GREEN ENERGY OPTIONS FOR SUSTAINABLE LOCAL ECONOMIC DEVELOPMENT:

Policy, Financing and Strategies for Green Energy

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Introduction

This report will document a growing trend of businesses, governments, individuals, and communities working together to integrate green energy strategies into a plan for sustainable local economic development. Three questions regarding this trend are considered: (1) what is the policy context for community strategies, (2) what are the steps involved in designing a sustainable energy strategy, and (3) what opportunities exist for harnessing the power of green energy projects for sustainable local economic development? Before beginning to explore these topics, there are questions regarding what factors have led communities to think about and adopt these plans. These questions are briefly considered in this introduction.

Why is there a movement to alternative energy solutions? The first reason is that the long term effects of global warming have been scientifically proven and citizens are becoming more aware of the detrimental effect that pollution has on their community, region, and the world. This degradation of our environment is caused foremost by coal-burning power plants, accounting for 2.5 billion tons per year of U.S. carbon dioxide pollution, and secondly, by automobiles, accounting for 1.5 billion tons of U.S. carbon dioxide emissions per year (National Resources Defense Council, 2007). A second interrelated reason is that the use of fossil fuels is expensive and promises to become more so. There are finite supplies of this traditional energy source, supplies of it are largely concentrated in certain geographic locations, extraction and transportation add to its cost, and the supply of these resources, especially natural gas and oil, are subject to economy-shaking production shocks.

Additionally, measures to regulate and to possibly charge for polluting are gaining ground in policy agendas worldwide. For example, the Kyoto protocol is a protocol to the United Nation’s international Framework Convention on Climate Change (UNFCCC) which was adopted on December 11, 1997 at the 3rd Conference of the Parties to the treaty in Kyoto. The protocol’s objective is to achieve the “stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system (UNFCC).” The UNFCCC states as its justification for capping emissions to create “a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner (UNFCC).”

There have also been discussions in the U.S. about adopting a carbon tax. Then President Bill Clinton began to address this subject with his proposal in 1993 of a BTU tax on all energy products to encourage conservation, however, this proposal was never adopted (Bredehoeft, 1995). Al Gore proposed a carbon tax during his 2000 presidential campaign and in his 1992 book Earth in the Balance: Ecology and the Human Spirit. Paul Anderson, chairman and CEO of Duke Energy, one of the nation’s largest coal-fired utilities, made a speech in 2005 pointing out the short-term focus of industry in meeting profit margins and their neglect in considering effects their operations may have on the environment (Anderson, 2005). He specifically called for a national carbon tax to help
promote conservation, to encourage the use of lower polluting existing power plants, and to promote the development of non-fossil fuel technologies.

A recent BBC poll shows that 74% of Americans support paying a higher tax on coal and oil if the revenues are used to promote efficiency or to develop new fuels (Rosenblum, 2007). Earlier this year several businessmen and economists formed the Carbon Tax Center to help organize support for a carbon tax. In the political arena, Mayor Bloomberg of New York City announced his support for and gave a proposal for a national carbon tax at a climate change summit in Seattle organized by the United States Conference of Mayors (Chan, 2007). There is growing civic demand and political support for a carbon tax to help limit emissions and encourage the development of renewables. These policies will have a large affect on the development of local economies.

What are the high level components of green energy strategies and how do they relate to sustainable local economic development? While alternative energy sources are an important part of green energy strategies, it is important to remember that they are only one piece of the puzzle. Comprehensive strategies for sustainable development also include strategies to promote energy efficiency, to de-emphasize car-oriented transportation from the community level, and to promote behavior such as recycling to minimize the environmental impacts caused by our everyday lives. These peripheral strategies involve promoting walkable communities, as well investments in alternative transportation options. Realizing energy efficiency wherever it can be achieved is also a key component.

Why do communities see green energy policies as beneficial? In addition to the issues discussed above, communities are beginning to realize how pursuing green energy strategies can allow them to revitalize underutilized geographic areas, to reinvest in depressed areas of their local economy, to pursue workforce development of their local labor force, and to provide access to growing funding sources for community projects. In other words, communities are realizing that green energy and related policies are not just beneficial from a strictly environmental perspective, but can also be significant contributors to the development of their local economy.

This paper primarily focuses on green energy options and how they relate to sustainable local economic development. However, in light of the previous discussion, there are policies of energy efficiency, alternative transportation, and community design that directly relate to decreasing the reliance on fossil fuels and have a significant effect on local development. Therefore, these other policies will be briefly discussed to illustrate how they complement and work together with the use of alternative energy production to achieve sustainable communities.
Literature Review

Policy Contexts

While much has been written on energy policy and green energy, for the purposes of this report, the policy context discussion will be limited to federal incentives and State of Georgia initiatives to promote sustainable economic development through the use of green energy. The majority of the policies mentioned below revolve around issues of production and manufacturing, which have direct correlation to job creation and workforce development. In several instances, policies focus exclusively on job-centered workforce development issues.

Federal Policies

The Farm Bill (2002) established the Renewable Energy Systems and Energy Efficiency Improvements Program under Title IX. This program currently funds grants and loan guarantees to agricultural producers and rural small business for assistance with purchasing renewable energy systems and making energy efficiency improvements, a particularly helpful policy for many Georgia green and non-green businesses.

In the Energy Policy Act of 2005, two sections of this most recent federal legislation focus on biofuels, both diesel and ethanol. Section 1345 of the Act allows a tax credit of 10¢ per gallon to small biodiesel producers for up to 15 million gallons. To be eligible, a producer must make less than 60 million gallons of biodiesel per year. Section 1347 of the Energy Policy Act changes the definition of a "small ethanol producer" to include a production capacity of up to 60 million gallons instead of the up to 30 million gallons originally established by Congress in 1990 (p. 943).

The U.S. Department of Energy’s Strategic Plan (2006) plan emphasizes the support for research and development efforts to reduce the cost of renewable energy technologies. The plan’s goal is to lower the cost and promote energy efficient technologies in all sectors of the economy, thereby enabling technology to increase energy productivity and create more economic value. The plan also advocates more exploratory science in renewable energy solutions. However, the bulk of the plan relies upon updates to the national grid system, more efficient petroleum technologies, and improvements upon the current energy scheme of fossil fuels. The Strategy could possibly be amended by some of the measures making their way through the current Congress.

The Green Jobs Act 2007, initially passed out of committee in a bipartisan June vote, provides for job training every year for about 35,000 U.S. workers (and potential workers) in green industries. The Act would help to meet demand for a skilled "green-collar" workforce in areas like solar panel installation, building weatherization, and wind farm construction. The Green Jobs Act is also a helpful tool in lifting people out of poverty. Many individuals have been hurt by the diminishing manufacturing sector of the economy, and this Act provides a “green way out.”
Supporters like U.S. Rep. George Miller suggest that this Act will make the American economy more progressive as well as stronger: “by helping green industries to grow by providing them with a strong supply of well-trained, highly-skilled workers, this bill would remove one of the barriers that slows our progress in confronting the serious dangers posed by global warming” (Melendez, 2007).

The Green Jobs Act of 2007 (H.R. 2847) was introduced by U.S. Reps. Hilda Solis and John Tierney. It authorizes up to $125 million in funding to establish national and state job training programs, administered by the U.S. Department of Labor, to help address job shortages that are impairing growth. In green industries, which include energy efficient buildings and construction, renewable electric power, energy efficient vehicles, and biofuels development – there is a lack of trained labor which not only costs money and time, but it also, if not remedied, slows the growth of the industry. It is still pending in the House, as of this writing.

**Figure 1:** Green Jobs

![Green Jobs](http://www.boston.com/jobs/galleries/green_jobs1118/)

The most current energy bill being discussed in Congress has recently been stripped of several renewable energy measures. The renewable energy industry was dismayed by the Congressional leadership’s apparent abandonment – a political strategy to get the bill passed by Thanksgiving.

The stripped provisions are two cornerstones of green energy policy. First, a Renewable Electricity Standard (RES) that requires utilities to supply 15% of their electricity from renewable sources was removed from the bill. Second, tax provisions, including a production credit for wind power and an investment credit for solar power, were also stripped (as of this writing).

While the Renewable Electricity Standard would be a new federal program (31 states already have some kind of renewable mandate), the tax incentives for solar and wind would continue programs already in place. Losing these tax breaks, which increase both sales and investment, is troubling for the renewable energy community. On November 15th, 2007, the American Solar Energy Society said that major investments in renewables and energy efficiency retrofits could produce 40 million jobs and generate $4.5 trillion in US revenue by 2030. Time will tell what the final bill looks like, but

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1 Source: http://www.boston.com/jobs/galleries/green_jobs1118/
whatever is passed will define the federal tool box for green energy economic
development for the next several years.

State of Georgia Policies

In February of 2006, the Governor’s Initiative was announced; it emphasized the
state’s commitment to biofuels. In his decree, he ordered a state energy strategy to be
drawn up which is also discussed below. Here is where Georgia’s top leader stands on
green energy and local economic development:

· Renewable, locally produced biofuels and bioenergy: Georgia agriculture and forestry offer rich
biomass resources for the production of biofuels and biomass energy; in 2005, Georgia biofuel
refineries produced over 3 million gallons of ethanol and biodiesel, but exported most of that fuel
out of state.

· Several new biofuel refineries and bioenergy projects have been proposed in Georgia and require
construction and operating permits from the Georgia Department of Natural Resources,
Environmental Protection Division.

· The recently enacted federal Energy Policy Act of 2005 creates a number of energy efficiency
and renewable energy incentives that can benefit Georgia businesses and families.

