Generating Solutions
How States Are Putting Renewable Energy Into Action

February 2002

A Report of the U.S. PIRG Education Fund and the State Public Interest Research Groups

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EXECUTIVE SUMMARY

Our current reliance on dirty, unreliable sources of energy such as coal, oil and nuclear has left this country with a legacy of asthma attacks, oil spills, radioactive waste and global warming. America deserves a safe, clean, affordable energy future. We can create jobs and secure this energy future by using America’s technological know-how to increase production from renewable sources, such as solar and wind. Consumers could save billions in energy costs each year if companies used available technology to make our cars, homes and appliances more energy efficient.

This report examines 21 states and their potential for electricity generation from renewable resources using state-of-the-art technology. We highlight success stories from Washington State to Maine that point to the enormous untapped potential for clean power generation from renewable resources.

Only 2% of our energy comes from clean, renewable sources. However, the potential power output of wind, solar, and geothermal resources in the United States is many times greater than our current total electricity consumption. The wind that blows in just four states—North Dakota, South Dakota, Kansas and Nebraska—is enough to meet the electricity needs of the entire country. The sun’s energy that hits the surface of the Earth every minute is greater than the total amount of energy that the world’s human population consumes in a year. We still only harness a fraction of that power, but the potential to generate energy from renewable sources is great.

Clean renewable energy has become increasingly more cost competitive. The American Wind Energy Association estimates that the cost of electricity generated from utility-scale wind systems has dropped by more than 80% over the last 20 years. According to the Solar Energy Industries Association, the cost of solar energy has dropped by a similar factor.

Because of the dramatically improved economics of renewable energy, state governments and municipalities across the country are implementing small-scale renewable energy programs. Often the testing ground for new, innovative policies, states have proven that we can increase production of renewable energy while creating jobs and saving consumers money. States will remain critical in increasing renewable energy generation, but to ensure that all Americans can enjoy the benefits of clean, renewable energy, we also need national standards.

In order to encourage increased energy production from renewable sources, we should implement policies at the state and national level that include the following:

• A clean energy standard, known as a renewable portfolio standard (RPS), to increase the amount of electricity generated from renewable sources of energy to 20% of power generation nationally by 2020.
• A public benefits fund to provide funds for energy efficiency programs, investments in promising renewable energy technologies, and low-income assistance programs. A national fund would provide matching funds to the states to help enhance state programs.

• National and state net metering standards that allow consumers who generate their own electricity from renewable technologies (e.g. a small wind turbine, a rooftop solar panel) to reduce their electric bill by getting credit for any power generated.

• A five-year extension of the Production Tax Credit (PTC) to encourage new energy generation from renewable sources, including wind, solar, geothermal energy, and clean biomass—specifically excluding municipal solid waste incinerators. The Production Tax Credit is critical in making renewable energy price-competitive with conventional energy sources, such as oil, coal and nuclear, which are heavily subsidized by the federal government. The extension of the credit will enable the renewable energy industry to develop and improve its technology, drive costs down even further and provide Americans with significantly more clean, emissions-free electricity generation.
INTRODUCTION: RENEWABLE ENERGY IS GOOD FOR THE ENVIRONMENT AND THE ECONOMY

Our reliance on dirty, unreliable sources of energy such as coal, oil and nuclear power has left us with a host of environmental and public health problems. America deserves a safe, clean, affordable energy future. We can create jobs and secure this energy future by using America’s technological know-how to increase production from renewable sources, such as solar and wind. Consumers could save billions in energy costs each year if companies used available technology to make our cars, homes and appliances more energy efficient.

Renewable Energy is a Vast, Virtually Untapped Resource
Currently, only 2% of our energy comes from clean, renewable resources. However, the potential power output of wind, solar, and geothermal resources in the United States is many times greater than our total electricity consumption. The wind that blows in just four states—North Dakota, South Dakota, Kansas and Nebraska—is enough to meet the electricity needs of the entire country. The amount of light energy that hits the surface of the Earth every minute is greater than the total amount of energy that the world's human population consumes in a year.\(^1\) We still only harness a fraction of that power, but solar and wind have the potential to significantly relieve our energy woes.\(^a\)

Clean renewable energy has become increasingly more cost competitive. The American Wind Energy Association estimates that the cost of electricity from utility-scale wind systems has dropped by more than 80% over the last 20 years.\(^2\) According to the Solar Energy Industries Association, the cost of solar energy has dropped by a similar factor. In fact, a study by the United States Energy Information Administration (EIA)—using very high estimates of renewable energy costs—shows that increasing the amount of electricity generated from renewable energy to 20% by 2020 would cost roughly the same as business as usual through 2006, and less in the long run.\(^3\)

Renewable Energy Boosts the Economy and Creates Jobs
Energy efficiency and renewable sources of energy would greatly benefit our economy. Investing in energy efficiency and renewable energy sources creates substantially more jobs than similar investments in oil and gas production. A recent study conducted by the Tellus Institute for the World Wildlife Fund found that increased investment in renewable energy and energy efficiency would create 700,000 jobs by 2010 and 1.3 million jobs by 2020.\(^4\) Another study by the State of Wisconsin found that increased use of clean renewable energy sources would create three times more jobs than increased use of traditional sources of electricity.\(^5\)

\(^a\) Not all of America’s renewable potential will be developed due to economic, physical, and other limitations.
Renewable energy also boosts economic growth by redirecting dollars spent on energy into local economies. Currently, most states import energy from other places, so money spent on petroleum and coal, for example, flows from the local economy to other states or even other countries. Some economists estimate that 80% of every dollar spent on energy bills leaves the state economy. In contrast, energy efficiency and local renewable energy sources keep energy dollars within the state economy. Economists refer to the "economic multiplier" as a measure of how much economic activity could be generated in a community by different types of investments. Money spent on oil and gas has an economic multiplier of $1.48, but money spent on energy efficiency has an economic multiplier of $2.32. This means that for every dollar spent, energy efficiency generates $.84 more economic activity in local economies than buying oil and gas.

Renewable Energy Creates a More Secure Energy System
In addition to economic benefits, increasing the amount of renewable energy used in the U.S. helps create a more resilient national energy system less vulnerable to disruption by human threats or natural disasters. Traditional energy sources rely on large centralized production and distribution systems. By creating more geographically dispersed energy sources, we decrease the risk that the failure or loss of one key plant will leave us in the dark.

Diversifying the energy mix to generate a greater percentage from clean renewable sources also ensures that we are less vulnerable to price spikes. The 2001 California energy crisis was in part the result of a sharp rise in the cost of natural gas, which in turn led to spikes in wholesale electricity prices. Renewable energy producers, in contrast, are not subject to commodity price spikes. With a diversified energy portfolio, consumers have alternative choices when prices rise rather than being held captive by the whims of a volatile fossil fuel market.

Renewable Energy Reduces Emissions of Soot, Smog and Greenhouse Gases
The Tellus Institute, in its report written for the World Wildlife Fund, found that investment in renewable energy and energy efficiency programs would reduce pollution that causes global warming by 8.5% between 2000 and 2010 and by 28% between 2000 and 2020. A report by the Union of Concerned Scientists found that gradually increasing the percentage of energy generated from clean renewable sources to 20% by 2020, along with energy efficiency measures, could reduce global warming emissions by one third, smog-forming emissions by 15% and soot emissions by 8%. Adding more energy efficiency measures to the renewable energy increase would reduce global warming emissions by two-thirds and smog and soot emissions by 55%.
HOW RENEWABLE ENERGY WORKS

In order to understand the advantages of renewable energy, it is helpful first to understand how electricity is generated using conventional methods. Almost all power plants have a spinning generator. The generator rotates a conductor through a magnetic field, creating an electric charge that is transferred to a circuit. Force must be used to make the generator spin. Most conventional power plants use a steam turbine to generate this force. Pressurized steam turns the turbine, which then spins the generator. Burning fossil fuels to produce heat generates the steam in conventional plants. In nuclear power plants, the nuclear reaction generates the heat.

If this process only generated electricity, we would have fewer environmental problems. But the process of burning fossil fuels and creating nuclear reactions also creates by-products. Electric power plants generate waste heat, which is heat not converted into electricity. Often streams or other water bodies absorb this heat, raising the temperature of the water and disturbing the ecosystem. Nuclear reactions create radioactive waste that remains toxic for thousands of generations. Burning fossil fuels releases carbon dioxide, the primary greenhouse gas responsible for global warming. By building up in the atmosphere, carbon dioxide traps heat that would otherwise escape. As a result, the average temperature of the earth rises. In addition, burning fossil fuels creates sulfur dioxide, the cause of acid rain; nitrogen oxides, a contributor to smog; and particulate matter, or soot, that lodges deep in human lungs and causes respiratory disease and premature death.

Because of all the problems that accompany fossil fuel and nuclear use, researchers have been searching for alternative clean energy sources, such as harnessing the heat of the Earth, the energy of the sun, and the force of the wind. The technologies have been tested and are ready for widespread use. Here’s how they work.

Solar Energy

The sun releases an enormous amount of energy. The Earth receives a small amount of this energy as heat and light. The amount of the sun’s energy that hits the surface of the Earth every minute is greater than the total amount of energy that the world’s human population uses in a year.

There are two main methods of harnessing the sun’s energy. One way uses the light energy the sun generates, and the other uses the heat energy from the sun. Photovoltaic (or PV) systems convert solar radiation, or sunlight, into electricity by using the photoelectric effect. This occurs when a beam of light hits the negative end of a pair of charged plates, creating an electrical flow of energy. The flow, or current, occurs because particles hit by the light move from the negative plate to the positively charged plate.

