitate establishment of "neighborhood lending libraries" for tools and other items.		3-5 years
		Strategy 3: Provide financial incentives and establish policies that encourage reduction of per capita waste.	Action 1: Promote rebates for reusable bags ($.05 per bag) and mandate charges for disposable bags ($.25 per bag) at local stores that exceed minimum annual sales volume ($ TBD). Assess after two years to determine if rebates/charges are effective, or if a ban on plastic bags is justified.	Allied Waste of Corvallis; Abundant Solar; City of Corvallis; Downtown Corvallis Association; local retailers	0-2 years
			Action 2: Structure the city franchise agreement so that it is more profitable for the hauler to reduce, rather than to increase, the volume of waste disposed per capita.		0-2 years
			Action 3: Implement a residential waste collection system that automatically weighs each container as it is picked up and charges by the pound. As the weight increases over a specific established weight per household/capita, the charge per pound increases (progressive rate schedule above base rate).		3-5 years
Goal 3: By 2020, the Corvallis community will increase proper disposal of hazardous waste by 75%. *Interim Goal: By 2014, increase proper disposal of hazardous waste by 40%.*	Metrics: Number of customers participating annually in household hazardous waste disposal events.	Strategy 1: Provide increased education to residents, businesses, and institutions regarding proper disposal of hazardous waste.	Action 1: Utilize additional media opportunities to publicize hazardous waste collection events.	Allied Waste of Corvallis; Benton Habitat for Humanity; OSU Campus Recycling; First United Methodist Church, Corvallis; Health Equity Alliance; Natural Choice Directory; City of Corvallis; Master Recyclers; Benton County	0-2 years
			Action 2: Promote existing resources that provide information about how to properly dispose of specific hazardous materials.		0-2 years
	Baseline: 3,027 customers (2007).	Strategy 2: Broaden opportunities for proper disposal of hazardous waste.	Action 1: Provide bi-annual curbside collection of e-waste.	Benton Habitat for Humanity; Allied Waste of Corvallis; Health Equity Alliance; City of Corvallis; local retailers of computers; local pharmacies; OSU; Mycological Society	0-2 years
			Action 2: Support establishment and implementation of pharmaceutical take-back program.		0-2 years
			Action 3: Explore alternative methods of disposing of toxics, such as mycological remediation.		3-5 years
		Strategy 3: Promote non-toxic alternatives.	Action 1: Launch a public awareness campaign to promote non-toxic alternatives to toxic cleaning products.	Allied Waste of Corvallis; Corvallis NW Earth Institute; Emerald Forest Architecture; First Alternative Co-op; Natural Choice Directory; First United Methodist Church, Corvallis; Health Equity Alliance; OSU Campus Recycling; Your Green Home; Downtown Corvallis Association; Oregon Toxics Alliance; local retailers; LBCC; OSU; local faith communities	0-2 years
			Action 2: Establish purchasing policies at public institutions that give preference to non-toxic alternatives to toxic products for cleaning, building repair and maintenance, landscape maintenance, and automotive repair and maintenance.		3-5 years
			Action 3: Establish recognition programs for "toxic-free" environments at businesses, schools, government facilities, and other institutions.		3-5 years