· The increased use of biofuels and high fuel efficiency vehicles by the agencies and departments
of the State of Georgia will result in economic and environmental benefits to the residents of
Georgia, including creating new jobs in the construction and operation of biofuel refineries in the
state.

· Agencies and departments of the State of Georgia shall prioritize the procurement of high fuel
efficiency and flexible fuel vehicles in their procurement decisions when such technologies are
commercially available and economically practical.

· All state-owned fueling facilities shall maximize the purchase of gasoline blended with ethanol
and diesel fuel blended with biodiesel for use in state vehicles, when available and economically
practical.

· The Georgia Department of Natural Resources and the Environmental Protection Division shall
conduct a review of permitting and regulatory procedures and streamline those processes to ensure
all proposed renewable energy facilities receive a 90-day permit review from the submission of a
complete permit application.

· The Georgia Environmental Facilities Authority, Division of Energy Resources shall develop an
implementation strategy to ensure that Georgia fully leverages the federal energy efficiency,
renewable energy, and energy management incentives and complies with all requirements created

State Energy Strategy for Georgia
The State’s energy strategy has developed numerous policy goals, a few of which
pertain directly to economic development.

Support Development of a Comprehensive Energy Research Agenda and Program
Not only does the State of Georgia need to develop a solid research agenda, it
needs to develop a high level of coordination is needed between the university
communities, research firms, and out-of-state institutions. The Georgia Research
Alliance could be a potential broker in creating these relationships. Further still, financing is a major issue. There are several grants (see federal section) that assist anywhere between 20% and 80% of research projects. The State of Georgia must somehow come up with the remaining costs, as the remaining funding can still be prohibitive.

**Establish a Comprehensive Statewide Technology Transfer Program That Incorporates Energy Technologies**

The State of Georgia loses 50% of its innovation in the energy sector to out-of-state entities (Energy Council, 2006, p. 80). To curb this exodus, partnerships between the universities’ research programs and local businesses must be created. The report recommends the model of the Northwest Energy Technology Collaborative, a joint venture between business, government, nonprofit organizations, and academic institutions to commercialize innovation and get it to market. With Georgia Tech’s Enterprise Innovation Institute and the University of Georgia’s Agribusiness and Economic Development Center, Georgia is in a prime location, with excellent assets and a strong economy, to capitalize on this type of networking. Making “green” a focus in corporate recruitment is also an important issue, especially if Georgia continues to grow and the state has companies knocking down the doors to do business here.

**Encourage Development of Emerging Clean Energy Industries**

Another strategy for the State of Georgia is to use one third of the tobacco settlement money to help fund the biofuels industry in rural and disadvantaged portions of the state. The loss in forestry jobs stymied by use of these OneGeorgia funds to bolster biomass solutions for the state could be a progressive way forward. In basic mathematical terms, only 5% of Georgia’s energy comes from renewable sources. The Georgia forestry industry has lost 60,000 and $7 billion in the last five years (Energy Council, 2006, p. 93).

**Designing a Sustainable Energy Strategy**

This section describes strategies that have been used in communities pursuing green energy projects. This survey of successful strategies seeks to highlight key aspects that communities should consider in planning projects for their own locality.

**Public participation**

Public participation is an essential element in designing sustainable energy strategies at the community level. The Smart Communities Network, an organization designed to promote energy smart communities, points out why citizen participation is an important component of a successful community energy plan (Smart Communities Network, 2007). The two main reasons why involving the community in development and implementation of programs is so important is that it helps them to understand how the plan will benefit their community as a whole and themselves as individuals.
Participation also increases support for the plan, builds public confidence, and encourages the input of citizens and their ideas on what should be pursued in the community.

The National Renewable Energy Laboratory, the nation's primary laboratory for renewable energy and energy efficiency research and development, recently held a training seminar entitled “Public Participation to Gain Acceptance of Renewable Energy.” This seminar also summarized a research and development project funded by the American Public Power Association entitled “Public Participation for Consumer Owned Utilities: An Implementation Guide.” Both of these projects illustrate that there is a realization that the public is becoming more involved in energy decisions and how it affects their communities.

Renewable Energy Long Island (RELI) is another organization aimed at promoting clean, sustainable energy use and development, specifically for Long Island. RELI states in its mission that it “seeks public participation in energy policy decisions to encourage energy efficiency, use of renewable energy sources, and to protect our environment, economy, and public health (RELI, 2007).” RELI participated, along with other local organizations, in drafting a citizens energy plan for Long Island. In this plan the authors stress the need for public outreach. They stress that “all stakeholders, not just industry representatives or elected officials, should be able to contribute directly to the creation of [a local] energy plan (RELI, 2002).”

RELI created a public outreach working group, made up of SEA members and individuals, that “seeks to foster public awareness and understanding of important regional energy issues and to generate a broad debate of issues discussed in the draft Citizens Energy Plan (RELI, 2002b).” The working group has the following mandate to disseminate the Citizens Energy Plan of Long Island:

as broadly as possible -- through promotion on member websites, newsletters, press releases and press conferences. This group is charged with distribution of the Plan to all legislators, town officials, LIPA and KeySpan officials, businesses, libraries, schools, etc. Every effort should be made to effectively educate the public on the content of the draft Citizens Energy Plan with the goal of generating a constructive debate of the issues, amendments where necessary, and ultimate endorsement of the final plan.

Five tasks are specifically laid out to achieve this goal: (1) increasing SEA’s member base of civic, health, environmental, and faith-based groups; (2) to draft, print, and distribute energy education materials to the residential, business, and governmental sectors; (3) to organize public hearings and enlist the participation of residents in formulating a comprehensive energy plan; (4) to reach out to the media and local utilities; and (5) to conduct ongoing strategy and assistance with adoption of an energy plan at the town and county legislatures (RELI, 2002b). Additionally the outreach campaign aimed to gather input from segments of the community not typically represented on energy issues, particularly low-income and disenfranchised communities as well as the small business sector. This public outreach model offers communities a useful tool for
organizing non-profits or community groups and offers legislators insight into what they can do to encourage and foster public participation in energy planning.

Other communities have realized the importance of public participation and have also realized that an informed, successful participation campaign does not begin overnight. Education is the key to teaching people about potential benefits of energy smart communities and is a process that will foster participation when the time comes to design and implement policy. The U.S. Department of Energy (DOE) division on Energy Efficiency and Renewable Energy has developed the EnergySmart Schools program as part of its Building Technologies Program (DOE, 2007). This program implements the idea of focusing on public education as part of an overall effort to build public participation and support. The website provides lesson plans and activities on energy efficiency and renewable technologies designed for grades K-12. The DOE has broadened this initiative to include educational materials for homeowners to learn about installing renewable energy systems in their home, for energy professionals interested in continuing education opportunities, and for school administrators interested in implementing energy efficiency and green energy projects at their schools (DOE, 2007b).

The most important part of the DOE’s educational efforts for local development is the program to encourage EnergySmart Schools. These schools can be built for the same initial costs as conventionally-built schools, but additionally offer long term savings in energy costs and provide a rich learning environment for students. The Bowling Green School District in Ohio built a solar school at Kenwood Elementary School. The Ohio Energy Project is contributing to the project by providing in-kind contributions of in the form of teacher training as part of the EnergySmart School Program. School administrators believe that this project will enhance the school’s math and science curriculum and will be the first of similar projects to occur in the future (Green Energy Ohio). A similar case in Spirit Lake, Iowa, involving a wind educational program at a local elementary school, has engaged the students in the wind power project and given them a hands-on understanding of the benefits of renewable energy (ICLEI). The EnergySmart School Program is explored in more detail later in this report.

Financing

Renewable energy projects are often inhibited by the daunting task of finding funding sources for their development. There are state and federal incentives available to promote the development and implementation of energy efficiency and renewable technologies. While important, these programs are not enough to fully finance community plans. Communities must become creative in securing additional sources of funding.

Financing for alternative energy projects is difficult for a number of reasons:

- Lack of education about renewable energy technologies translates into low confidence levels from the investment community
• Lack of accurate and standard information on failure rates, operating costs and project risk
• Renewable energy projects usually have higher upfront capital costs
• Scale. Renewable energy projects are often small compared to their transaction costs.
• Projects are often underfinanced, and as a result, are often perceived as risky by investors (Sonntag-O’Brien and Usher, 2005)

Until market forces or public policies create an environment where renewable energies can compete with conventional energy sources, it may be necessary for local economic developers to assist producers with the task of raising capital by creating innovative packages of funding that come from multiple sources.

Following, are a list of financing ideas for local economic developers to consider when approaching green energy resource-driven local economic development strategies:

• **Bond Initiatives.**
  o Revenue Bond programs (used to finance public ventures) could be used to fund clean energy projects. Repayment of these bonds to bondholders would be in the form of energy cost savings.
  o Industrial Development Bond programs (bonds where private investors provide private sector loans through government agencies) could be used to make low-interest loans to private firms after demonstrating the public benefit of clean energy.

• **Venture Capital.**
  o Kleiner, Perkins, Caufield & Byers, Menlo Park, California. Greentech Initiative invests in greentech innovation and technology.
  o Nth Power, San Francisco, California. Invests exclusively in global energy investments.
  o Cleantech Group, LLC./Cleantech Venture Network Ann Arbor, Michigan.
  o Entertech Capital, Philadelphia, Pennsylvania. Invests in energy and clean energy technologies.
  o NGent Partners, New York, New York. Invests in businesses that meet market demands through clean technology.