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b Electricity is measured in watts. One kilowatt (kW) is equal to 1,000 watts. A megawatt (MW) is one million watts or 1,000 kilowatts. Most electricity bills display electricity use in kilowatt-hours (kWh). A kilowatt-hour means 1,000 watts or one kilowatt of electricity produced or consumed for one hour.
Solar thermal technologies utilize the sun’s heat energy. The heat is then used to power steam turbines to generate electricity or to heat water. These technologies include solar concentrator power systems and flat plate solar collectors.

Concentrated solar power plants focus the sun’s heat energy by using mirrors at different angles. The heat generated from this process is channeled into a conventional electricity generator. Each plant consists of two parts, one to convert and collect heat energy, and the other to transform the heat energy into electrical energy. Flat plate solar collectors do not produce electricity, but instead use heat at very high efficiencies to warm up buildings, homes, and water.

The availability of light varies greatly depending on location. However, even on extremely cloudy days a solar powered system will produce energy—just not as much. During periods for which there is insufficient light to produce the power demanded, solar powered systems may require a supplemental power supply, such as a direct connection to an electricity grid, batteries, fuel cells or a small generator.

Figure 1. Solar Potential in the United States. The following figures detail each state’s capacity for generating energy from concentrated solar systems and flat-plate collectors. These maps show that extremely sunny areas, such as the Southwest, receive enough sunlight that a concentrated solar system in Arizona could generate 63,364,000 kWh, enough to power more than 6,300 homes. Even in cloudy New England, a concentrated solar system in New Hampshire could generate 30,237,000 kWh, enough to power more than 3,000 homes.
Wind Energy

Wind resources in just the windy areas of this country, consisting of about 6% of the continental United States, could supply more than one and a half times the electricity consumption of the entire country. The wind that blows in just four states—North Dakota, South Dakota, Kansas and Nebraska—is enough to meet the electricity needs of the entire country. Wind resource potential is measured by class of wind. Different classes can generate different amounts of power, with class 1 being the weakest and class 7 being the strongest.

Wind power systems consist of a wind turbine, a tower, wiring, and a way to collect and transmit the electricity. By using the wind to force the turbines to turn, the wind turbines generate mechanical power. The mechanical power is used to generate electricity.

"Farming” the wind generates massive amounts of electricity; larger farms can power several thousand homes. Agricultural farms could benefit from increased small-scale wind production. A Union of Concerned Scientists report documents that wind developers are paying farmers $2,000 or more per year for each wind turbine they

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The class 3, 4, 5 and 6 wind areas in Kansas, Nebraska, North Dakota and South Dakota yield 5,841,659 million kWhs of generation potential, according to NREL data. In 2000, the U.S. generated 3,799,944 million kWhs of electricity. Even if Class 3 wind potential is excluded, these four states have the potential of generating 3,217,386 million kWhs of electricity from wind power. Not all of this potential will be developed due to economic, physical, and other limitations.
More than half of the states in the U.S. are using some amount of wind power, since wind energy is one of the most cost-competitive renewable energy technologies. According to the American Wind Energy Association, wind energy capacity increased 60% in 2001. The amount of wind capacity installed during 2000 was more than double the amount installed during any other year. 

**Geothermal Energy**

One scientific study estimates that the energy potential in one percent of the heat in the top ten kilometers of the Earth’s crust is 500 times more than the energy from all of the Earth’s oil and gas resources. Another study estimates the known, currently accessible geothermal resources at 23,000 megawatts (MW) for thirty years. This is enough energy to power the entire state of Indiana for a year.

There are two ways of generating geothermal energy. The hydrothermal process draws heat from geothermal geysers. Some geysers are naturally close to the surface, but others require drilling down into the Earth’s crust to reach areas that are hot enough to use for energy production. The heat sources can be found anywhere from a few hundred meters to 3,000 meters below the surface. The second process, known as the hot dry rock method, involves hydraulic fracturing, breaking rock apart and then creating an artificial geyser by pumping water through the break to use the heat naturally created by the rock. This process potentially has negative environmental implications; however, since the geothermal industry has yet to apply this technology, scientists have not completed any comprehensive studies on its environmental impact. Further research is necessary before any broad-scale application of the hot dry method occurs. All geothermal energy production needs to be carefully sited to ensure that the environment is not harmed.

Geothermal energy is used in two ways: to power large electric plants and to power small heat pumps. The large scale geothermal resources needed to power the larger electric generating plants are concentrated in the Western states, although small-scale geothermal ground source heat pumps can be used nearly anywhere. This is because in most places, the topmost ten feet of the Earth’s surface has a temperature between 50 and 60 degrees Fahrenheit. Ground source heat pumps rely on this heat and water near the surface of the Earth rather than heat located deeper in the Earth’s crust.

Geothermal heat pumps are 50-70% more efficient at heating and 20-40% more efficient at cooling than traditional electric heating and cooling systems. Because of this, using geothermal energy in heat pumps reduces pollution from fossil fuels and cuts energy costs. In fact, geothermal heat pumps usually pay for themselves within three years.
Figure 3. Geothermal Energy Potential in the United States. Figure 3 shows that the Western states contain the most concentrated geothermal resources of the type necessary to power large-scale utilities, but all states can power small-scale heat pumps.

Source: Department of Energy

Clean Biomass

"Biomass" is any living plant matter such as plants, grasses and agricultural crops. Although the types of biomass can vary from region to region, all states contain plentiful biomass. Currently, biomass generates more electricity than any other renewable source in the country. Utilities burn biomass to generate the heat needed to power turbines.

Generation facilities can use biomass in its solid form to generate electricity or first convert it into a liquid fuel. As with fossil fuels, biomass is burned to generate electricity. Consequently, it is important that utilities only use the cleanest and most efficient forms of biomass. Municipal solid waste incineration, for example, should not fall under the rubric of "clean" biomass. Waste incinerators are the second largest source of dioxin in this country. Dioxin, a known human carcinogen, is one of the most toxic chemicals known to science. Incinerators also account for nearly 20% of the nation’s emissions of mercury, a toxic metal that can damage the growing brains of children at low exposure levels. Instead, plant matter, such as crops grown specifically for energy purposes or agricultural trimmings, should be used as biomass sources.
Figure 4. Clean Biomass Potential in the United States. The darker sections in the map below highlight the regions with the most potential for generating energy from clean biomass.

Landfill Gas
As household waste in landfills decomposes, it creates gases, such as methane, that escape into the atmosphere. When released directly into the air, methane contributes to global warming. To prevent explosions that could occur with an uncontrolled release of flammable gas, municipalities often control the emissions with flaring, burning the gas in the open air. However, flaring wastes energy potential. Municipalities and utilities can use landfill gas to produce electricity, transforming the problem into a renewable energy solution. Landfills emit these gases whether or not utilities use them to generate electricity, so landfill gas-to-electricity facilities do not create any new emissions and can help to reduce landfill odors.

Any system converting landfill gas into electricity system has three basic components: the gas collection system, which gathers the gas being produced within the landfill; the gas processing and conversion system, which cleans the gas and converts it into electricity; and the interconnection equipment, which delivers the electricity from the project to the final user. Because landfill gas is present throughout the landfill, the operators place wells at various depths and locations. The type and depth of the landfill will determine the number and spacing of wells.

Thousands of closed landfills across the country offer a virtually untapped opportunity for landfill-to-electricity generation. For landfill facilities that already control landfill gas emissions, converting it to electricity instead of wasting the potential energy makes sense. However, as with any technology, decision-makers should monitor facilities for potential environmental side-effects of converting landfill gas to electricity, such as the potential for accidental release of toxic chemicals often present in landfills.
RENEWABLE ENERGY IN ACTION AT THE STATE LEVEL

Because of the dramatically improved economics and reliability of alternative energy sources, states and municipalities across the country have launched small-scale renewable energy programs. Often the testing ground for new, innovative policies, states have proven that we can increase our reliance on renewable energy, save consumers money and protect the environment while creating jobs. Several state governments, municipalities, and utilities have implemented policies to encourage renewable energy growth. A full list of these incentives is included in Appendix A.

In the following pages, we profile 21 states, detailing the energy mix they currently use to generate electricity and contrasting it with their potential for generating electricity from wind, solar, geothermal, clean biomass, and landfill gas. Appendix C contains a state-by-state breakdown of renewable energy generation potential by source. In addition, we review several local case studies that illustrate how renewable energy and energy efficiency are saving consumers money, creating jobs and protecting the environment. States profiled include California, Colorado, Florida, Georgia, Illinois, Indiana, Iowa, Louisiana, Maine, Michigan, Montana, Nevada, New Hampshire, New Mexico, North Dakota, Ohio, Oregon, Pennsylvania, Texas, Washington, and Wisconsin. We chose to profile these states for several reasons:

1- They represent a broad cross-section of the country, ranging from highly populous and industrialized states such as Texas to rural states with small populations such as Maine.

2- These states experience the ill effects of our dependence on fossil fuels in similar ways but to varying degrees.

3- These states have varying levels of potential to develop renewable energy, ranging from tremendous potential in North Dakota to more modest potential in Georgia.

The state profiles demonstrate the vast potential for renewable energy in this country and provide good models and case studies for how renewable energy can work at the local level. Federal level policy needs to follow suit in order to translate these state and local models on a much larger scale across the entire nation.
California deserves a safe, clean, affordable energy future. To fully develop the clean energy potential available in the state, we need to encourage smart energy choices that will help our health, our environment and our economy.