TOPIC AREA: WATER

VISION: Water conservation efforts decrease the amount of water city residents' use, and steams and creeks are clean and clear.				Potential Key Organizations (bold = confirmed)	Timeline
Goal 1: By 2050, there will be a 50% reduction in the water flow (quantity) from 2008 annual levels through the Corvallis municipal water systems (currently including the Taylor and Rock Creek Water Treatment Plants, the Wastewater Treatment Plant, and the storm water drainage system). *Interim Goal: Reduce water flow from 2008 annual levels through the Corvallis municipal water systems 25% by 2020.* *Develop a community water center for public demonstration in a publicly accessible location.*	Metrics: Gallons/year total volume, not adjusted for population growth or any other factor.	Strategy 1: Develop programs to reduce water level flows by addressing individual and organizational water/wastewater use patterns.	Action 1: Adopt individual plans and goals to reduce drinking, sewer and storm water flow levels resulting from personal water/wastewater use patterns.	**First Alternative Co-op; League of Women Voters of Corvallis; Emerald Forest Architecture; Willamette Disc Golf Club; Willamette Watershed Productions; First United Methodist Church, Corvallis; Seventh Generation Building Guild;** City of Corvallis; OSU	0-2 years
			Action 2: Provide recognition and economic incentive programs for reduced usage of the three municipal water systems.		0-2 years
			Action 3: Evaluate both residential and institutional usage patterns of the three municipal water systems and current water use reduction programs. Recommend new programs targeting lowering water-use patterns.		3-5 years
	Baseline: Annual flows: Waste water treatment plant = 4 billion gallons. Storm water through the treatment plant = 0.76 billion gallons. Storm water directly into water ways = 1.52 billion gallons. Drinking water = 2.76 billion gallons.	Strategy 2: Implement technologies that reduce annual flow through drinking, sanitary and storm water systems.	Action 1: Low-flow Technologies – Promote to all property owners and require low flow technologies on all water-related systems during the permitting phase.	**First Alternative Co-op; League of Women Voters of Corvallis; Emerald Forest Architecture; Willamette Watershed Productions; T. Gerding Construction;** City of Corvallis	0-2 years
			Action 2: Alternative Sewer Technologies - Promote state-sanctioned alternative sewer technologies that safely reduce municipal sewer flow for all existing buildings and require reductions for all relevant building permits. These technologies could include gray-water re-use, composting toilets, and Living Machines©.		0-2 years
			Action 3: Low Impact Development Storm Water Runoff Reduction Technologies – Promote Low Impact Development techniques for all properties and require when issuing building permits. These techniques could include minimizing pavement/building footprint, rain gardens, infiltration trenches, permeable pavers, rainwater harvesting, green roofs, vertical gardens, drought-tolerant/layered vegetation, and permaculture.		0-2 years
		Strategy 3: Develop alternative water sources that will reduce current flow levels in the municipal systems.	Action 1: Plan and install a community Sustainable Water Demonstration Site in a high-traffic and accessible existing enterprise that will demonstrate large-scale usage of alternative water sources, such as rainwater and gray-water.	**Willamette Watershed Productions; First Alternative Co-op; Seventh Generation Building Guild; Emerald Forest Architecture;** City of Corvallis	0-2 years
			Action 2: Develop a system for using municipal treated wastewater for state-approved functions within the City of Corvallis.		6-10 years
Goal 2: By 2025, the Corvallis watersheds will be revived to conditions that provide healthy habitat characteristics that support reproducing populations of cold water native fish in Corvallis principal streams. *Interim Goal: Set back 25% of piped stormwater outfalls by 2013. Construct velocity-dispersing wetlands and/or buffers on all stormwater outfalls set back in Action B by 2023.*	Metrics: The presence of self-sustaining cold water native fish populations.	Strategy 1: Evaluate current stream habitat characteristics and develop a plan to meet the designated standards.	Action 1: Evaluate the presence and conditions of cold water native fish in the waterways.	**Benton Soil and Water Conservation District; Marys Peak Group Sierra Club; Native Plant Society of Oregon; Willamette Watershed Productions**	3-5 years
			Action 2: Engage property owners adjacent to principle streams in the evaluation of the healthy habitat characteristics.		3-5 years
			Action 3: Engage property owners adjacent to principle streams in the planning process to remediate stream characteristics.		3-5 years
	Baseline: Current watershed conditions providing healthy habitat characteristics for cold water native fish. The baseline will be determined by completion of Strategy 1 by 2012.	Strategy 2: Eliminate direct draining of stormwater from the municipal storm drain outfalls into existing stream channels.	Action 1: Evaluate the number and impact of direct storm drain outfalls on local waterways.	**Benton Soil and Water Conservation District; Marys Peak Group Sierra Club; First Alternative Co-op; Willamette Watershed Productions;** City of Corvallis; Corvallis property owners	0-2 years
			Action 2: Open and set back 50% of piped stormwater outfalls.		6-10 years
			Action 3: Construct velocity-dispersing wetlands and/or buffers between all outfalls and stream channels.		20-30 years
		Strategy 3: Improve and protect Corvallis urban stream corridors to provide habitat characteristics that support cold water native fish.	Action 1: Pursue acquisition or easement to protect land along principle stream corridors.	**Benton Soil and Water Conservation District; Emerald Forest Architecture; Greenbelt Land Trust; Marys Peak Group Sierra Club; OSU Extension, Benton County; Native Plant Society of Oregon; T. Gerding Construction; Willamette Watershed Productions;** Corvallis property owners	3-10 years
			Action 2: Implement plans to improve conditions of streams, native riparian vegetation and stream flows.		3-10 years
			Action 3: Evaluate and develop plans to increase sufficient vegetation throughout the Corvallis watersheds that will provide ecological and hydrological support to cold-water native fish in the streams.		3-10 years