• **Federal Programs**
  o US Department of Energy Grants.
    ▪ Biomass Research and Development Initiative: $18 million dollar DOE program for research and development of biomass, biofuels, and related projects.
    ▪ Solar America Initiative-University Photovoltaic Process and Product Development Support: $1.5 million DOE award ceiling for the coordination and funding of research efforts focused on cost reductions in technology, deployment, demonstration, etc.
- Business Energy Tax Credit: Solar and geothermal energy property installed in 2006 and 2007

- **State of Georgia.**
  - **Biomass Sales and Use Tax Exemption.** 100% exemption for biomass material used in energy production from state sales and use taxes.
  - **Renewable Energy Production Tax Credit.** $0.02 per kilowatt hour for electricity generate from wind, geothermal and some biomass technologies, municipal solid waste, and small hydroelectric sources.
  - **Business Energy Tax Credit.** Solar, geothermal and microturbine energy property tax credit of 30% of expenditures for installations before December 31, 2008, and 10% thereafter.

- **Pension Funds.** States can leverage large pension funds to make private equity investments for green energy technologies. The State of California’s Green Wave Program used pension fund investments to invest in clean technologies and environmentally responsible corporations.

- **Cooperative Development Programs.** For green technologies like wind power, where communities are ambivalent about the presence of wind turbines or other structures, community stakeholders form a limited liability corporation in which they pool their funds and loan them to a for-profit-C corporation, which would use the loan to finance construction and operation.

- **Third Party Solar Financing.** This is a third-party arrangement that would transfer the high entry costs associated with solar energy to investors. Investors finances the purchase and installation of solar panels and sells the energy to the property owner or tenant.

- **Energy Saving Performance Contracts (ESPC).** These are creative financing mechanisms that rely on Energy Service Companies (ESCO) that specialize in achieving efficiency gains in buildings. ESCOs provide companies with energy savings assessments, the costs associated with achieving these savings, and they retrofit the buildings to achieve assessment goals.

One successful example of creative financing is Drake Landing in Alberta Canada (EnerWorks, 2007). This development of 52 homes is Canada’s first and North America’s largest solar community. The project used about 800 solar collectors built by EnerWorks, a leading North American developer and manufacturer of solar thermal systems, and designed based on technology developed in cooperation with Queen’s University. The most notable aspect of this project for this discussion is its use of a partnership among Alberta businesses, governments, and environmental community all brought together by the desire to build a model sustainable community. Natural Resources Canada was involved in formulating and leading the project, Technology Early Action Matters supported the project because it used technologies to mitigate greenhouse gases while sustaining economic and sustainable development, the Green Municipal Funds of the Federation of Canadian Municipalities offered support funded by the
Canadian government in an effort to leverage a mix of public and private funding, and Climate Change Central helped to financially support the pre-design site planning and investigation and helped procure additional funding and partners for the project. As illustrated, the project was funded by a variety of sources and built many partnerships; what is also important from an economic development standpoint was how it relied on national, regional, and local entities. What this formulation of partnerships means is that the project benefits economic growth, job training, and businesses as well as the environment.

Cost Benefit Analysis

The Rocky Mountain Institute has developed an online tool called the Community Energy Opportunity Finder to help communities identify possible programs for their area to pursue. The tool is designed to help users interested in opportunities for energy efficiency, renewable energy, and economic growth. The energy finder tool allows communities to quantify the benefits in saved energy from energy efficiency programs, to measure monetary resources freed for respending by lower utility bills in the residential, commercial, and governmental sectors through community member and city programs, to increase local jobs by exploring new policies and energy options, to help reduce national dependence on fossil fuels, and to support the participation of residents in formulating these community planning policies (CEOF, 2007). The tool requires inputs that should be relatively simple for communities to gather including energy use patterns, physical characteristics of the region, energy prices, and development rates and square footage of commercial, residential, and public buildings.

The types of green energy options that are viable for a particular area are an important part of this cost benefit analysis process. Below is a brief description of different energy options and programs and how they relate to implementation in certain areas.

Energy Efficiency

Energy efficiency is an alternative to fossil fuel use that fits in with sustainable energy programs, and works to compliment a transition to green energy sources. The benefits that energy efficiency programs can bring to communities are recently being realized and have great potential. The Rocky Mountain Institute points out that the knowledge and technology exists to improve energy efficiency by 30 to 50 percent (COEF, 2007b). The Local Government Commission (LGC), a nonprofit organization working to build livable communities, argues that “Researching available sources of funding for energy efficiency projects should be one of the first steps a local government takes when evaluating any long-term strategy to develop a more sustainable community through local energy policies (LGC 2007).”

The Rocky Mountain Institute has compiled a list of case studies gathered from their own Community Energy Workbook and from the American Council for an Energy
Efficient Economy report America’s Best: Profiles of America’s Leading Energy Efficiency Program. Following are some brief descriptions of relevant case studies focused mainly on energy efficiency but also incorporating green energy development and the building of sustainable communities. A unique example is the Village Homes project in Davis, California. This project took a broad approach to sustainability by pursuing energy-efficient and passive solar house design, sustainable land use planning, the use of urban agriculture, and walkways for pedestrians and bikes. The development also included narrow streets and an alternative runoff system relying on a local system of streams, ponds, orchards, and vineyards designed to coexist with the housing in the community (CEOP, 2007c).

An extensive retrofitting program was carried out by Chicago’s Center for Neighborhood Technology. This center saw high energy costs as a main factor in the high rate of housing abandonment in the city, a factor which also was leading to lack of affordable housing in the region. The center secured $15 million from the City of Chicago and a local utility to found the Chicago Energy Savers Fund, a one-stop shop for residential energy conservation. The project was managed through a network of eight Community Energy Centers overseen by city and local community groups. The program successfully retrofit 12,000 units of low- and moderate-income housing in the city, resulting in annual energy savings of 24% and financial savings of $1.5 million per year (CEO, 2007d).

The American Council for an Energy Efficient Economy released in 1997 a study that directly measures the benefits to economic development of energy efficiency programs. The study entitled “Energy Efficiency and Economic Development in New York, New Jersey, and Pennsylvania” seeks “to better understand how additional investments in energy efficiency technologies can contribute to lower energy expenditures and new employment opportunities for residents of New York, New Jersey, and Pennsylvania, as well as generally strengthen economic activity and quality of life (Nadel et al, 1997).” The study made baseline projections to 2010 and developed two high-efficiency energy scenarios for the region “based upon detailed analysis of energy efficiency potential in buildings in the residential, commercial, and industrial sectors as well as efficiency improvements in light duty vehicles in the transportation sector (Nadel et al, 1997).” The adoption of energy efficiency policies was resulted in a forecast of 164,000 new jobs for the Mid-Atlantic Region. This rise in employment is cited as being equivalent to the number of jobs supported by the expansion or relocation of 1,095 small manufacturing plants to Mid-Atlantic region and the increase in wages and salaries of $3.5 billion (in 1993 dollars) is the equivalent of tourist expenditures from approximately 16.9 million visitor days (Nadel et al, 1997). The effect of energy-efficiency adoption on the regional economy is illustrated by a projected net increase of $612 million by 2010, roughly 0.05% of the region’s gross state products (Nadel et al, 1997).

Finally, governments at all levels, local, state, and federal, can set a strong public precedent for energy conservation and environmental stewardship by adopting energy efficiency policies. The U.S. Department of Energy’s center for Energy Efficiency and Renewable Energy (EERE) points out that state and local government spend more than
$11 billion annually on fixed-site energy costs, constituting up to 10% of a government’s annual operating budget (DOE, 2006). The Energy Policy Act of 1992 addressed this potential source of energy efficiency by mandating a 35% drop in energy use by 2010 for all federal buildings. EERE summarizes a wealth of resources available at the state and local level to evaluate, fund, and implement energy efficiency in government buildings:

state energy offices help support state government building projects, while the National Association of State Energy Officials (NASEO) provides a forum for the exchange of information and ideas. The National Conference of State Legislatures researches and advises state legislatures on various issues including energy policy. The National Association of Counties (NACo) has initiated a County Energy Efficiency Network, designed to leverage resources and provide technical assistance, localized training, support staff, and financial assistance to counties implementing cost-saving energy management strategies. NACo also supports Public Technology, Inc., an organization that helps city and county governments implement new and emerging technologies (DOE, 2006).

Wind

The National Renewable Energy Laboratory (NREL) cites the following economic development impacts for local communities pursuing installation of wind power capacity: construction, operations and maintenance, property tax revenues, landowner revenues, manufacturing opportunities, economic multiplier effects, and net economic development impact compared to fossil fuel technologies (NREL, 2007). In terms of jobs, wind power means 40-140 jobs during construction per 100 MW, 6-20 permanent operations and maintenance jobs, contracts for local construction and service workers, and the possibility to enhance technical expertise of the local workforce (NREL, 2007). A Spanish company, Garmesa, is building a new plant in Pennsylvania, creating 1,000 new jobs over five years and $40 million in new investment for the area (NREL, 2007). This example illustrates the potential manufacturing jobs from increased demand for wind turbines. NREL shows an estimate of three manufacturing jobs for each MW of installed wind power capacity. The Danish Wind Manufacturers Association estimates that a mature wind market supports 17 jobs per MW of installed capacity (NREL, 2007). Grand Forks North Dakota is an example of these projections in action. Grand Forks is home to LM Glasfiber ND Inc., the U.S. subsidiary of a Danish manufacturer of blades for wind turbines. The plant employs 200 workers and has received $3 million in investments from the company to meet increasing demand for its markets in the U.S. and Canada (Organization for International Investment).