California’s Electricity Generation

California has long been at the forefront of progressive environmental policy. In 2000, California generated 10% of its electricity from renewables sources. However, the state still depends on fossil fuels and nuclear power for 71% of its electricity needs. Hydroelectric power, which emits less pollution than fossil fuels but causes its own set of environmental problems, accounted for 19% of the state’s energy mix.

California’s Renewable Energy Potential

Potential from Wind, Clean Biomass, Geothermal and Landfill Gas

California has tremendous capacity to generate electricity from renewable sources such as wind, clean biomass, geothermal energy and landfill gas. In fact, California’s potential for generating electricity from these renewable sources is 18% higher than the electricity currently generated from dirty energy sources. California’s total generation potential from wind, geothermal, clean biomass and landfill gas is 219.2 billion kilowatt hours (kWh)—enough to power 22 million homes.

Solar Energy Potential in California

California also has the best solar potential in the country, although the precise amount is difficult to quantify. According to the National Renewable Energy Laboratory, if Californians installed only a

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\[d\] The Energy Information Administration calculations include municipal solid waste as a renewable energy source. U.S. PIRG and the State PIRGs do not consider municipal solid waste to be a clean form of biomass.

\[e\] In order to quantify California’s solar potential, we would have to make assumptions about cost and rooftop and other space available now and in the future for photovoltaics.
Football-field sized amount of solar panels on their rooftops, the state could harness more than 1.2 million kilowatt-hours (KWh) of electricity, enough to power 125 homes. Similarly, if the state installed just one concentrated solar system covering approximately 200 acres, it could generate more than 71 million KWh of electricity, enough to power 7,142 homes.

Renewable Energy Would Protect California’s Environment, Create Jobs and Bolster the Economy

In addition to cutting air pollution and radioactive waste, increasing electricity generation from renewable sources could boost California’s economy. According to a report by the Tellus Institute, investment in renewable energy and energy efficiency could create 77,400 jobs in California by 2010 and 141,400 jobs by 2020.26

Renewable Energy and Energy Efficiency at Work

Across the state, 16,000 turbines generate enough electricity for nearly half a million people. The industry has been growing since the mid 1980s, creating nearly 400 full-time jobs. California has installed 1,671 MW of wind power and has plans to install an additional 660 MW. 5,000 wind turbines generate clean energy in California’s Tehachapi Pass alone, helping to offset 1.1 billion pounds of global warming emissions each year.

In 2001, 73% of San Francisco voters approved two solar energy measures that will transform the city into the nation’s largest municipal producer of solar powered electricity. Proposition B will provide $100 million for the installation of solar panels on city-owned buildings, wind turbines and energy conservation technologies—all at no cost to taxpayers. Proposition B will pay for itself entirely through energy savings. Proposition B will generate 30 megawatts from wind power and 10 megawatts from solar, providing enough electricity for 16,700 residences and making San Francisco the largest producer of sun-generated electricity in the country.27

More than 400 megawatts of electricity are produced by 15 geothermal plants in California’s Imperial Valley. The city of Santa Rosa has partnered with one local provider to deliver the city’s reclaimed water to the geothermal field, where the Earth heats the water for use in geothermal energy production. Another electricity provider is able to retrieve minerals such as zinc from the waters in its geothermal wells. The additional revenue from the sale of minerals should lead to lower electricity prices for consumers.

Launched in 1993 and including more than 750 residential rooftop solar units and dozens of commercial and church rooftop systems, the Sacramento Municipal Utility District’s (SMUD) PV Pioneer systems feed more than 1500 KW of clean electricity directly into SMUD’s grid. In total, Sacramento, with 8 megawatts of solar power, is now the country’s biggest municipal producer.

Channel Islands National Park has a long history of using renewable energy to reduce fossil fuel consumption on the island while meeting demand for power. Solar energy is well-suited to the island, where diesel is expensive and risky to transport. In 1998, the National Park installed two off-grid photovoltaic systems to power the employee housing site. Simple payback for the cost of the systems will occur in eight years, with the savings equaling $36,000 in 10 years and $246,000 in 25 years. Had the National Park chosen diesel rather than solar, the fossil fuel generators would have burned 10,000 gallons of diesel fuel resulting in 119 tons of global warming emissions, 5,750 tons of smog forming pollutants, 285 pounds of soot, and 8,120 pounds of carbon monoxide.28

A field of "sunflowers" turns from east to west on a hillside in northern California. The colorfully designed solar panels follow the sun from rise to set each day to take in 25% more energy than immobile systems. Each panel sits on a rotating pedestal, and their shape and color suggest a field of flowers. The hillside system provides energy to a 750-acre vineyard nearly a mile away in the Napa Valley.

In the summer of 2001, California reduced demand for peak electricity by about 12% compared to 2000, averting predicted rolling blackouts during the hottest months of the year.
Colorado deserves a safe, clean, affordable energy future. To fully develop the clean energy potential available in the state, we need to encourage smart energy choices that will help our health, our environment and our economy.

Colorado’s Electricity Generation

Colorado is too dependent on dirty energy sources. In 2000, Colorado generated 97% of its electricity from coal and gas and none from renewable sources such as wind, solar and geothermal energy. The state relies on coal for 82% of its electricity, making Colorado one of the most coal-dependent states in the country. Hydroelectric power, which emits less pollution than burning fossil fuels but causes its own set of environmental problems, accounted for 3% of the state’s energy mix.

Colorado’s Renewable Energy Potential

Potential Energy from Wind, Clean Biomass, Geothermal and Landfill Gas

Colorado has tremendous capacity to generate electricity from renewable sources. In fact, Colorado could generate from wind alone 12 times the energy it currently generates from coal, petroleum, gas, and hydroelectric power combined. Colorado’s total generation potential from wind, clean biomass and landfill gas is 548.7 billion kilowatt hours (kWh)—enough to power more than 55 million homes.

Solar Energy Potential in Colorado

Colorado also has some of the best solar potential in the country, although the precise amount is difficult to quantify. According to the National Renewable Energy Laboratory, if Coloradans installed only a football-field sized amount of solar panels on their rooftops, the state could harness more than 1.2 million kilowatt-hours (KWh) of electricity, enough to power 122 homes. Similarly, if the state installed just one concentrated solar system covering approximately 200 acres, it could generate more than 61.5 million KWh of electricity, enough to power 6,177 homes.

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1 In order to quantify Colorado’s solar potential, we would have to make assumptions about cost and rooftop and other space available now and in the future for photovoltaics.
Renewable Energy Would Protect Colorado’s Environment, Create Jobs and Bolster the Economy
In addition to reducing the air pollution created by burning fossil fuels, increasing electricity generation from renewable sources could boost Colorado’s economy. According to a report by the Tellus Institute, investment in renewable energy and energy efficiency could create 10,000 jobs in Colorado by 2010 and 17,700 jobs by 2020.32

Renewable Energy and Energy Efficiency at Work

In February 2001, the Colorado Public Utility Commission (PUC) directed Xcel Energy to enter into negotiations to build a wind generation project along with its portfolio of resources that will supply the company’s electricity needs for the next five years. The PUC ruled that the proposed wind facility, a 162-megawatt wind plant near Lamar, would be more cost-effective than another natural gas plant and provide greater benefits to public health, rate-payers and the environment.33

Xcel Energy’s Windsource program sells wind power in 100 kilowatt-hour blocks, allowing customers to decide how much they use. Since it was first introduced in 1997, Windsource has grown to be the country’s largest customer-driven wind program. The company generates the wind power it sells as Windsource in Colorado from a wind farm in northern Colorado, just south of the Wyoming state line. The Ponnequin Wind Facility is the first commercial wind farm in Colorado. The wind farm currently has 44 turbines that can generate up to 30 MW of electricity. Xcel Energy now has more than 17,000 customers in its Windsource program in Colorado, including more than 400 businesses and four wholesale customers.34

High in the Rocky Mountains, the outside air is never very warm. But the water treatment plant in Leadville is using the sun’s energy to beat the cold. Special solar collectors on the south wall draw in light and cold air from outside year-round; the heated air is then circulated throughout the building. The plant’s solar wall saves an estimated $4,370 in energy costs per year.

James Udall of Aspen saves $200 a year by obtaining three quarters of his electricity from his solar energy system. His was one of five homes to install a solar system through a 1997 program of the Community Office for Resource Efficiency (CORE). By replacing coal-fired electricity, Udall’s solar panels prevent 16 pounds per day of harmful greenhouse has emissions.

Newton Middle School in Littleton, CO, is one of 28 schools in the state to install a photovoltaic system as part of the Renewable Energy Trust program. Established in 1993, the program allows more than 15,000 utility customers to “round-up for renewables,” rounding up their monthly electric bills to the nearest dollar. Newton Middle School’s system will prevent more than 5,550 pounds of global warming emissions each year.35
Florida deserves a safe, clean, affordable energy future. To fully develop the clean energy potential available in the state, we need to encourage smart energy choices that will help our health, our environment and our economy.

**Florida’s Electricity Generation**

Florida is too dependent on dirty energy sources. In 2000, Florida generated 96% of its electricity from fossil fuels and nuclear and 4% from renewables. Coal, the dirtiest of fossil fuels, accounted for more than one-third of the state’s energy mix. Florida’s two nuclear power plants also generate a significant percentage of the state’s electricity. Each year, the average nuclear power plant produces 20 tons of highly radioactive waste that remains lethal for thousands of human generations.