IMPLEMENTATION

Action Teams

At Town Hall 3, participants volunteered for Actions Teams, collaborative groups that will be tasked with implementation of the Action Plan. Approximately 190 volunteers expressed interest in joining an Action Team. Additional volunteers are able to join Action Teams via the Coalition website.

On October 25, 2008, a work session was held with Work Group leaders and Steering Committee members to celebrate the Work Groups' efforts and to explore how best to transition from the planning to the implementation stage. The focus was on identifying and discussing interconnections between topic area goals and strategies and identifying opportunities for collaboration among the newly forming Actions Teams. Each volunteer identified help needed from other groups, where they could offer assistance to other groups, and areas of overlap.

Action Team Responsibilities and Structure

Action Teams have responsibility for on-the-ground activities which include:

- Identifying and convening appropriate partners for collaborative actions
- Implementing strategies and actions
- Gathering needed metrics (i.e. baseline data) for reporting and planning
- Submitting reports and data (progress on metrics)
- Working with other Action Teams on addressing inter-related goals and actions

Initially the Actions Teams are being organized around topic areas. Each Action Team is facilitated by a leadership team of three or more people. The role of the leadership team is to coordinate meetings and provide reports to the Steering Committee. One leader from each Action Team is designated as the team's point of contact for communication with the Coalition Steering Committee.

As Action Teams are formed, members are given detailed guidelines and information about Coalition management so that all volunteers may work as effectively as possible with each other, with partner organizations such as the City of Corvallis, and with the Sustainability Coalition Steering Committee. Each action team has a Steering Committee liaison who will attend Action Team meetings regularly. The liaison's role is to assist the leaders in facilitating the team's progress and to provide regular written updates to the Steering Committee.

Guidelines for Selection of Actions

In selecting actions to begin working on, Action Teams are asked to briefly and quickly evaluate all actions in their topic area based on the following criteria:

- How well does the action move the community toward the guiding objectives
- Feasibility within resources (volunteer time available, partner commitments, funds)
- Amount of time required to accomplish the action
- Interest in the group to pursue the action
- Whether action has been successfully implemented locally or elsewhere
- Financial implications (cost/benefit analysis of the action)
- Legal implications (is the action allowed by law)
- Coordination with others needed (identify who and how)

If the Action Team has concerns regarding the effectiveness or appropriateness of any actions included in the topic area matrix, they may consider whether different actions should be substituted to more effectively implement the proposed strategy. During this discussion, the Action Team will consult the list of all actions gathered during the Town Hall process as well as consider new actions.

Following this evaluation, Actions Teams will determine how many actions to begin working on. Teams will select at least one "quick win" (an action that can be easily implemented and quickly produce results by January 2010) and one "big win" (an effort-intensive action that that will have a significant impact). They will also identify key organizations, including those identified in the Community Sustainability Action Plan that may already be working on the actions chosen.

Action Team membership may change as the need and opportunity arises. Each team will decide how they are going to do their work. For example, they may focus on one goal at a time or split the team into sub-committees focused on specific goals or strategies.