Larry Flowers, National Technical Director of Wind Powering America, gave an interview in which he outlines the monetary benefits of wind energy to rural communities (DOE, 2007c). Wind Powering America is a DOE launched project to increase the use of wind energy in the U.S. Wind turbines, like most power generation options, are capital intensive. The benefit of the capital costs is the tax base provided to the local
community, which can support infrastructure, development in schools, health clinics, roads, all sorts of infrastructure projects. Flowers cites examples in “the town of Highmore, South Dakota, Flowers notes, receives one-fourth of its education budget as a result of property taxes from wind development in Hyde County. And Carbon County, Wyoming receives more than 30-percent of its property taxes from the wind farm there (DOE, 2007c).”

Flowers also provided advice for communities considering installing wind power projects. He suggests that interested parties should “get information from states with wind working groups and existing wind projects. He says the local farmers who are hosting projects and local leaders are a good resource and can explain how they got started and the benefits they've experienced (DOE, 2007c).” He cites county commissioners as “the most enthusiastic group because they see wind farms as really providing jobs, tax base and revenue to local communities. And county commissioners are often very good at sharing, sort of the process, of what they had to go through in order to understand what the wind farm opportunity is, as well as some of the challenges (DOE, 2007c).” In light of national policies to pursue required levels of renewable energy capacity, Wind Powering America assessed the impacts of using wind power for 20% of U.S. electricity. Flowers reports that this scenario “represents over 300 billion dollars in rural economic development to the United States. And it's those kinds of huge impacts to our rural economy that we really need to get the rural leaders and landowners to become alert to and to get engaged in (DOE, 2007c).” The map below shows the estimated manufacturing jobs created under this scenario.

**Figure 2**

**Total Cumulative Manufacturing Jobs Created by Scenario that Meets 20% of U.S. Electricity Needs From Wind (2004 - 2030)**

*Source: NREL, 2007*
Figure 3 shows an assessment of wind power potential in the U.S. Figure 4 shows a map of rural areas hit especially hard by depopulation, making them potentially ripe areas for economic development.

**Figure 3**

Farmers and rural communities are behind wind power because of these opportunities for economic development. Dan McGuire of Lincoln, Nebraska is Director of the American Corn Growers Foundation. He states that “higher production costs combined with low commodity prices paid to farmers spells economic trouble for rural America. That’s why the American Corn Growers Foundation and the American Corn Growers Foundation Association promote wind energy. It’s why we developed the Wealth from the Wind program. We support wind farming as both an alternative income stream for farmers and land owners and an economic development opportunity for rural communities (DOE, 2007c).”

The Nebraska Wind Energy Task Force conducted a study which found that while Nebraska spent $113 million on imported coal in 1998, the state’s ten windiest counties experienced a median income 21% lower and poverty rate 4% higher than the state average (NREL, 2005). The task force concluded that “a commitment to developing wind power in Nebraska could help counteract these trends in rural areas (NREL, 2005).” Dave Benson, farmer and county commissioner of Nobles county Minnesota, sees energy harnessed from wind power as an export “crop” of rural communities. His region currently generated 360 MW while the rural communities can only use 50-60 MWs. Rural leaders in Benson’s area are planning a transmission line to carry excess power to the Twin Cities. “We need a new line to export this crop,” said Benson, “and we’re educating the community to be partners in owning the means of production. Our hope is that local communities benefit (NREL, 2005).”
Solar

As illustrated by the map below, the United States has ample solar resources, with over half the nation having excellent or very good potential for solar energy production.

**Figure 5**

[Image: Map of the United States showing solar resource distribution.]


Green jobs for American workers was one of the major topics covered at the 36th American Solar Energy Society (ASES) Conference, SOLAR 2007, held in Cleveland this year. According to ASES, “Bernard Kotlier and Kim Craft from the International Brotherhood of Electrical Workers (IBEW) Local 11 chapter in Los Angeles described the challenges of training the projected tens of thousands of installers needed nationally to meet increased demand for solar energy. Kotlier and Craft shared how the IBEW and the Los Angeles National Electrical Contractors Association are training photovoltaic (PV) installers across California through a joint program — a model ripe for replication nationwide (Spratley, 2007).” Also present was the Renewable Energy Policy Project’s George Sterzinger, who “urged policy-makers to support retooling of U.S. industry to mitigate energy efficiency and renewable energy (EE/RE) manufacturing bottlenecks. The goal, he emphasized, must be to create an *industry* rather than just individual RE/EE projects (Spratley, 2007).”
How can communities take advantage of and participate in the growing solar industry? One way is by education and youth development. Students of John Hay high school in Cleveland “will learn hands-on lessons about renewable energy as a result of the 1.1-kilowatt photovoltaic (PV) system installed at the school as part of the American Solar Energy Society (ASES) Legacy School Program (Spratley, 2007).” The project was installed in 2007 and is the seventh addition to the ASES Legacy School Program, established in 2001 “to support solar education, solar career development and energy education in ethnically, culturally, economically and academically diverse communities.”

Another way for communities can harness the economic development potential of solar power is to build a market for solar homes by adopting policies to bring efficient, solar-powered houses into the mainstream. Robert W. Hammon, co-chair of California’s New Solar Homes Partnership Advisory Committee and principal of ConSol, published a study in Solar Today, a bimonthly published by the American Solar Energy Society, examining how the promotion of solar homes in California and New Mexico can be replicated in other U.S. regions (Hammon). A prime area for solar photovoltaic energy systems is the southwest U.S. because of its geographic location. This region is also projected to have more than a half-million new homes built within the next three years (Hammon). Hammon discusses how California and New Mexico are both seeking to transform their housing markets, but through two different means:

“California continues to encourage photovoltaic (PV) installations through monetary incentives, or “buy down” of the systems. However, its California Solar Initiative and New Solar Homes Partnership have been improved to require energy efficiency and to base incentives on predicted performance rather than on system ratings. New Mexico has taken a different approach, combining tax credits and innovative tariffs to promote PV installations” (Hammon).

In California, the state energy commission is working with builders and developers to incorporate high levels of energy efficiency and high performing solar systems to foster a self-sustaining market for solar-powered homes. The partnerships will benefit builders and land developers “through community energy-efficiency programs (CEEPs), providing expedited building permits and land entitlement, possible fee-deferrals and increased recognition” (Hammon). California also formed an informal committee, including stakeholders from the building, electric utility, and solar industries, that works to help facilitate participation by builders and developers in pursuing solar homes.

In addition to fostering participation from the building community, California is also committed to helping economically challenged home-owners to meet their energy bills. A separate affordable housing committee provides input on program designs and implementation strategies to achieve this goal. This committee includes stakeholders from the California Department of Housing and Community Development, the State Treasurer’s office, the California Housing Finance Agency, the affordable housing development community, as well as the commercial banking and solar energy industries.
New Mexico has chosen to harness momentum created by research and development of solar energy in the southwest to create the New Mexico Zero-Energy Home (NM ZEH) program. The research and market experience results from work carried out by the Building Industry Research Alliance (BIRA), a U.S. Department of Energy (DOE) Building America team. BIRA has developed methods to encourage builders to build, and local and state governments to support, the development of communities of highly energy-efficient homes with solar by working with builders, utilities, local governments and state governments in the region.

New Mexico is encouraging the development of solar community using a tool including “state tax credits for PV and energy-efficiency installations, coupled with the Built-Green New Mexico program’s Gold level guidelines; a progressive renewable portfolio standard (RPS) tariff and net-metering from PNM, the largest gas and electric utility in NM; along with federal tax credits for solar and energy efficiency” (Hammon). New Mexico is also working with local governments, including the city of Albuquerque, to establish programs designed to recognition, faster plan review and possibly reduced fees for builders of ZEH homes.

Hammon emphasizes that “New Mexico also will have lessons for identifying and addressing hurdles to expanding energy-efficiency and solar-promoting policies in other U.S. regions. For instance, local jurisdictions and state governments, while supportive of advancement, may not adapt to change as quickly as California has done. New Mexico’s great growth potential, with builders expected to add about 14,000 new homes per year, will be an asset in overcoming such challenges” (Hammon). He also points out that “California and New Mexico’s success in transforming the new home market may also carry over to the market for existing homes, encouraging homeowners to add solar energy systems to their homes. After all, it is homeowners who stand to reap the lion’s share of benefits, including reduced home-operating costs, fixed future utility bills and increased property values” (Hammon).

Geothermal

Geothermal energy is harnessed from the heat stored beneath the Earth’s surface. In the United States, most geothermal reservoirs of hot water are located in the western states, Alaska, and Hawaii. The largest geothermal field in the world exists in The Geysers, California. A 2006 study by MIT concludes that the U.S. could generate 100 GWs of electricity by 2050 with a maximum investment of one billion dollars in research and development for fifteen years (MIT, 2006).

The U.S. Department of Energy’s Office of Energy Efficiency and Renewable Energy Division is home to the Geothermal Technologies Program. This program released a study in August, 2004 on the economic and employment benefits of geothermal energy (DOE, 2004). Geothermal energy production was already a $1.5-billion-dollar-per-year industry in 2004. In 1996, the geothermal energy industry provided 12,300 direct and an additional 27,700 indirect jobs in the U.S. In terms of
economic development, geothermal energy can be beneficial to local economic because it is generated using indigenous resources. In addition to possibilities for exporting the power generated as a product to other areas, there is a large national and international market for manufactured geothermal energy-related equipment. The study cited that in 2004 foreign countries alone were projected to spend between $25 and $40 billion constructing geothermal power plants.

Nevada is an example of a state that has successfully used geothermal energy for economic development. The state produces 240 MW of electricity using geothermal sources, equivalent to that produced from 800,000 tons of coal or 3 million barrels of oil each year. Localities and the state receive increased tax revenues from locally produced power, including $800,000 in county taxes and $1.7 million in property taxes in 1993. Additionally, the U.S. Bureau of Land Management receives nearly $20 million yearly in rents and royalties from geothermal plants located on federal lands, half of these funds are returned to the state (DOE, 2004).