**Florida’s Renewable Energy Potential**

**Potential for Clean Biomass and Landfill Gas**

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<thead>
<tr>
<th>Source</th>
<th>Amount</th>
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<tbody>
<tr>
<td>Clean Biomass</td>
<td>7,423 mill. kWh</td>
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<tr>
<td>Landfill Gas</td>
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Florida has important capacity to generate electricity from clean biomass and landfill gas. In fact, Florida could generate almost 8.7 billion kilowatt-hours (kWh) from clean biomass and landfill gas alone—enough to power 873,000 homes.

Unfortunately, Florida does not have significant potential for developing wind power. In total, Florida could meet 5% of its electricity generation needs with clean biomass and landfill gas.

**Solar Energy Potential in Florida**

However, Florida has some of the best solar potential in the country, although the precise amount is difficult to quantify. According to the National Renewable Energy Laboratory, if Floridians installed only a football-field sized amount of solar panels on their rooftops, the state could harness more than one million kilowatt-hours (KWh) of electricity, enough to power 104 homes. Similarly, if the state installed just one concentrated solar system covering approximately 200 acres, it could generate more than 38 million KWh of electricity, enough to power 3,833 homes.

**Renewable Energy Would Protect Florida’s Environment, Create Jobs and Bolster the Economy**

In addition to reducing the air pollution created by burning fossil fuels and radioactive waste from nuclear power plants, increasing electricity generation from renewable sources could boost Florida’s

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8 The Energy Information Administration calculations include municipal solid waste as a renewable energy source. U.S. PIRG and the State PIRGs do not consider municipal solid waste to be a clean form of biomass.

h In order to quantify Florida’s solar potential, we would have to make assumptions about cost and rooftop and other space available now and in the future for photovoltaics.
According to a report by the Tellus Institute, investment in renewable energy and energy efficiency could create 37,000 jobs in Florida by 2010 and 66,800 jobs by 2020.39

**Renewable Energy and Energy Efficiency at Work**

In 1998, the Florida Solar Energy Center, Sandia National Laboratories and Lakeland Electric teamed up to conduct a photovoltaic demonstration project in Lakeland. The project constructed two homes side-by-side, one built to be energy efficient with solar electric and heating systems, the other to comply with standard state building codes. On the hottest day of the year, the efficient house used 70% less energy on air conditioning than the standard house. When solar electric power production is considered, the efficient house had a near zero net electric demand on the grid during peak hours. In addition, the control house emitted the equivalent of 122 pounds of global warming emissions per day, compared to zero emissions from the efficient house relying on solar power.40

Free hot water has come to more than 800 homes in Florida through the Solar Weatherization Assistance Program (SWAPS) program, which brings low-cost solar to low-income homes throughout the state. The Ahmadi family of Miami enjoys annual savings of 77% on its water heating costs by using the SWAPS solar system on sunny days, rather than traditional electricity.41

In 1992, Florida’s Metro-Dade County came together with Habitat for Humanity to build Jordan Commons, a model community of 200 energy efficient homes. The community is home to low-income Floridians left homeless by Hurricane Andrew. The community also has access to an educational program teaching residents how to save money and energy by managing consumption. Jordan Commons serves as a testing site for renewable energy technologies, including solar water heaters.

The Florida Solar Energy Center assisted the Florida Department of Corrections (DOC) in evaluating the status of the solar water heating systems installed at various Florida DOC Institutions. These systems had been installed many years ago in conjunction with the construction of the prison facilities. Upgrades to the first seven prisons, all in northeast Florida, will result in an annual savings of more than $1 million. Once all 58 prisons are completed, Florida taxpayers can expect to save $8 million every year.42

Florida’s Northwest Elementary School worked with the Florida Solar Energy Center to make its main building more energy-efficient. The school installed occupancy sensors, which function to turn lights off when the classroom is unoccupied for a set amount of time and turn them back on when movement is detected. With this simple step, the school cut its electricity usage by 10%, saving $1,694 annually in energy costs.
Georgia deserves a safe, clean, affordable energy future. To fully develop the clean energy potential available in the state, we need to encourage smart energy choices that will help our health, our environment and our economy.

Georgia’s Electricity Generation

Georgia is too dependent on dirty energy sources. In 2000, Georgia generated 95% of its energy from fossil fuels and nuclear and only 3% from renewable sources such as wind, solar and geothermal energy. The state relies on coal, the dirtiest of fossil fuels, for two-thirds of its generation, making Georgia one of the most coal-dependent states.

Georgia’s Renewable Energy Potential

Potential Energy from Wind, Clean Biomass and Landfill Gas

Georgia has considerable capacity to generate energy from renewable sources. In fact, Georgia could meet almost 20% of its electricity needs with clean biomass, wind and landfill gas alone, generating more than 23.4 billion kilowatt hours (kWh) of electricity—enough to power 2.3 million homes. This is almost enough energy to entirely displace nuclear power in Georgia.

Solar Energy Potential in Georgia

However, Georgia has solid solar potential, although the precise amount is difficult to quantify. According to the National Renewable Energy Laboratory, if Georgians installed only a football-field sized amount of solar panels on their rooftops, the state could harness 979,000 kilowatt-hours (KWh) of electricity, enough to power 98 homes. Similarly, if the state installed just one concentrated solar system covering approximately 200 acres, it could generate more than 34.2 million KWh of electricity, enough to power more than 3,433 homes.

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1 The Energy Information Administration calculations include municipal solid waste as a renewable energy source. U.S. PIRG and the State PIRGs do not consider municipal solid waste to be a clean form of biomass.

2 In order to quantify Georgia’s solar potential, we would have to make assumptions about cost and rooftop and other space available now and in the future for photovoltaics.
Renewable Energy Would Protect Georgia’s Environment, Create Jobs and Bolster the Economy

In addition to reducing the air pollution created by burning fossil fuels and radioactive waste from nuclear power plants, increasing electricity generation from renewable sources could boost Georgia’s economy. According to a report by the Tellus Institute, investment in renewable energy and energy efficiency could create 21,300 jobs in Georgia by 2010 and 38,300 jobs by 2020.46

Renewable Energy and Energy Efficiency at Work

The Piper Glen subdivision in Gwinnett County, Georgia, teamed up with a local utility to install a geothermal heating and cooling system. For Piper Glen residents, the system saves 40% on heating and 25% on cooling costs annually and will have paid for itself in less than six years. For the utility, this geothermal system helps reduce overall energy demand during peak times. The Piper Glen system serves 33 homes.

Project Harambee, a joint effort between CTSI, the U.S. EPA, the City of Atlanta Water Department, EarthBond, the Turner Foundation, the Southface Energy Institute and residents of the Brown Village Cluster of the Atlanta Project, is projected to save $200,000 for the residents of Atlanta’s Brown Village neighborhood. The project distributes energy-management kits to Brown Village’s mostly low-income residents and recruits local plumbers to install ultra-low-flush toilets. Other Atlanta neighborhoods plan to replicate these efforts, expanding to an additional 15,000 homes. The program already saves 80,000 pounds of atmospheric pollution annually.

The Aquatic Center at the Georgia Institute of Technology contains 2,856 solar modules on the roof of the building, which was constructed for the 1996 summer Olympic Games in Atlanta. A separate solar thermal system provides heat for the pool. For the seven-month period from July 1996 through January 1997, the system produced 162.2 megawatt hours of electricity. For a full year, researchers had predicted 409 megawatt hours, which is enough to power about 35 average Georgia homes.

The wind and the sun provide energy 60 miles from land at the US Navy’s Tactical Air Combat Training System (TACTS) range off the shore of Savannah, GA. Wind turbines and a solar array supply power to three platforms in the Atlantic Ocean, allowing for communication between the range and onshore computers in South Carolina. The platforms need to transmit flight data during training exercises, and the harsh conditions of the Atlantic make the wind-solar combination an ideal energy choice. The Navy plans to add wind turbines to other TACTS ranges in the U.S.

Georgia is home to more than 600,000 Good Cents Environmental Homes. To qualify under Good Cents, a home must meet criteria in six categories: energy efficiency, building materials, construction practices, water efficiency, building design, and ecological living. A typical home may include solar panels and wind power, appliance efficiency 10% above national standards, and a recharging station for electric cars. Potential buyers may lower their cost even further through local lenders’ Energy Efficient Mortgage programs.

The Southface Energy and Environmental Resource Center opened during the 1996 Summer Olympics in Atlanta, GA. The 6,300-square-foot building uses more than 100 different energy efficient and renewable technologies, which reduce energy use by approximately 61,000 kWh and prevent more than 91,948 pounds in global warming emissions every year. Some of the technologies employed include solar electric shingles, geothermal heat pumps and energy efficient lighting.
Illinois deserves a safe, clean, affordable energy future. To fully develop the clean energy potential available in the state, we need to encourage smart energy choices that will help our health, our environment and our economy.

Illinois’s Electricity Generation

Illinois is too dependent on dirty energy sources. In 2000, Illinois generated almost all of its electricity from fossil fuels and nuclear power and a mere .3% from renewable sources such as wind and solar. The state relies on coal, the dirtiest of fossil fuels, for almost half of its electricity generation. Illinois also is one of the most nuclear-dependent states—third only to New Hampshire and South Carolina—generating more than half of its electricity from six nuclear power plants.