Action Teams may also elect to form a committee or team with representatives from each Action Team to meet quarterly or bi-annually to manage inter-connections between goals, strategies and actions. Ad hoc groups can be assembled from multiple teams to implement actions that fit into multiple topic areas.

Partnering with the City of Corvallis

The partnership agreement between the City of Corvallis and the Coalition that was signed in 2008 establishes the cooperative partnership between the two organizations. This document provides an important framework for moving the community more effectively towards its vision. Throughout the community initiative process, the Coalition has received the support and guidance of City Council liaison(s) who have attended Steering Committee and Executive Committee meetings on a regular basis. The City Council liaison(s) to the Steering Committee will provide a valuable communication channel to continue the productive relationship between the Coalition and the City of Corvallis.

In November, 2008 the Mayor of Corvallis convened a seven member Ad Hoc Committee consisting of current and former City Councilors and the City Manager to discuss the goals, strategies, and actions proposed by the 12 Coalition Work Groups. The committee reviewed the actions to determine the City resources and existing plan modifications necessary in order to implement the Action Plan. This plan has considerable potential public policy impacts. The committee identified many City policies that would be affected by this plan such as the Comprehensive Plan, Corvallis Area Metropolitan Planning Organization (CAMPO) Destination 2030 Plan, and the Parks and Recreation Master Plan. The group's consensus was that more than half of the strategies involved either a significant leadership role for the City or a support role. City staff is currently reviewing the goals, strategies and actions with the goal of providing the City Council with the information necessary to determine their next steps. This evaluation will be on-going, but an initial report is anticipated in late December 2008. This report will assist the 2009-10 City Council in setting goals and priorities in the area of sustainability.

COALITION MANAGEMENT

Successful implementation of the Community Sustainability Action Plan will require effective coordination in management of the Action Teams and other Coalition committees. The following section outlines how implementation will occur within the current Coalition management structure, as well as recommendations from the consulting team regarding possible changes in this management structure.