New Mexico uses geothermal energy for more than just power production. With the help of the geothermal energy program at the Southwest Technology Development Institute at New Mexico State University (NMSU), the state now leads the nation in geothermally heated greenhouses, with more than half of the state’s acreage heated with geothermal energy. Industries working with the NMSU greenhouse incubator have built 28 acres of greenhouses, creating 250 jobs with an estimated payroll of $3.7 million per year and estimated sales of $13.4 million. Other projects to be launched in the near term were estimated to represent more than $21.5 million in capital investments, sales of $26.1 million, and 500 new jobs (DOE, 2004). This continued growth will benefit the economy directly as well as encourage more businesses to locate in New Mexico.

A separate study cited by Geothermal Technologies Program report estimates an economic multiplier effect of 2.5 for geothermal energy investments in the U.S. That means that for every dollar invested in geothermal energy $2.50 will be produced in economic activity from supplier industries and other economic “ripple” effects (DOE, 2004). Another study cited in this report showed that geothermal power plant construction requires 26 jobs per MW, compared with 6 to 8 jobs for the construction of a natural gas powered plant (DOE, 2004). Jobs in operations and maintenance, which last the entire life of the plant rather than just during construction, were projected to be 1.88 jobs per MW, compared with 0.21 to 0.45 per MW for natural gas fired plants.

Anaerobic Digestion and Landfill Gas

The U.S. Environmental Protection Agency Landfill Methane Outreach Program (LMOP) provides a concise summary of landfill gas:

“Most of the waste we generate ends up in landfills, where it decomposes and produces landfill gas. Landfill gas released into the air smells bad, contributes to local smog, and is an explosion hazard. Additionally, landfill gas is about 50 percent methane, a potent greenhouse gas that
contributes to global climate change. However, this methane is also a reliable and renewable fuel source that, if not collected, goes to waste (EPA, 2007).”

LMOP is a program designed to assist project developers, utilities, landfill owners and operators, and communities in realizing new landfill gas energy (LFGE) projects.

Three towns, Wind Gap, Pen Argyl, and Plainfield Township, in Northampton County Pennsylvania provide an excellent example of LFGE being used for economic development. The region had also been hit by declines in its staple industries in recent years, causing unemployment and economic instability. Waste Management Inc. (WMI) owned and operated a local landfill and was looking for productive uses of the gas byproduct. The company chose to involve the local community by creating a task force comprised of local volunteers. The task force decided to create an independent non-profit corporation, the Green Knight Economic Development Corporation (GKEDC), to own the power production facility and to use the revenue from electricity sales to fund local economic development efforts (EPA, 2007).

GKEDC received a $9.2 million loan from a local bank, with WMI guaranteeing the loan. WMI designed and operates the 10 MW facility currently located at the plant, although the plant is owned by GKEDC. In March 2001, the project began selling energy to a local energy marketer. GKEDC has been using profits from these sales to fund local economic development activities as well as civic and educational projects (EPA, 2007).

Another project involved a partnership between the Tennessee Valley Authority and the city of Memphis, Tennessee. The city’s wastewater treatment facility had a lagoon which produced methane gas which had to be burned to reduce hazards from gas buildup. The lagoon was covered to capture the methane, which is now used to produce a methane by-product which is co-fired with coal at the TVA’s Allen Fossil plant. This project has eliminated the need to consume 20,000 tons of coal per year, diminishing pollution and retaining those saved expenditures in the local economy.

**Biomass**

Biomass energy resources include trees and grass crops and waste from forestry, agricultural, and urban wastes. According to the Union of Concerned Scientists (2007) biomass energy currently supplies 15 times as much energy in the U.S. as wind and solar power combined. The two general approaches to harvesting biomass energy are cultivating crops specifically for energy production and using the residues from plants with other primary uses. Estimates for the overall potential of biomass in the nation vary. The Department of Energy has projected that the U.S. could produce 4 percent of our transportation fuels from biomass by 2010, and as much as 20% by 2030 (UCS, 2007). In terms of electricity, the DOE projects that energy crops and residues could meet up to 14 percent of the nation’s power needs (UCS, 2007).
Wallowa County, Oregon (2006) recently included biomass energy and economic development in its 2006 wildfire protection plan. This community was particularly hard hit by closings of saw mills in the 1990s. Trends in full-time jobs, per capita income, schools, and social services have been indicators of a weak economy. The county has identified that a restoration of public forestry lands could help provide more jobs for the area as well as supplies for wood manufacturing and biomass energy plants. Additionally, the U.S. Forest Service has been forced to spend over $100 million for wildfire suppression within the past ten years (Wallawa, 2006). Most of the materials generated from the fuel reducing wildfire suppression activities are not suitable for wood products manufacturing. In addition, commercial timber harvest, non-commercial thinning, and wood manufacturing residues can produce raw material for renewable energy production.

The community has realized that biomass for renewable energy production can have economic benefits for their rural, natural resource-based economy. Wallowa estimates that six jobs are created for each MW of installed biomass capacity, including jobs at the plant, in fuel processing, and in delivery of raw materials. Additional, indirect jobs are created in the forest management and logging industries. The community was conducting assessments of installing wood energy systems in local school buildings, because wood energy is 50 percent of the cost of oil heat and 12 percent of the cost of electrical heat (Wallawa, 2006).

The community assesses that a 5 MW biomass power plant would create 16 new jobs at the plant with payroll and benefits equal to $600,000 and 18 new jobs in fuels procurement. A 15 million gallon per year biomass ethanol facility would employ 30 people at the plant and 70 people in feedstock supply and delivery systems (Wallawa, 2006). The higher feedstock and sophisticated plant equipment required for an ethanol plant would cause a higher employment and economic impact than a biomass power plant alone.

The Department of Energy Office of Energy Efficiency and Renewable Energy has established a Biomass Program. This entity seeks to work with industry, academia, and national laboratory partners to promote balanced research in biomass feedstock and conversion technologies. The program states that “through research, development, and demonstration efforts geared at the development of integrated biorefineries, the Biomass Program is helping transform the nation's renewable and abundant biomass resources into cost competitive, high performance biofuels, bioproducts, and biopower (DOE, 2007d).” The Biomass Program recently released its Multi-Year Program Plan. The program involves more research and development in feedstock and conversion technologies, demonstration and deployment of biorefineries and biofuels infrastructure development, and pursuing effective communication, policies, and partnerships to accelerate biofuels market development. This program will be beneficial to economic development as it progresses, with opportunities for communities to join early in this new national initiative.
The state of Georgia is a progressive state seeking to lead innovation and implementation of bioenergy solutions. The Georgia Department for Economic Development (2007) states that “the state has the human and technical capital to succeed; the deep understanding of future energy needs and environmental benefits to residents; a pro-business climate that encourages entrepreneurship in bioenergy; and the support of state officials, producers and its residents.” As an initial policy step, the State Energy Office recently completed a comprehensive energy plan. The state has passed legislation to reduce taxes on ethanol and biofuels companies. Additionally, the state has awarded grants to speed industry development. An example of a grant funded project is the Savannah-based Herty Advanced Materials Development Center, a world leader in cellulose processing, which recently received $1 million in state funds to expand the development of biofuel facilities in Georgia. These grants are designed to support business development in this sector by reducing risk and increasing the speed that new technologies can be deployed into the market.


Green Energy Strategies for Sustainable Local Economic Development

Sustainable local economic development (SLED) strategies integrate traditional economic development goals of job creation, tax base expansion, and wealth creation; with equity, participation, and environmental sustainability. As economic development practitioners become increasingly focused on issues of sustainability, it seems intuitive that the growing green energy sector should serve as a catalyst for revitalization, workforce development and job creation.

Revitalization (Brightfields)

In 2001, the United States Environmental Protection Agency passed the Small Business Liability Relief and Brownfields Revitalization Act. This act was designed to turn the policies of the EPA’s Brownfield Program into legislation that would promote the clean up and redevelopment of the estimated 450,000 brownfield sites in the United States. The US EPA defines brownfields as, “property, the expansion, redevelopment, or reuse of which is complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant” (2006).

Although there have been many brownfield redevelopment projects undertaken since the Brownfield Act began, there continue to be many obstacles associated with redeveloping these sites. The largest of these obstacles is hazardous waste mitigation and the liability associated with site clean-up.

In 1999, the U.S. Department of Energy, in an effort to play a greater role in brownfield redevelopment, created the concept of transforming idle industrial property into revenue-generating sources of green energy technologies called, “brightfields.” According to the US EPA, brightfields refer to the “conversion of contaminated sites into usable land by bringing pollution-free solar energy and high-tech solar manufacturing jobs to these sites, including the placement of photovoltaic arrays that can reduce cleanup costs, building integrated solar energy systems as part of redevelopment, and solar manufacturing plants on brownfields” (2006).

Brightfield conversion addresses many issues pertinent to sustainable local economic development. It combines environmental issues like climate change and hazardous waste mitigation with revitalization and reuse of idle industrial land for the production of green energy.

The primary benefit of brightfield conversion as an approach to brownfield redevelopment is its ability to put a site back into economic reuse without disturbing the land or requiring costly hazardous waste mitigation. Renewable energy resources that are most suitable for brightfield conversion are those that would not require disturbance of the land. For example, the production of biomass energy crops would not be suitable for
brightfield conversion due to the digging, planting, and reaping of the energy resource. Solar energy, in the form of photovoltaic systems however, would be most ideal.