Illinois’s Renewable Energy Potential

Potential Energy from Wind, Clean Biomass and Landfill Gas

Illinois has considerable capacity to generate energy from renewable sources. In fact, Illinois could generate 106 billion kilowatt hours (kWh) from wind alone, more than the electricity it currently generates from coal, oil and gas combined. Illinois’s total generation potential from wind, clean biomass and landfill gas is 154.7 billion kWh, or 88% of the state’s current generation from dirty energy. This is enough energy to power more than 15 million homes.

Solar Energy Potential in Illinois

In addition, Illinois has significant solar potential, although the precise amount is difficult to quantify. According to the National Renewable Energy Laboratory, if Illinois residents installed only a football-field sized amount of solar panels on their rooftops, the state could harness 927,000 kilowatt-hours (KWh) of electricity, enough to power 93 homes. Similarly, if the state installed just one concentrated solar system covering approximately 200 acres, it could generate more than 32.6 million KWh of electricity, enough to power 3,274 homes.

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The Energy Information Administration calculations include municipal solid waste as a renewable energy source. U.S. PIRG and the State PIRGs do not consider municipal solid waste to be a clean form of biomass.

In order to quantify Illinois’s solar potential, we would have to make assumptions about cost and rooftop and other space available now and in the future for photovoltaics.
Renewable Energy Would Protect Illinois’s Environment, Create Jobs and Bolster the Economy

In addition to reducing the air pollution created by burning fossil fuels and radioactive waste from nuclear power plants, increasing electricity generation from renewable sources could boost Illinois’s economy. According to a report by the Tellus Institute, investment in renewable energy and energy efficiency could create 31,900 jobs in Illinois by 2010 and 56,400 jobs by 2020. In addition, the Department of Energy estimates that for every dollar spent, energy efficiency generates $.84 more economic activity in local economies than buying oil and gas. In contrast, Chicago’s Center for Neighborhood Technology found that $.90 of every dollar spent on energy immediately left the local economy.

Spotlight on Illinois’s Renewable Portfolio Goal

On June 22, 2001, Illinois Governor George H. Ryan signed legislation (HB 1599) creating the Illinois Resource Development and Energy Security Act. The legislation states as an explicit goal that at least 5% of the state's energy production and use be derived from renewable forms of energy by 2010 and at least 15% by 2020. However, it does not include an implementation schedule, compliance verification, or credit trading provisions. HB 1599 also authorizes up to $500 million of new state revenue bonding to support the development of technologies for wind, biomass, and solar power in Illinois.

Renewable Energy and Energy Efficiency at Work

Chicago’s Mayor Daley has pledged to buy 20% of the electricity need for city buildings, streets and subways from renewable energy sources within five years. The City of Chicago and the 48 municipalities forming the Local Government Electric Power Alliance also have pledged to provide 20% of their electricity needs from renewable sources within five years. Chicago’s plan will avoid annual emissions of 250,000 tons of carbon dioxide and 1,000 tons of smog pollution every year. In the first year of the agreement, Commonwealth Edison will supply 10% of the city’s electricity needs from power plants fueled with methane recovered from landfills. Within five years, ComEd will add new renewable energy facilities, including wind and solar plants, to provide 20% of the group’s electrical needs -- a total of 80 megawatts, or enough to power 80,000 homes.

Illinois is home to two wind farms, both nearing completion. The Indiantown Wind Project is a state-of-the-art wind project in Bureau County, Illinois. This project has a nameplate capacity of 50 megawatts (MW) and will deliver 120 million kilowatt-hours of electricity to Illinois each year—enough to power 13,000 households. The second project, near Compton in Lee County, is being developed by Navitas Energy and could power 15,000 homes when completed. Some property owners, in most case farmers, leasing land to Illinois Wind Energy or Navitas Energy for their turbines could make more than $30,000 a year. Navitas Energy, during its negotiations with landowners, told them they would receive 3% of the electric revenue each year for each turbine on their property, with a minimum of $2,400 per turbine. One Compton farmer will have 16 turbines on his property. That’s a minimum of $38,400 a year for taking a small percentage of his land out of production.

The Chicago White Sox are teaming up with the Illinois Institute of Technology to tap into solar energy at Comiskey Park. Engineering students from IIT have installed a solar electric system outside the park, which will provide power to a White Sox billboard. The system will store electricity during the day to be used for night games.

The first Chicago public school to acquire a photovoltaic system was the Frank W. Reilly Elementary School. Over the first five years of this solar powered system, the Reilly school will offset 120,000 pounds of global warming pollution, the equivalent of driving a car 150,000 miles.

The Chicago Department of Environment is working closely with ComEd to help foot some of the bill for new solar projects, which includes several museums. The Peggy Notebaert Nature Museum was among the first to receive a photovoltaic system, which provides about 3% of the building’s energy. The Field Museum recently installed a similar system, which generates 49 kilowatts of energy. The combined solar energy output of these museums is equivalent to that used by 13-16 houses per year.
Indiana deserves a safe, clean, affordable energy future. To fully develop the clean energy potential available in the state, we need to encourage smart energy choices that will help our health, our environment and our economy.

### Indiana’s Electricity Generation

Indiana is too dependent on dirty energy sources. In 2000, Indiana generated more than 99% of its electricity from fossil fuels and only .1% from renewable sources such as wind, solar and geothermal energy. Indiana relies on coal, the dirtiest of fossil fuels, for almost 95% of its electricity generation—making Indiana one of the most coal-dependent states in the country.

### Indiana’s Renewable Energy Potential

#### Potential Energy from Clean Biomass and Landfill Gas

- **Clean Biomass**: 25,505 mill. kWh
- **Landfill Gas**: 1,274 mill. kWh
- **TOTAL**: 26,799 mill. kWh

Indiana has important capacity to generate energy from clean biomass and landfill gas. In fact, Indiana could generate almost 26.8 billion kilowatt-hours (kWh) from clean biomass and landfill gas alone—enough to power 2.7 million homes and supply 21% of the state’s energy needs. Unfortunately, Indiana does not have significant potential for developing wind power.

#### Solar Energy Potential in Indiana

Indiana also has significant solar potential, although the precise amount is difficult to quantify. According to the National Renewable Energy Laboratory, if Hoosiers installed only a football-field sized amount of solar panels on their rooftops, the state could harness more than 886,000 kilowatt-hours (KWh) of electricity, enough to power 89 homes. Similarly, if the state installed just one concentrated solar system covering approximately 200 acres, it could generate more than 31.8 million KWh of electricity, enough to power 3,194 homes.

### Renewable Energy Would Protect Indiana’s Environment, Create Jobs and Bolster the Economy

In addition to reducing the air pollution created by burning fossil fuels, increasing electricity generation from renewable sources could boost Indiana’s economy. According to a report by the Tellus

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"The Energy Information Administration calculations include municipal solid waste as a renewable energy source. U.S. PIRG and the State PIRGs do not consider municipal solid waste to be a clean form of biomass.

In order to quantify Indiana’s solar potential, we would have to make assumptions about cost and rooftop and other space available now and in the future for photovoltaics."
Institute, investment in renewable energy and energy efficiency could create 20,900 jobs in Indiana by 2010 and 36,000 jobs by 2020.62

Renewable Energy and Energy Efficiency at Work

Bethlehem Steel Corporation was able to reduce average monthly energy consumption by nearly 50% at its largest plant on the shores of Lake Michigan in Burns Harbor, Indiana. The energy efficiency technologies adopted at the Burns Harbor plant save the company $8 million per year. It is estimated that if the steel industry widely implemented these technologies, net annual savings would reach $198 million and more than 1.2 million tons of harmful emissions by 2005.

The DuPont Medical Center in Fort Wayne was constructed in two phases. For the second phase, officials decided to install a geothermal heating and cooling system, instead of merely duplicating the gas/electric units of Phase I. The new system now runs at half the operating cost of the older phase.

Visitors to Science Central in Fort Wayne, Indiana can log on to learn about energy generated from renewable sources. Twelve donated computers allow monitoring through a special website of the solar electric system at the front of the building. A small wind turbine visible from Science Central also is linked to the website. The museum’s interactive system allows visitors to compare the science and economics of energy in Fort Wayne and around the country.

Located 50 miles southeast of Chicago, Coffee Creek Center is a 640-acre new development located near the intersection of three major highways. The groundbreaking design of Coffee Creek Center is the result of a multi-year effort to create a unique, environmentally sensitive community incorporating the most advanced thinking in environmental design, urban planning and landscape ecology. Architects are designing buildings at Coffee Creek Center as an integral part of the natural environment, properly oriented to take advantage of solar energy for daylighting and energy production. Buildings will use advanced materials selected to enhance indoor environmental quality and minimize the draw-down of finite resources. The community will obtain its energy through innovative small scale, local energy systems and will incorporate renewable energy sources such as photovoltaics and wind power.63
Iowa deserves a safe, clean, affordable energy future. To fully develop the clean energy potential available in the state, we need to encourage smart energy choices that will help our health, our environment and our economy.

Iowa’s Electricity Generation

Iowa is too dependent on dirty energy sources. In 2000, Iowa generated 97% of its electricity from fossil fuels and nuclear power and only 1% from renewable sources such as wind and solar. Coal, the dirtiest of fossil fuels, accounted for 85% of the state’s energy mix.

Iowa’s Renewable Energy Potential

Potential Energy from Wind, Clean Biomass and Landfill Gas

Iowa has tremendous capacity to generate electricity from renewable sources. In fact, using wind power alone, Iowa could generate 21 times the electricity it currently generates from dirty energy sources. Iowa’s total generation potential from wind, clean biomass and landfill gas is 925 billion kilowatt hours (kWh)—enough to power 93 million homes.