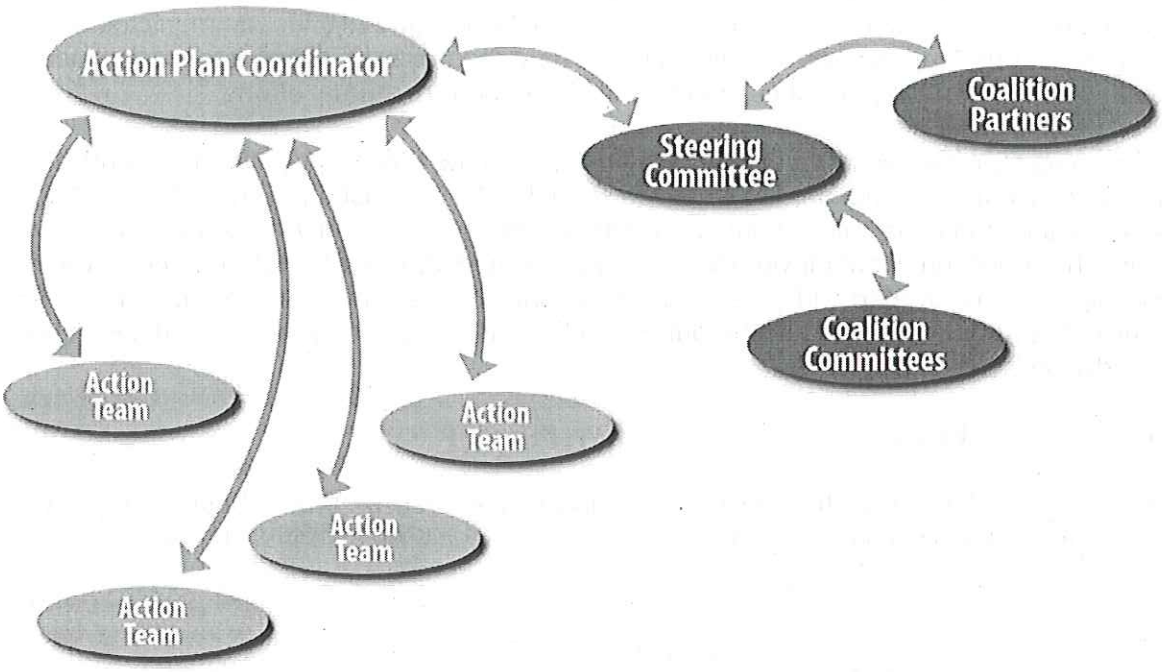
Current Coalition Structure

The 15-member Steering Committee will continue to set policy and approve the budget for the Coalition. In addition, they will be responsible for the coordination and management of the Action Plan implementation and will approve actions, grant proposals, requests for funding, and public positions submitted by Action Teams and Committees. The Coalition's two co-facilitators will continue to work together to schedule meetings, set agendas, facilitate meetings and serve as the official spokespersons for the Coalition. A five-member Executive Committee will continue to carry out the day-to-day responsibilities of the Coalition. Other committees will be established as needed and report to the Executive Committee and the full Steering Committee. Each member of the Steering Committee will serve as the liaison for one or more Action Teams and provide periodic reports to the Steering Committee.

Consultant Recommendations

In order to preserve the momentum that has been created and to ensure adequate coordination and oversight to successfully implement the Action Plan, the Coalition would benefit from a management structure that clarifies the roles and responsibilities of all participants. The team at Cogan Owens Cogan proposes a series of recommendations that are detailed here.

The consulting team recommends the following structure:



Coordination

As soon as funding is available, an Action Plan Coordinator position should be created to provide strong coordination, ensure accountability, and maximize efficiency. In addition, this person will manage record keeping, assure data and reports are filed, help establish reporting standards, recruit and orient new members, prepare case studies and best practices, publicize the program, coordinate program partners, and manage Coalition communication.

The Coalition Steering Committee should continue to provide leadership for the organization as they are in the best position to provide the leadership and oversight for the effort going forward. This group should continue to be the keeper of the vision, the primary decision making body and the sounding board for input from the Coalition and community members. The Steering Committee should participate in the annual planning and review process, provide direction and supervision of the Action Plan Coordinator, and oversee budgeting and fundraising.

Role of Partners in Plan Implementation

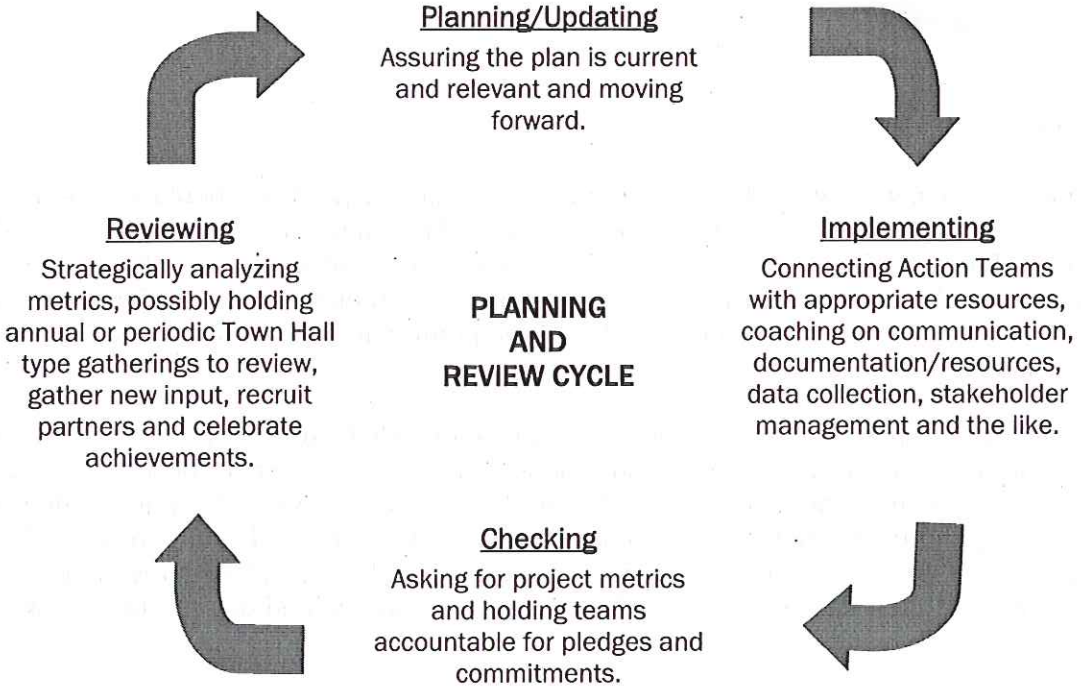
Commitments by partner organizations to work on specific strategies and actions are a significant and necessary component of the Action Plan implementation. All partner organizations should seek ways to participate in and support the action plan. The Steering Committee should continue to reach out to all partner organizations and seek their