Photovoltaics are solar energy systems that convert light to energy using solar panels or cells. This energy technology can stand directly on the ground without penetrating the soil. Photovoltaics require little maintenance and can be installed to function both on and off the power grid, making them an ideal green energy resource for brightfield conversion.

Examples of brightfield conversion projects in the United States are:

- **The City of Chicago.** In 1999, the City formed a partnership with Commonwealth Edison and the Spire Corporation to redevelop a brownfield site into a photovoltaic manufacturing facility with a roof-mounted photovoltaic system that would produce 3 megawatts of solar energy annually that would be fed into the regional power grid and create 100 jobs.

- **Brockton, Massachusetts.** The City of Brockton redeveloped a 27-acre former manufactured gas facility into a solar array field that would produce 1 megawatt of solar energy annually and serve as a park with educational displays.

Brightfield conversion has not yet gained momentum as a brownfield redevelopment strategy. However, with the increasing interest in renewable energy resources and clean technology, brightfield conversion has the potential to become a useful economic development tool for attracting manufacturers of solar energy systems, as well as putting communities on the path to becoming more energy efficient.
Jobs

As more communities and industries move toward the usage of green energy resources, it will become increasingly important for workforce development practitioners to identify opportunities for low-skilled workers to be trained and educated to take advantage of the increasing demand for green collar jobs. Green collar jobs are jobs that involve green or sustainable environmental practices like brownfield remediation, solar panel installation, and maintenance of wind farms.

Workforce development

Sustainable local economic development is concerned with more than the task of bringing jobs to a community. Its objective is to match the skills of the local workforce to the needs of the firms that are considering locating to the area and ensuring equitable access to these jobs (Tsou, 2006, p. 3). To achieve this, cities must be proactive in encouraging workforce development across all skill sets.

The participatory process is important to the development of a successful workforce development program (Tsou, 2006, p. 9). Workforce development programs that engage trainees, businesses, and job training organizations are best able to develop programs that meet the needs of all stakeholders (Tsou, 2006), p. 9.

Examples of workforce development programs with a green energy focus are:

- **Oakland, California:** In 2006, Oakland launched a green jobs campaign that set out to put low-income communities on the path to social and economic recovery (Jones & Wyskida, 2007) by creating the Oakland Green Jobs Corp. The Green Jobs Corp is a partnership between the City, community colleges, and labor unions that will create paid internships in renewable energy and energy efficiency industries and provide a “comprehensive job-training pathway” to residents who are difficult to employ (ex-convicts, at-risk youth, welfare recipients, etc.) (Kim, 2006, p. 72). The Oakland Green Jobs Corp. is currently gathering funding for its job training program and is scheduled to get off the ground in 2008.

- **Bronx, New York:** Sustainable South Bronx, an organization in New York whose mission is the economic and environmental rebirth of the South Bronx, has created a program called, B.E.S.T. (Bronx Environmental Stewardship Training) that offers a free, ten-week green collar job training for its residents. The B.E.S.T. program provides training in green roof installation, hazardous waste clean up, and certificates in brownfield remediation, among other things.

- **Washington, D.C.:** Although in the nascent stages of development, Washington, D.C. has just announced a green jobs initiative that will name a Green Collar Jobs Advisory Council who will be charged with working on a strategy to link clean energy solutions to job creation for citizens in the district.
Green Collar Jobs

In August of this year, the U.S. House of Representatives acknowledged the need for green collar job training by passing the Green Jobs Act of 2007. The Green Jobs Act makes $125 million dollars per year available to national and local job training programs to train workers for jobs in the clean and renewable energy sector. (Spittler, 2007).

Green collar jobs are defined as, “blue collar workforce opportunities created by firms and organizations who mission is to improve environmental quality (Pinderhughes, 2006). These jobs include any work that is involved in the design, manufacturing, installation and maintenance or operation of renewable energy technology (Kathleen, 2007).

With many communities moving toward the adoption of renewable energy and sustainable development policies, the economic opportunities in the renewable energy industry are growing. As more wind farm farms, photovoltaic systems, and biomass engines come online, there will be an increase in demand for the technical expertise of workers who can fill the jobs associated with building and operating these facilities (Jones, 2007).

Green collar jobs contribute to sustainable local economic development by providing living wage employment that typically cannot be outsourced to countries where labor is cheaper. Some of the components associated with wind turbines (structural towers and rotor blades) are too large for long-distance transport to be economical. For example, the rotor blades on a wind turbine are typically 144 feet and can be as large as 210 feet or more. Firms that manufacture these component parts would therefore find it most economically feasible to be located in an area that is most central to wind farms.

The American Solar Energy Society estimates that with the right policies in place, the renewable energy and efficiency industry could create as many as 40 million jobs by the year 2030 (Bezdeck, 2007, p. iv).

Following are job creation estimates (per megawatt energy) for green energy resources that hold the most promise for near future economic development projects.

Wind Energy Jobs

Jobs created by wind energy can range from the skilled labor required in component manufacturing, wind farm construction and installation, to wind energy mechanics, or windsmiths who operate and maintain turbines.

Wind farms can take up to one year to construct. The Renewable Energy Project found that for every one megawatt of wind energy capacity, .68 year-long installation jobs and 3.19 year-long manufacturing jobs are created (Bezdek, 2007).
**Solar/Photovoltaic Energy Jobs**

Jobs created by solar/photovoltaic energy can be divided into two categories, manufacturing and installation/operation. Like manufacturing jobs in most sectors, solar manufacturing jobs have no location requirement and can be located anywhere. Installation and operation jobs created by solar/photovoltaic energy are local jobs that can bolster the economics of the regions where solar is installed. The Renewable Energy Project estimates that every one megawatt of solar/photovoltaic capacity installed creates 32.6 year-long manufacturing jobs and 6.52 installation and operations jobs (Bezdek, 2007).

**Biomass/Biofuel Jobs**

Most biomass and biofuel power plants are located in rural areas. As a renewable energy source that burns organic materials for energy, the location of power plants is dependent upon the fuel source (wood chips, corn crop, etc.). It is estimated that 4.9 jobs are created for every megawatt of capacity installed in a biomass plant. Jobs created through biomass energy production are local jobs that can add to a region’s economy (McNeil Technologies, 2003, p. 79). Biomass Jobs are best suited to rural economies that are in need of jobs and a local tax base (Morris, 2000, p. 83 and p. 52).
Case Studies

Rebuilding the Massachusetts Workforce: Innovative and Integrative Workforce Development

This example from the Northeast is an innovative way to coordinate many institutions into a job-centered workforce development network. Creating a strong workforce is more than training; it is also about education and opportunity.

High School to College

Greater Lowell Technical High School (www.gltech.org) wants to create a college-level certification program with Middlesex Community College (www.middlesex.mass.edu) in certain renewable-energy fields. For example, Greater Lowell graduates who have been trained as electricians would take classes at Middlesex to become certified solar panel installers. Would-be mechanics will take collegiate courses on biofuels and other alternative energies. A high school student, it is thought, will be more employable with green job skills.

Teaching Teachers

For another illustration, Greenfield Community College (www.gcc.mass.edu) has received a $50,000 grant from the Massachusetts Technology Collaborative (www.mtpc.org) to train local high school teachers on how to go green in their classes. The grant will fund costs for teachers from four schools to learn at GCC about renewable energy technology techniques and theories. The goal of the project is to create a “curriculum that spans from high school to college” (Carroll, 2007).

The renewable energies courses at GCC were begun in the spring of 2007. They are meant to provide community members and students with the skills to install and maintain the new green energy technologies. The supply of people who know how the newer green technologies work has not caught up to the industry demand. Courses that have been taught include “introduction to photovoltaic technology” (panels that convert solar energy into electricity), “photovoltaic installation”, “solar domestic hot water”, “passive solar technology” and “energy conservation and efficiency” (Carroll, 2007).

Connecting Training to Business

In 2007, the college received a $372,000 grant from the Massachusetts Workforce Competitiveness Trust Fund of the Commonwealth Corporation (www.commcorp.org), a quasipublic agency of the state. The Fund is a three-year initiative focused on several sectors. It is designed to enable a broad range of residents—including older, low-wage, disabled citizens, and the unemployed—gain access to employment, education, and the self-sufficiency skills. The financial assistance helped to pay for a Sustainable Practices in Construction (SPC) project. The grant coordinated with community colleges and local businesses to fund tuition and stipends for employees at local businesses to take
renewable energy courses. Resources from the SPC project grant support development of a comprehensive sustainable energy program, called Renewable Energy Workforce Education (RENEWED) at GCC (CCT, 2007). They hope to eventually create an associates’ degree program.

Green Business Incentives

Massachusetts Technology Collaborative has established a $15 million business expansion initiative to lend money to expansion-minded companies that produce renewable-energy products (MTC, 2007, p. 10). MTC reported in August 2007 that the 556 clean-energy entities in the state provide some 14,400 jobs. For instance, Evergreen Solar Inc. (www.evergreensolar.com), a manufacturer of solar-powered products, began building its first U.S.-based manufacturing plant in Devens, Massachusetts, a $165 million facility expected to generate 300 new jobs. Part of the incentive to move to Devens was the up-and-coming, trained labor force that Massachusetts high schools and community colleges will be producing (MassDevelopment, 2007).
Chicago’s Brightfield Initiative: Converting Brownfields into Sources of Solar Energy

Located on the southern shore of Lake Michigan, the City of Chicago is one of the United State’s most populous cities. With an estimated 150,000 acres of land area, it became apparent to the Chicago Mayor’s office in the early 1990s, that the City had a significant number of abandoned industrial properties.