Solar Energy Potential in Iowa

Iowa also has significant solar potential, although the precise amount is difficult to quantify. According to the National Renewable Energy Laboratory, if Iowans installed only a football-field sized amount of solar panels on their rooftops, the state could harness more than 944,000 kilowatt-hours (KWh) of electricity, enough to power 95 homes. Similarly, if the state installed just one concentrated solar system covering approximately 200 acres, it could generate more than 34 million KWh of electricity, enough to power 3,433 homes.

Renewable Energy Would Protect Iowa’s Environment, Create Jobs and Bolster the Economy

In addition to reducing the air pollution created by burning fossil fuels and radioactive waste from nuclear power plants, increasing electricity generation from renewable sources could boost Iowa’s economy. According to a report by the Tellus Institute, investment in renewable energy and energy efficiency could create 8,300 jobs in Iowa by 2010 and 14,700 jobs by 2020.

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In order to quantify Iowa’s solar potential, we would have to make assumptions about cost and rooftop and other space available now and in the future for photovoltaics.
Spotlight on Iowa’s Alternative Energy Law

Enacted in 1991, this law requires investor-owned utilities to purchase a combined total of 105 MW of their generation from renewable and small hydropower sources, which translates to 2% of Iowa’s electricity by 2011. The Iowa Utilities Board has divided the requirement among the state’s three investor-owned utilities -- Mid-American, IES Utilities (now Alliant Energy), and Interstate Power -- based upon each utility’s percentage of sales during high demand periods. These utilities are meeting this requirement mostly with wind power and biomass applications.68

Renewable Energy and Energy Efficiency at Work

Iowa is now one of the leading states for wind power, with 350 high-tech wind turbines producing enough power for close to 100,000 homes. Iowa’s wind power reduces acid rain and smog emissions by 5.4 million pounds per year each and global warming emissions by 1.3 billion pounds per year.69

Of the more than 350 wind turbines in Iowa, 55 are located at the Cerro Gordo Wind Farm near Ventura. The farm, operated by FPL Energy, generates enough electricity to meet the needs of more than 11,000 typical Iowa customers. The wind power currently in use throughout Iowa displaces enough coal to fill a train 36 miles long, saving the state $6.2 million annually in fossil fuel imports.

Wind farms near Clear Lake and Storm Lake pay rent to 115 land owners to site their wind turbines. They pay about $2000 per turbine, for a total of $640,000 per year. They also pay $2 million per year in taxes to counties, money that is used for schools, roads and health care. It took 200 people six months to build the wind farms. About 40 people work there now.

The Spirit Lake School District received a lot of attention in July 1993 when it became only the second school district in the nation to own a wind turbine. The turbine produces 324,000 kW of electricity annually, which amounts to $24,900. The elementary school, however, uses only $20,000 worth of electricity. The district sells its excess electricity to the utility company. The turbine cost $238,000 to install. With help from DOE and the $25,000 yearly savings, the turbine will pay for itself in less than five years. After that, the district can redirect the savings into education. In addition, using wind instead of coal in the school replaces 225 tons of coal and prevents 750,000 pounds of global warming emissions from polluting the air every year.70

On August 10, 1995, the Nevada Community School District started up its second wind generator, becoming the first district in the state to have two wind turbines. The first turbine, a 250-kW generator installed in December 1993, immediately started saving the district $500 a week in electricity costs. With a second, 200-kW generator, the district now produces 477,688 kW-hours worth of electricity per year for its middle school and high school. That amounts to $36,100 worth of electricity produced by the two wind turbines. On top of the money being saved in electricity costs, the district has increased its budget further by selling its excess electricity to the local utility company. Since the first turbine began operation, the schools have produced an excess of 117,200 kilowatt-hours of electricity, mainly from days when the buildings are not being used. Nevada Community School District sold this excess electricity for $7,056.71

The Chariton Valley Resource Conservation Development (RC&D) agency is developing a proposed switchgrass-to-energy initiative. Chariton Valley received research funding from the National Renewable Energy Laboratory for a feasibility study to evaluate both feedstock and conversion aspects of using dedicated energy crops. According to the 1994 Iowa Biomass Energy Plan, Iowa has the potential to grow enough switchgrass to provide electricity to 1.9 million homes.72

The town of Osage, Iowa has reduced natural gas consumption by 45% in the last three decades as a result of its Demand-Side Management program. Osage Municipal Utilities (OMU) began the program in 1974 with infrared detection of homes and businesses. The infrared scans determine where heat is escaping, and OMU customers receive rebates and incentives for insulating buildings and water heaters. The program not only results in $1.2 million in energy savings each year, but has prevented the construction of a new coal power plant.
Louisiana deserves a safe, clean, affordable energy future. To fully develop the clean energy potential available in the state, we need to encourage smart energy choices that will help our health, our environment and our economy.

Louisiana’s Electricity Generation

Louisiana is too dependent on dirty energy sources. In 2000, Louisiana generated 95% of its electricity from fossil fuels and nuclear power and 4% from renewable sources such as wind and solar. The state depends on coal, the dirtiest of fossil fuels, for more than a quarter of its electricity needs.

Louisiana’s Renewable Energy Potential

Potential Energy from Clean Biomass and Landfill Gas

Louisiana has tremendous capacity to generate energy from clean biomass and landfill gas. In fact, Louisiana could displace its nuclear power plants using just these renewable resources; alternatively, clean biomass and landfill gas could displace almost three-fourths of the coal-generated electricity in the state. Louisiana’s total generation potential from clean biomass and landfill gas is 16.7 billion kilowatt hours (kWh)—enough to power 1.7 million homes. Unfortunately, Louisiana does not have any significant capacity for wind power generation.

Solar Energy Potential in Louisiana

Louisiana also has significant solar potential, although the precise amount is difficult to quantify. According to the National Renewable Energy Laboratory, if Louisianans installed only a football-field sized amount of solar panels on their rooftops, the state could harness more than 945,000 kilowatt-hours (KWh) of electricity, enough to power 95 homes. Similarly, if the state installed just one concentrated solar system covering approximately 200 acres, it could generate more than 33.4 million KWh of electricity, enough to power 3,353 homes.

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The Energy Information Administration calculations include municipal solid waste as a renewable energy source. U.S. PIRG and the State PIRGs do not consider municipal solid waste to be a clean form of biomass.

In order to quantify Louisiana’s solar potential, we would have to make assumptions about cost and rooftop and other space available now and in the future for photovoltaics.
Renewable Energy Would Protect Louisiana’s Environment, Create Jobs and Bolster the Economy
In addition to reducing the air pollution created by burning fossil fuels and radioactive waste from nuclear power plants, increasing electricity generation from renewable sources could boost Louisiana’s economy. According to a report by the Tellus Institute, investment in renewable energy and energy efficiency could create 19,200 jobs in Louisiana by 2010 and 32,900 jobs by 2020.76

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<tr>
<th>Renewable Energy and Energy Efficiency at Work</th>
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<tbody>
<tr>
<td>&quot;Watts On Schools&quot; is American Electric Power’s way of bringing solar power to schools in communities throughout Texas, Arkansas and Louisiana. Through Watts On Schools, AEP has installed 19 solar energy systems totaling 76 kW at public elementary, middle, and high schools located within the service areas of three of its electric utility operating companies. Each system is capable of producing enough energy each month to power a typical Texas home. Participating schools receive the energy produced by the systems for free, lowering the schools’ electric bills every month. North DeSoto Middle School in Stonewall, Louisiana began generating its own solar power from a photovoltaic solar system on March 24, 2000.77</td>
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<tr>
<td>The home of Ray and Dottie Mosher, located near New Roads, Louisiana, features a unique geothermal heat exchange system—its pipe loops are submerged in the adjacent False River. This design saved Mosher $2,000 in installation costs. The home uses half as much energy for heating and cooling as a conventional Louisiana home.</td>
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<tr>
<td>Five Louisiana universities offer an elective course in energy auditing. As part of the state’s “Creating Energy Smart Schools in Louisiana” initiative, students enrolled in this course use software to assess energy usage at local public schools and offer suggestions for improvement. The program has performed audits on more than 100 buildings, reducing energy consumption by 20 to 25% and saving more than $1 million.</td>
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<tr>
<td>Beaird Industries in Shreveport, Louisiana received a contract from FPL Energy to fabricate 800 wind towers for its West Texas wind farms by November 2001 for a total price of $55 million. This contract required Beaird to expand its workforce by nearly 200 people, primarily skilled welders. This contract demonstrates the underlying economic potential of clean energy.78</td>
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Maine deserves a safe, clean, affordable energy future. To fully develop the clean energy potential available in the state, we need to encourage smart energy choices that will help our health, our environment and our economy.

Maine’s Electricity Generation

Maine generates more electricity from renewable sources than any other state—29% in 2000. However, Maine still derives 42% of its energy from fossil fuels and 29% from hydroelectric power, which is less polluting than fossil fuels but causes its own set of environmental problems that could be avoided with increased generation from renewable energy sources.

Maine’s Renewable Energy Potential

Potential Energy from Wind and Clean Biomass

Maine has tremendous capacity to generate energy from wind and clean biomass. In fact, Maine could generate 33% more electricity from wind and clean biomass than it currently does from dirty energy sources. Maine’s total potential for electricity generation from these renewable sources is 12.5 billion kilowatt hours (kWh)—enough to power 1.2 million homes.