participation and support of the Action Plan. In addition, all of the potential key organizations listed in the Action Plan should be contacted to encourage their active participation on an Action Team. The Coalition should continue regular communication with the partner organizations via e-mail and quarterly meetings to share information, learn about their sustainability activities, and to provide support for mutual efforts.

Maintaining a productive and positive relationship with the City of Corvallis will be critical to the success of the Action Plan. The Coalition should track City sustainability actions and how the community actions will benefit from collaboration with the City or support the City's goals. The Coalition should invite the appropriate City staff to participate on Action Teams that align with or overlap with the City's key priorities. Coalition members should actively participate in processes open to the public, such as attending open houses and serving on City advisory committees.

Implementation Process

The diagram below illustrates the planning and review process that should underpin the effort. The Coalition should pursue the following cycle, ideally on an annual basis:



The Coalition should detail each of these steps and schedule those onto a master calendar such as the one illustrated below.

Action Team Responsibilities

- Meetings: Initially monthly. At least quarterly in 2010
  - Update Steering Committee about on-going projects
  - Track results
  - Request help as needed
  - Coordinate with other teams
  - Work on collaborative projects
- Collect and report metrics: Annually
- Review actions, create new actions and identify collaborative actions: Annually

Annual Community Sustainability Report

- Coordinator collects data from teams
- Coordinator prepares report
- Presented/reviewed by Coalition
- Released broadly to community, media and partners

Annual Town Hall

- Report and celebration

Steering Committee

- Communicates regularly with partner organizations
- Reviews and evaluates annual report from Coordinator on progress
- Reports on individual efforts (passports)
- Adaptive management

Sample Calendar

	Q1 2009	Q2 2009	Q3 2009	Q4 2009	Q1 2010
Steering Committee					-Review project data -Update plan
Action Plan Coordinator	Support baseline data collection		Facilitate mid-year project conference (bring team representatives together for cross team coordination, data alignment, training, celebration, etc.)		Issue annual report
Action Teams	-Identify at least two projects: a quick win and a big win. -Assign lead accountability of each project to a team member. -Begin collection of base line data. -Identify partners for projects.	Implement projects	Gather progress data	Gather and report data on project progress or impact	Implement new actions
Action Team Leaders		Integration work session		Integration work session	

Program Metrics

The success of the action planning effort is based on the ability to establish and track program goals and progress on chosen actions. The metrics established as part of the planning process should form the cornerstone of this effort. The coordinator should take responsibility for assuring the data is aggregated and associated with the original program goals.

In addition, the Coalition should maintain a small set of additional measures that will provide feedback on the effectiveness of the process itself. This should include monitoring on some of the following indicators:

- Participation — Number of Coalition partners, number of people participating in Action Teams or other committees, residents who participate in special events such as the Town Halls.
- Progress on actions — Number of actions undertaken/completed each year.
- Financial — Amount of support funding taken in by Coalition, return on investment or savings from completed projects.
- Exposure and publicity — Number of times efforts/events are mentioned in media, number of presentations Coalition members are asked to do, inquiries from citizens or other communities, media, partner organizations or others.