In 1993, the City’s Department of Planning and Department of the Environment were challenged by the Mayor’s office to identify the City’s brownfield sites, clean them up and redevelop them in a way that would generate jobs and tax revenue. The result of this challenge was The Chicago Brownfields Initiative. The Brownfield Initiative was established to, “link environmental cleanup with industrial real estate development in order to create jobs and generate tax revenue.” The City identified and targeted 26 brownfield priority sites for redevelopment, and in 1996, after receiving a $54 million Section 108 loan from the U.S. Department of Housing and Urban Development, it began purchasing and cleaning up its brownfield sites. While the Department of the Environment focused on site cleanup, the Department of Planning set about identifying economic development solutions that would attract businesses to locate on these sites, employ local residents, and improve the quality of their lives (http://www.p2pays.org/ref/17/16869.pdf).

As fate would have it, the City was also working on becoming greener and had set out to identify solar energy sources that would displace some of the electricity produced by coal-fired power plants. By engaging the parks department, transit authority, and other city departments, the Chicago Solar Alliance was born with the goal of increasing the reliability of Chicago’s electric grid and improving air quality.

The Brightfield Initiative

The United States Department of Energy, aware of Chicago’s mission of brownfield redevelopment, improving air quality, and improving the electric power system, approached the city with their Brightfield concept. Brightfields are defined as former, contaminated industrial sites that are converted into usable land by the installation of green energy technology, more specifically, solar photovoltaic systems. The benefit of converting a brownfield into a brightfield is that it does not require disturbance of the land or hazardous waste mitigation. Solar panels can be placed on the ground without any soil disturbances. This was a promising idea, as it had the potential for decreasing the number of brownfield sites within the City, without the clean-up costs associated with redevelopment, and it could provide a renewable source of electricity.

The U.S. Department of Energy introduced the City to the Spire Corporation. Spire Corporation was a manufacturer of photovoltaic equipment that had expressed interest in expanding its business model to include solar module assembly through its Chicago subsidiary, Spire Solar Chicago.
After reviewing its inventory of brownfield sites, the City identified a 21-acre abandoned concrete and stone crushing facility that had been used as an illegal dumping site for teardown debris from houses and roadway projects. After acquiring the property, the City undertook a $9 million clean up effort to prepare the site for reuse.

In 1999, the City and the Department of Energy announced a partnership with Spire Solar Chicago to redevelop 17 acres of the former brownfield site with a manufacturing plant that would bring more than 100 high-tech jobs to the economy, and a 2.5 megawatt photovoltaic array that would cover 10 acres and generate more than 10 million kilowatt hours of solar electricity.

**Project Goals**

**Economic Development Goals**

The overarching economic development goal of Chicago’s Brightfield Initiative was to convert a brownfield site into reusable land that would:

- Generate revenue that would finance future brightfield conversions
- Create 100 high-technology jobs for local people
- Provide green energy technology that would bolster the City’s existing electric supply.

**Renewable Energy Goals**

The Chicago Solar Alliance, Commonwealth Edison and Spire Solar Chicago guided the renewable energy goals of the brightfield conversion project. The goals were as follows:

- Production of over 22 million kilowatts of power annually
- Production of 3 photovoltaics annually
- Obtain 20% of City’s electric power generation from alternative energy sources
- Installation of an on-site solar energy system that would supply some of the energy needs of the site and serve as an educational center.
- Installation of photovoltaic panels manufactured on the site on municipal buildings, schools, transportation routes and commercial properties.

**Financing**

The City invested $9 million toward clean up of the brownfield site. A portion of this was financed with Section 108 HUD funds and the balance was financed through the resale of on-site aggregate for site clean-up. To make the project financially feasible for Spire Solar Chicago, the City agreed to purchase $2 million in photovoltaic energy panels for installation in schools and municipal buildings and Commonwealth Edison agreed to purchase $6 million in photovoltaics to improve the reliability and efficiency of its electric power grid.

**Outcome**
The Chicago Brightfields Initiative has resulted in the following outcomes:

- 2 of the 2.5 megawatts of solar arrays planned were installed on 30 rooftops throughout the city
- New tenants to the site included:
  - The Chicago Center for Green Technology
  - Spire Chicago
  - The Chicago Green Corps, a job-training organization that provides landscaping and horticulture training.
  - Landscape company
  - 1 solar array was placed on the roof of the building
- Creation of the Chicago Center for Green Technology
- Installation of 10 kilowatt photovoltaic system at Reilly Elementary School.

While the Chicago Initiative achieved many of its objectives, some of the most important objectives lost steam. In 2005, Spire Solar Chicago closed its manufacturing plant and relocated to Bedford, Massachusetts.

Since the Chicago pilot project, there have been 6 additional brightfield projects to receive U.S. Department of Energy grants.

- A superfund site in Washington received a 38.7 kilowatt array
- A 7.2 kilowatt rooftop system was installed on a converted warehouse in Cedar Rapids, Iowa.
- A former petroleum processing plant in Paulsboro, New Jersey received 276 kilowatts of solar modules installed by BP (owner of the contaminated site).
- The largest brightfield to date was installed in Brockton, Massachusetts in 2006. This project was a former 3.7-acre manufactured gas plant that was installed with 1,395 solar modules. It produces 535 megawatts of energy per year
- Many of the difficulties of the brightfield initiative program appear to lie in the limited amount of technical and financial resources available to projects from the Department of Energy and local governments.
- While the Spire Corporation relocated from the Chicago site in 2005, I think that it might be beneficial going forward (if the City of Chicago did not already have this preventative measure in place) for local governments to require clawback clauses on future brightfield conversion projects, particularly for anchor firms.

Conclusion

The Chicago Brightfield Initiative, much like the national model, has fallen short of its expectations. As I continue to pursue case study research, I hope to identify any correlations between other brightfield conversion projects and the Chicago pilot.

As a sustainable economic development tool, photovoltaic energy resources still holds promise. Going forward, local governments might consider clawback clauses on...
future brightfield conversion projects (particularly for anchor firms) that would motivate firms to have a larger vested interest in long-term location.

Community support is also important. Involving the community in the process can give a project momentum. As well as create an environment where the community has a vested interest in seeing the project succeed.

The Brockton, Massachusetts Brightfield project was a major success. Lori Ribiero, project manager for the project, says it was a success for many reasons: significant community support, charismatic leadership, detailed feasibility study, and its partnership approach (Ribiero 2007, p.49). While Ribeiro says that, “this confluence of factors is rare”, it should not be deemed impossible.

Going forward, brightfield conversion is not the panacea for all brownfield redevelopment, but it does have the potential to address this problem in a manner that also puts communities on the path to displacing traditional electrical energy with green energy. Perhaps wind farms should also be considered as a green energy resource for brightfield conversion? With the right amount of public policy, community support, and technical and financial support from the DOE and local governments, brightfield conversion could be a useful sustainable local economic development tool that combines renewable energy with job creation, tax base expansion, and revitalization for communities with large inventories of brownfield sites.
The Department of Energy’s EnergySmart Schools Program

In 1994 the U.S. Department of Energy’s Energy Efficiency and Renewable Energy program created the Rebuild America program. The Smart Growth Network (2007) provides an excellent summary of the program: “Rebuild America is a network of hundreds of community-based partnerships across the nation who are saving energy, improving building performance, easing air pollution through reduced energy demand, and enhancing the quality of life through energy efficiency and renewable energy technologies. The program functions as mechanism for revitalization, economic development, and job creation at the local level throughout the country”. A major component of the Rebuild America program is the EnergySmart Schools campaign.

About the EnergySmart Schools Campaign

EnergySmart Schools is a public-private partnership through which the DOE “seeks to catalyze significant improvements in energy efficiency in the nation's K-12 schools at a time of enormous opportunity (EnergySmart Schools, 2007).” The DOE specifically points out that state and local agencies plan to invest more than $60 billion to build or renovate schools over the next three years (EnergySmart Schools, 2007). The campaign provides four focused “how to” guides for interested communities including, planning, financing, designing and building, and operations and maintenance. Additionally, the campaign provides resources for teachers to use in developing energy-related curricula. The campaign is endorsed by the National Schoolboard Association and has made partnerships with educational associations, state and regional energy efficiency programs, state energy officers, and utility companies.

The DOE cites the following as outcomes of its campaign: saving participating schools $2 billion annually in energy costs, providing healthier learning environments, educating the public about affordable energy efficiency technologies and practices, reducing demand for electricity use from power plants, and providing reliable, off the grid, emergency community shelters during times of emergency (EnergySmart Schools, 2007). These outcomes are consistent with achieving three key components of the 2001 National Energy Policy including: increasing energy conservation, relieving congestion on the nation’s electricity transmission and distribution system, and establishing a national priority for improving energy efficiency and environmental protection.

Planning

Building energy smart schools requires more planning than is used in conventional schools. Specifically, energy smart schools must employ “whole building” system design, which requires weighing “a wide range of options to find optimal design solutions that meet the defined project goals and fit the school's size, functions, and climate zone (EnergySmart Schools, 2007b).” This process involves forming a collaborative planning process involving a multidisciplinary team of specialists and stakeholders. Fostering this collaborative participation process early ensures that the most options are available for implementation in the specific school. Solutions reached
in the planning process balance elements such as “as good site design, daylighting, building controls, solar and other on-site renewable energy options, water conservation strategies, and energy-saving operations and maintenance practices (EnergySmart Schools, 2007b).” Including a variety of specialists and stakeholders in this process ensures that investments and long-term benefits are optimized for the specific school.