Solar Energy Potential in Maine

Maine also has significant solar potential, although the precise amount is difficult to quantify. According to the National Renewable Energy Laboratory, if Maine residents installed only a football-field sized amount of solar panels on their rooftops, the state could harness more than 921,000 kilowatt-hours (KWh) of electricity, enough to power 92 homes. Similarly, if the state installed just one concentrated solar system covering approximately 200 acres, it could generate more than 31 million KWh of electricity, enough to power 3,114 homes.

Renewable Energy Would Protect Maine’s Environment, Create Jobs and Bolster the Economy

In addition to reducing the air pollution created by burning fossil fuels, increasing electricity generation from renewable sources could boost Maine’s economy. According to a report by the Tellus Institute, investment in renewable energy and energy efficiency could create 3,700 jobs in Maine by 2010 and 6,600 jobs by 2020.

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*s The Energy Information Administration calculations include municipal solid waste as a renewable energy source. U.S. PIRG and the State PIRGs do not consider municipal solid waste to be a clean form of biomass.

† In order to quantify Maine’s solar potential, we would have to make assumptions about cost and rooftop and other space available now and in the future for photovoltaics.
Spotlight on Maine's Renewable Energy Standard

The State of Maine Public Utility Commission adopted a Renewable Resource Portfolio Requirement rule on September 28, 1999, which became effective November 4, 1999. The rule requires electric providers to supply at least 30% of their total retail electric sales in Maine with electricity from eligible renewable resources. Eligible resources must be a “small power production facility” that produces electricity using only a primary energy source of biomass, waste, renewable resources, or a combination of these resources and has a production capacity of 80 megawatts or less including any other facilities at the same site. A renewable resource also may be a generation facility of 100 MW or less that uses fuel cells, tidal power, solar arrays and installations, wind power installations, geothermal installations, hydroelectric generators, biomass generators, or generators fueled by municipal solid waste in conjunction with recycling. In addition to renewables, the portfolio standard can be met with “efficient resources,” specifically, qualified cogeneration facilities.

Electric providers that fail to comply with the 30% renewable portfolio standard are subject to penalties including license revocation, an optional payment into a renewable resource research and development fund, or other monetary penalties determined by the Maine Commission. Interestingly, Maine allows electric providers to meet the renewable portfolio standard through averages over a period of two or more years. That is, a provider that does not satisfy the renewable portfolio standard during a certain annual period but meets at least 20% of the renewable portfolio standard may make up for it over the next annual period—as long as the 30% renewable portfolio standard is met.

Maine presents an interesting case. When Maine implemented its renewable portfolio standard, the state already had the highest percentage of renewables use in the country—at 50% of total capacity, according to Maine’s calculations (which include hydroelectric power as “renewable.”) Thus, while Maine’s renewable portfolio standard is the highest in the country, the percentage is in fact lower than the existing level of renewables use, as defined by the state of Maine. 

Renewable Energy and Energy Efficiency at Work

Maine’s first wind farm, being developed by Endless Energy Corporation (EEC), will produce clean, renewable electric power from 29 modern wind turbines and generate about 200 million kilowatt hours a year, enough to power 33,000 Maine homes. The project will be constructed on the Redington Pond Range and Black Nubble mountains, approximately four miles west of Sugarloaf Mountain ski area and eight miles south of Stratton, Maine. The Redington project will prevent more than 630,000 pounds of pollution per day compared to existing fossil fuel produced electricity in New England. The company predicts that the project will benefit the Carrabasset Valley region by contributing taxes, creating jobs, and providing an ecotourism attraction.

A blueberry factory operated by G.M. Allen & Sons took advantage of Maine’s net metering program to install a wind turbine in late 2000. The turbine is capable of producing 80,000 kWh annually, enough energy for 12 homes. During the off season, when it produces more energy than the factory can use, Allen receives credit for the excess, which can be applied during the busy August harvest season. The turbine is expected to help power the blueberry factory for 30 years.

The two-story custom home of Bob Lord on Maine’s coastline is a model of energy efficiency, featuring modern building materials and insulation as well as efficient lighting and appliances. Not only does the home require just 40% of the energy used by similar-sized New England homes, Lord’s solar energy system produces more electricity than the building uses. An additional solar thermal unit provides space heating and hot water for the home.

Monhegan Island Plantation is installing a photovoltaic (PV) hybrid system, which will include a photovoltaic grid system and net metering. The island also has started educational workshops for both the island community and off-island interested parties. Monhegan’s overall goal is to establish a 30 kW photovoltaic interconnected grid system with a central battery bank as part of a solar hybrid power source serving the whole island.
Michigan deserves a safe, clean, affordable energy future. To fully develop the clean energy potential available in the state, we need to encourage smart energy choices that will help our health, our environment and our economy.

**Michigan’s Electricity Generation**

Michigan is too dependent on dirty energy\(^u\) sources. In 2000, Michigan generated 97% of its energy from fossil fuels and nuclear and only 2% from renewable sources such as wind and solar.\(^u\) Coal, the dirtiest of fossil fuels, accounted for two-thirds of Michigan’s energy mix, making it one of the most coal-dependent states in the country.\(^v\)

**Michigan’s Renewable Energy Potential**

**Potential Energy from Wind, Clean Biomass and Landfill Gas**

Michigan has tremendous capacity to generate electricity from renewable sources. In fact, Michigan could displace 89% of its current electricity generation from dirty sources with energy generated by wind power, clean biomass and landfill gas. Michigan’s total generation potential from these renewable sources is 91 billion kilowatt hours (kWh)—enough to power more than 9.1 million homes.\(^u\)

**Solar Energy Potential in Michigan**

Michigan also has important solar potential, although the precise amount is difficult to quantify.\(^v\) According to the National Renewable Energy Laboratory, if Michigan residents installed only a football-field sized amount of solar panels on their rooftops, the state could harness more than 836,000 kilowatt-hours (kWh) of electricity, enough to power 84 homes.

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\(^u\) The Energy Information Administration calculations include municipal solid waste as a renewable energy source. U.S. PIRG and the State PIRGs do not consider municipal solid waste to be a clean form of biomass.

\(^v\) In order to quantify Michigan’s solar potential, we would have to make assumptions about cost and rooftop and other space available now and in the future for photovoltaics.
Renewable Energy Would Protect Michigan’s Environment, Create Jobs and Bolster the Economy

In addition to reducing the air pollution created by burning fossil fuels and radioactive waste from nuclear power plants, increasing electricity generation from renewable sources could boost Michigan’s economy. According to a report by the Tellus Institute, investment in renewable energy and energy efficiency could create 29,800 jobs in Michigan by 2010 and 51,000 jobs by 2020.87

Renewable Energy and Energy Efficiency at Work

Customers are on a waiting list to buy renewable energy in Traverse City, Michigan. The state’s first wind turbine was also the largest in the continental U.S. when it was installed in 1996. A federal incentive program allows Traverse City Light & Power to provide wind energy at a cost comparable to purchasing wholesale electricity. The turbine generates enough energy to power about 200 local homes.

Consumer Energy customers in Michigan can now buy 10, 50 or even 100% of their electricity from clean energy, thanks to two new wind turbines operating near Mackinaw City. The turbines provide enough energy for about 600 homes. Subscribers in Consumer Energy’s Green Power program had paid extra to purchase three quarters of the wind-produced electricity even before the turbines began operating in December 2001. The company estimates it will need to expand its green power program to meet rising demand.

Detroit Edison launched its SolarCurrents program on Earth Day in 1996 with the opening of a solar electric power plant outside Ann Arbor. The utility expanded the program in 1997 with a second photovoltaic facility in Southfield and a new phase, called SolarSchools, to benefit schools in its service area. Commercial customers pay for new solar generation through SolarCurrents, and credit for the power goes to local schools. Under SolarSchools, six commercial customers will help Detroit Edison promote solar energy by becoming partners with 10 southeastern Michigan school districts. Each participating school receives credit towards its electric bill for 2,000 kilowatt-hours of electricity annually from the Southfield solar electric facility. Detroit Edison also has developed a two-week curriculum on solar and renewable energy for grades four through six as part of the SolarSchools program.88

Families across Michigan are turning to renewable energy to save money. Jim and Sandra Schmidt began saving nearly $4,000 per year when they switched from electric to geothermal heating and cooling. Their four-bedroom home in Oakland was fifteen years old when it was retrofitted for renewable energy. The geothermal system replaced costly electric heat and a large, unsightly air conditioner. By saving money on their monthly energy bill, the Schmidts recovered the cost of the system in just two and a half years. Pam and Joe Anderson of Metamora have been building geothermal homes in Michigan, as many as 15 a year, since 1988. Five years ago, they finally built one for themselves. Geothermal heat pumps provide heating and cooling to the home’s two separate temperature zones. By combining geothermal energy with efficient building materials and insulation, the Andersons have brought their heating, cooling, and hot water costs down to about $1,200 per year—about what it cost to heat their old house with propane, although the new home is twice as large.89
Montana deserves a safe, clean, affordable energy future. To fully develop the clean energy potential available in the state, we need to encourage smart energy choices that will help our health, our environment and our economy.