Documentation and Reporting

To ensure that all lessons and achievements are captured, the Coalition should maintain a set of records, including the following documentation:

Records of Process

- Procedures used for data collection on surveys as well as on the metrics associated with each project or goal.
- Archive of public relations materials produced throughout the year(s).
- Training support materials.
- Frequently asked questions (FAQ's) and lessons learned.

Records of Results

- Annual reports that include data on actions and internal measures of success.
- Meeting records of Action Teams, committees and other groups associated with the effort.
- Case studies and best practices related to individual projects.

Communication

The Coalition should develop a comprehensive communication plan to ensure all interested parties are kept informed and involved in the effort. The plan should include systems to maintain both internal as well as external communications. The communications should be scheduled on the master calendar along with regular meetings and other key milestones.

Internal
The focus of internal communications is to keep Coalition partners and Action Team members apprised of progress, issues, and events. The Google groups or other web-based tools should provide a central repository of information that is largely maintained by the contributors and participants. By centrally locating meeting records and having a single distribution system for communications, the Coalition will facilitate communication both across and within the teams.

External
In addition to keeping Coalition partners informed, the coordinator should take responsibility for maintaining the public website where the most recent reports can be posted along with announcements, event notifications and requests for participation or funding.

Training

The following training should be developed to keep the effort moving forward:
- Orientation for new Coalition partners and new Action Team or committee members.
- Speaker's bureau training to prepare Coalition members to represent the program to the public.
- Facilitator training to prepare Action Team leaders.
- Training on sustainability or The Natural Step for community members.
- Regular briefings and work sessions with the City Council.

Funding

The Coalition should seek a sustainable source of funding to maintain the effort. Some potential sources include:
- Coalition partners
- City of Corvallis
- Grants from foundations, government agencies and others
- Corporate sponsors
- Individual donations
- Businesses providing in-kind donations
- Savings that result from some of the actions

New Partners

The Steering Committee should continue to solicit and encourage the participation of community members and organizations that are new to the Coalition. They may join Action Teams at any time and offer ideas for strategies and actions that may not have been recommended during the initial action planning process.

Transitional Management Structure

Since funding is not currently available for the implementation of this plan or for any paid positions, the Coalition will continue to operate under the current structure. In January, 2009, the Coalition will review and evaluate the effectiveness of the proposed model and

other management models. Concurrently, the Steering Committee will seek funding for implementation of the Action Plan, including funds for possible staff positions.

CONCLUSION

The Corvallis Sustainability Coalition Action Plan process has been an extraordinary community effort. Many individuals including students, business owners, community leaders, and other area residents volunteered thousands of hours to this process. It could not have been accomplished without these volunteers and without extensive collaboration among many diverse segments of the community working together towards a common vision: "creating a community in which the needs of the present are met without compromising the ability for future generations to meet their own needs. It is a flourishing and thriving community with a vibrant economy that respects, restores and cares for the community of life". (Corvallis Sustainability Coalition Vision)

How to achieve a truly sustainable community is the greatest challenge we face. This plan for the community identifies actions that individuals and organizations can take at the local level that will create the greatest impact on the lives of residents.

This integrated Community Sustainability Action Plan is an opportunity for the Corvallis/Benton County community to examine where we are today, to look down the road at the community we desire, and to take strong steps toward our preferred future. It is an opportunity for all of us to engage and take action to protect what we value about our community and ensure that those values will endure into the future. It is an opportunity to work on specific actions that address environmental, social and economic challenges today - while there is still time. And most of all, it is an opportunity to leave a positive legacy for future generations.

We invite you to be a part of this effort. Contact us at: www.sustainablecorvallis.org.

APPENDICES

Appendix A: Work Group Volunteers
Appendix B: Sponsors
Appendix C: Partner Organizatons
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Appendix E: Process diagrams
Appendix F: Town Hall 1 – Participant Input
Appendix G: Town Hall 2 – Participant Input
Appendix H: Town Hall 3 – Keypad Polling Results
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Appendix J: Resource List