The planning process involves these broad level steps: (1) conducting a needs assessment and forming an advisory board, (2) identifying project benchmarks, (3) setting and prioritizing general project goals, (4) developing a preliminary budget and funding options, (5) winning project approval from the school board, banks, and utilities, and (6) selecting a project design group. Each step is briefly discussed below.

EnergySmart Schools provides the following advice for step 1, assessing needs, “conduct a needs assessment to estimate roughly what the new facility will require in space and functions. Then, consider forming an advisory group from your school and school district, including teachers, facilities management, and other key functions. Also consider including people from the local community and perhaps your state energy office who share your interest in energy efficiency and can help to define and champion the project (EnergySmart Schools, 2007b).” This strategy correctly includes involvement by the community and by leaders to foster a feeling of community ownership early in the process; a strategy which will enhance the quality of the plan through collaboration and also form relationships which will later become vital to project implementation.

Step 2 involves forming project benchmarks. This step involves using available resources, especially an advisory board, to research similar projects already conducted. In addition to searching for similar projects used for benchmarking, research should be conducted on LEED standards, through the U.S. Green Building Council, and on best practices and innovations provided through the Collaborative of High-Performance Schools program. This step creates an agenda for the range of choices to be considered for the project.

Next, step 3 involves setting and prioritizing goals, which according to the campaign involves “minimizing consumption of purchased energy and other resources such as water, while also ensuring healthful air quality and comfort. Some districts also define goals for use of non-toxic, recycled, or locally sourced materials; onsite power generation from renewable sources; and purchase of “green” energy. In addition, some districts define educational goals related to their new facilities, including ways to incorporate the features and performance of their energy-efficient facility into curricula (EnergySmart Schools, 2007b).”

Step 4 is to develop a preliminary budget and financing options. DOE suggests contacting, with the help of an advisory board, benchmark schools identified in step 2 to get a sense of project costs and financing options that these other projects recommend. This step is only preliminary and is developed further in a later discussion of finance options.
The next step involves making the case for the project to the school board, PTA, local banks, utilities, and community organizations. This process requires having a preliminary plan from the previous steps. There are many benefits of EnergySmart schools to showcase in presentations and discussions during this approval winning process. First, construction costs for EnergySmart school is not necessarily above the cost of a conventional design. The figure below compares detailed construction costs for typical and energy efficient buildings. The percentages of total costs are comparable and saved costs in energy consumption are significant, enough to outweigh construction costs of a more advanced building if they indeed exceed traditional designs. However, DOE stresses that early planning and careful design consideration should not result in extra costs.

Second, energy is the largest cost for schools after personnel and reducing these costs through innovative design produces significant savings. The figure below illustrates the savings in yearly costs from an energy efficient school.
Third, schools can reduce energy costs without sacrificing educational quality. Rather, these savings can be used to invest in other areas to improve educational quality. Additionally, the building design alone may contribute to rises in the quality of education and student performance. A study by the Heschong Mahone Group shows a correlation between the use of daylighting and improved student performance. Students from the Capistrano school district in California located in rooms with daylighting, large windows, or skylights performed 19 to 26 percent better on standardized reading tests and 15 to 20 percent on standardized math tests than students in classrooms without these features.

Fourth, the DOE argues that “schools are central to the community they serve and should reflect community values (EnergySmart Schools, 2007b).” Schools provide an excellent opportunity to raise awareness about global warming, renewable fuel technology, and energy conservation. The centrality of schools in communities can be used to provide demonstration models for innovative designs.

Finally, education is key to achieving energy efficiency and alternative fuel use in the U.S. Schools are the best place to begin this process. The DOE makes the following suggestions regarding this educational opportunity, “High-performance schools can make many of their components part of the educational experience. At some schools, the building’s heating, ventilation, and air conditioning systems are encased in glass so that students can learn about their operation. The students can even give tours to visitors, explaining the function of each energy-efficient feature (EnergySmart Schools, 2007b).”

The final phase of the planning process is step 6, choosing a project design team. This team should be made of experts from different disciplines including architects, engineers, and other specialists. Some districts also hire a project manager to oversee design and construction, as well as to help select a design team.

Financing

Once the initial planning process has been completed and support has been built in the community further exploring finance options is the next step. Financial concerns can be the most significant hurdle to overcome in achieving an EnergySmart school. An advantage of a design based on energy efficiency is the increased financing options created beyond internal financing and traditional bank loans. Fortunately, many state governments, utilities, and foundations provide financing programs specifically designed for high-performance construction.

Internal financing from a school’s own operating or capital funds are commonly used for smaller, short-term projects with relatively short repayment periods. This option allows for faster implementation and for the retention of all energy cost savings by the school. However, many schools will not have the funds necessary to finance even small, and especially large initiatives. One solution to this problem involves using revolving investment funds to incrementally achieve cost savings from energy efficiency. Over time cost savings are continually invested in the revolving funds, then these savings and
the interest they accrue are invested in additional cost saving improvements to fund future projects. Both of these approaches allow for more control by the school district.

Another option which still retains significant school control are lease or lease-purchase agreements. In this approach, a school secures equipment or building improvements through a private vendor, who is then repaid over time using the energy cost savings from the project. The downside of this method is that cost savings from the programs begin leaving the school system.

In a similar approach, schools can negotiate energy-saving performance contracts. The DOE provides the following summary: “Energy-saving performance contracts can be used to upgrade equipment and improve the energy performance of existing facilities. A performance contractor estimates potential energy-cost savings for the school, and the school and contractor divide the amount saved. The more energy-cost savings generated, the more the performance contractor earns—and the more money the school has to put toward other projects. The formula for that division is negotiated prior to the lease signing. The National Association of Energy Service Companies has an online searchable database of companies that provides this and other types of services related to the evaluation, financing, and implementation of energy-efficient improvements. The National Clearinghouse for Educational Facilities also has a valuable resource list about performance contracting for school buildings (EnergySmart Schools, 2007c).”

Debt financing through the use of municipal bonds when schools must seek additional financing sources is another solution. Schools can sometimes use municipal bond markets to issue a general obligation bond. These bonds are often tax free, but also require voter approval and a significant debt obligation taken on by the school.

Additional options involve seeking and applying for grants and low interest loans. Many states now offer grants or low interest loans for energy-efficient school upgrades. The Database of State Incentives for Renewables & Efficiency provides information for each state on these programs. Local utilities are another source of grants and low interest loans. Some utilities offer their own programs for energy efficiency projects and also may have a source of financing called a public benefits fund, a fund created by a fee charged to customers monthly to help fund energy efficiency. The U.S. EPA designed the supplemental environmental projects program which allows companies which have violated environmental laws to fund energy efficient projects in lieu of paying a fine. Foundations and other non-profit resources can be a funding source. The Foundation Center provides searchable information about nonprofit resources available for energy efficiency projects.

Design and Construction

The best opportunity for energy efficiency and renewable energy programs in schools is during the project design phase for new construction. However, significant gains can still be realized by retrofitting existing schools and this is often preferable to building expensive new infrastructure that is not necessary. Design elements to consider
when formulating a project include daylighting to reduce electric lighting needs, choosing the best HVAC system based on the “whole building” design, integrating renewable energy sources such as wind and solar, and evaluating the “building envelope” or external shell and its relation to the surrounding environment. Additionally, the DOE website offers specific advice to interested communities on choosing a design team, an architect, and a building contractor.

**Operations and Maintenance**

Because many energy efficient and renewable energy improvements provide the return on their upfront investment over the life cycle of the building, operations and maintenance is an essential project element to consider. The DOE points out that “a well-thought-out, well-executed O&M program can provide huge savings in equipment and energy costs (EnergySmart Schools, 2007c).” A comprehensive O&M plan should include procedures for HVAC systems and equipment, indoor air quality systems and equipment, cleaning equipment and products, materials, water fixtures and systems, recycling and waste systems, and landscape maintenance.

**Conclusion**

The EnergySmart School program is an effective way to educate children about the possibilities of green energy use and also expose them to future green career paths. At the same time, these schools serve to educate the community about sustainable energy strategies. Additionally, energy costs are the highest cost that schools must face beyond staffing. Considering the savings benefits, for the same price as traditional construction in new schools, combined with the educational opportunities makes EnergySmart schools a positive choice for communities.
Conclusion

This report examined how policies in the State of Georgia and at the federal level are promoting economic development in local communities. Most policy is currently focused around issues of production and manufacturing. For this reason, these policies focus on job-centered workforce development as a strategy for sustainable local economic development.

Next, this report surveyed successful strategies used by communities to work towards sustainability. The key areas to focus on in designing a strategy are shown to be public participation in strategy formulation, procuring creative forms of financing, performing cost-benefit analyses, and realizing gains from energy efficiency programs. Public participation serves to educate the public as well as garner support by involving them directly in the planning process. Using creative forms of financing and performing cost-benefit studies ensures that projects are feasible and successful. Integrating energy efficiency into green energy programs can provide substantial returns for little up front investment.

Following the discussion of successful strategies, the report considers alternative fuel sources and their applicability in different geographic areas. Wind and solar are shown to hold the most promise throughout the country. Both resources have strong potential to be used in traditional agricultural areas, where economic development prospects are few and these resources can help to supplement incomes. Additionally, the benefits in terms of jobs, revitalization, education, and business development are considered.

Finally, in depth case studies are considered that show how the policies, strategies, and technologies discussed have been successfully combined and implemented. The cases considered focus on a workforce development initiative in Massachusetts, a brownfield reclamation project in Chicago, and the EnergySmart Schools program. The analysis shows that policy, financing, and citizen support exist for successful renewable energy programs. This analysis is designed to serve as a guide of examples and best practices for communities pursuing such programs.
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