Montana’s Electricity Generation

Montana is too dependent on dirty energy sources and hydroelectric power. In 2000, Montana generated 58% of its electricity from fossil fuels and 0.2% from renewable sources such as wind and solar.\textsuperscript{w} Although hydroelectric power, which accounted for 42% of the state’s total energy mix, is less polluting than fossil fuels, it causes its own set of environmental problems that could be avoided by turning to renewable energy.\textsuperscript{91}

Montana’s Renewable Energy Potential

Potential Energy from Wind, Clean Biomass and Landfill Gas

Montana has tremendous capacity to generate energy from renewable sources. In fact, Montana could generate 36 times more electricity from wind, clean biomass and landfill gas than it currently generates from dirty energy sources. Montana’s total generation potential from these renewable sources is more than 1 trillion kilowatt hours (kWh)—enough to power 105 million homes.\textsuperscript{92}

Solar Energy Potential in Montana

Montana also has significant solar potential, although the precise amount is difficult to quantify.\textsuperscript{x} According to the National Renewable Energy Laboratory, if Montana residents installed only a football-field sized amount of solar panels on their rooftops, the state could harness more than 976,000 kilowatt-hours (KWh) of electricity, enough to power 98 homes. Similarly, if the state installed just one concentrated solar system covering approximately 200 acres, it could generate more than 38 million KWh of electricity, enough to power 3,832 homes.

\textsuperscript{w} The Energy Information Administration calculations include municipal solid waste as a renewable energy source. U.S. PIRG and the State PIRGs do not consider municipal solid waste to be a clean form of biomass.

\textsuperscript{x} In order to quantify Montana’s solar potential, we would have to make assumptions about cost and rooftop and other space available now and in the future for photovoltaics.
Renewable Energy Would Protect Montana’s Environment, Create Jobs and Bolster the Economy
In addition to reducing the air pollution created by burning fossil fuels, increasing electricity generation from renewable sources could boost Montana’s economy. According to a report by the Tellus Institute, investment in renewable energy and energy efficiency could create 2,300 jobs in Montana by 2010 and 4,000 jobs by 2020.93

Renewable Energy and Energy Efficiency at Work

The nation’s first wind farm on tribal land is being constructed on the Blackfeet reservation in Glacier County, Montana. The project will generate between 36 and 66 megawatts of wind energy and could power up to 22,000 homes. When completed, Blackfeet will be the largest wind facility in Montana. Additionally, a demonstration turbine will be installed at nearby Blackfeet Community College, which teaches courses focused on wind energy.

The State General Services Division has installed a photovoltaic power system atop the Boiler Plant Building just east of the State Capitol. The output from the array replaces distributed electricity to the Capitol Building and serves as a visible example of the viability of today's renewable energy technologies. Estimated annual output of the system is 3,679 KWh. It is expected to have a useful life of 20-plus years and should require little maintenance other than periodic cleaning of the array and tightening of electrical connections. Estimated electric cost savings from the project are $343 per year.

Two ranches are taking advantage of solar energy in Montana’s Painted Robe Creek watershed. Each more than a mile from the utility grid, the two solar electric systems supply the energy needed to pump water into drinking tanks for cattle. The virtually maintenance-free systems replaced gasoline-powered generators, which required almost daily attention.

Twelve schools in Montana each received 2-kW solar electric systems through the Sun4Schools program. Geyser High School and Butte East Middle School are among the participants. Monitoring systems at each school collect data on energy output as well as demand and feed it to an Internet site so that students can compare figures from all twelve schools. Sun4Schools plans to add five additional systems in the next year.

Learning, spirit and renewable energy have merged on the Northern Cheyenne Reservation near Busby in south central Montana. The Learning and Spirit Lodge, built by the Sisters of St. Francis and the Northern Cheyenne Reservation community, gets its electricity from a wind turbine and solar electricity panels. It also features an on-demand tankless water heater, passive solar design, cellulose insulation and efficient fluorescent lighting. The system satisfies the electrical power needs of the large gathering room, offices, bedrooms, and two bathrooms.94

Miles from the nearest utility power lines, Jim Tomlinson has installed solar electric panels for his cattle in a remote area near Gold Creek, Montana replacing a gasoline-powered generator. The solar unit provides power to the irrigation system that brings water to Tomlinson’s cattle. Tomlinson also uses solar-powered electric fencing to control cattle movement, as part of an intensive grazing strategy. Solar energy saves time and work for Jim, who previously had to trek 90 miles round trip to refuel the generator. An unexpected benefit is that he has been able to continue pumping and watering his cattle as usual during the summer of 2000, despite the drought in Montana. Because of the severely dry conditions and extreme fire danger, he would not have been allowed to run a gasoline-powered generator in the forest that summer.95
Nevada deserves a safe, clean, affordable energy future. To fully develop the clean energy potential available in the state, we need to encourage smart energy choices that will help our health, our environment and our economy.

**Nevada’s Electricity Generation**

Nevada is too dependent on dirty energy sources. In 2000, Nevada generated 89% of its electricity from fossil fuels and 4% from renewable sources such as wind and solar. Coal, the dirtiest of fossil fuels, accounted for more than half of Nevada’s energy mix—making it one of the most coal-dependent states in the country. Hydroelectric power, which is less polluting than fossil fuels but causes its own set of environmental problems, accounted for 7% of the state’s total.

**Nevada’s Renewable Energy Potential**

**Potential Energy from Wind, Geothermal, Clean Biomass and Landfill Gas**

Nevada has tremendous capacity to generate energy from renewable sources. In fact, Nevada could generate 37% more electricity from wind, geothermal, clean biomass and landfill gas than it currently does from dirty energy sources. Nevada’s total generation potential from these renewable sources is 47 billion kilowatt hours (kWh)—enough to power 4.7 million homes.

**Solar Energy Potential in Nevada**

Nevada also has some of the best solar potential, although the precise amount is difficult to quantify. According to the National Renewable Energy Laboratory, a patch of 100 square miles of open space in Nevada covered with efficient solar panels could generate all the electrical power needs of the United States. If Nevadans installed only a football-field sized amount of solar panels on their rooftops, the state could harness more than 1.2 million kilowatt-hours (kWh) of electricity, enough to power 122 homes. Similarly, if the state installed just one concentrated solar system covering approximately 200 acres, it could generate more than 67 million kWh of electricity, enough to power 6,762 homes.

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96 The Energy Information Administration calculations include municipal solid waste as a renewable energy source. U.S. PIRG and the State PIRGs do not consider municipal solid waste to be a clean form of biomass.

97 In order to quantify Nevada’s solar potential, we would have to make assumptions about cost and rooftop and other space available now and in the future for photovoltaics.
Renewable Energy Would Protect Nevada's Environment, Create Jobs and Bolster the Economy
In addition to reducing the air pollution created by burning fossil fuels, increasing electricity generation from renewable sources could boost Nevada's economy. According to a report by the Tellus Institute, investment in renewable energy and energy efficiency could create 5,300 jobs in Nevada by 2010 and 9,100 jobs by 2020.100

Spotlight on Nevada's Renewable Energy Standard
As part of its 1997 restructuring legislation, the Nevada legislature established a renewable portfolio standard. In 2001, the legislature revised the minimum amount of generation from renewable energy to increase by 2% every two years, starting with a 5% renewable energy requirement in 2003 and achieving a 15% requirement by 2013 and each year thereafter. Not less than 5% of the renewable energy must be generated from solar renewable energy systems. Besides solar, qualifying renewable energy resources include wind, geothermal, and biomass that occurs naturally or that is regenerated.101

Renewable Energy and Energy Efficiency at Work
Nevada has more than a dozen geothermal heat plants operating in the state. According to the Department of Energy, Nevada's geothermal power plants produce more than 200 megawatts of electricity, saving energy imports equivalent to 800,000 tons of coal or three million barrels of oil each year. Nevada uses more geothermal energy per capita than anywhere else in the country. Property and county taxes collected from geothermal energy also are an important source of revenue for Nevada's local and state governments.

The Elko Heat Company's massive geothermal heat exchange system serves 17 local businesses in Elko, NV. In addition to saving customers 70% on their energy bills, compared to the cost of conventional fuel, the system generates $110,000 in revenue each year for Elko Heat. Some of the water heated in the geothermal system is later softened for use by a commercial laundry.

Patagonia, Inc. has taken advantage of the more than 300 sunny days per year at its Reno service center. In June 1999, Patagonia unveiled the first solar energy system in Nevada under the Million Solar Roofs Initiative. As one element of its overall environmental program, the company has installed 16 solar panels on the south face of the facility. Coupled with energy-efficient heating and cooling systems and insulation, the company saves 30-35% on its energy bills. In addition, the solar system eliminates approximately 10,000 pounds of carbon dioxide emissions, 11,400 grams of soot emissions, and 15,500 grams of smog per year.102

A hilltop location makes wind power a sensible choice for Renegade Radio. This Christian FM radio station, broadcast from a hilltop site east of Reno is powered almost entirely by a 7.5 kW turbine. The radio station meets its remaining energy needs with a solar electric system. The station has been using this combination of renewable energy sources since May 1996.
New Hampshire deserves a safe, clean, affordable energy future. To fully develop the clean energy potential available in the state, we need to encourage smart energy choices that will help our health, our environment and our economy.

**New Hampshire’s Electricity Generation**

New Hampshire is too dependent on dirty energy sources. In 2000, New Hampshire generated 83% of its electricity from fossil fuels and nuclear power and 8% from renewable sources such as wind and solar. Nuclear power, which produces the most hazardous waste known to science, accounted for more than half of the state’s energy mix—making New Hampshire one of the most nuclear-dependent states in the country. Hydroelectric power, which is less polluting than fossil fuels but causes its own set of environmental problems, accounted for 9% of the state's total.

**New Hampshire’s Renewable Energy Potential**

**Potential Energy from Wind, Clean Biomass and Landfill Gas**

New Hampshire has tremendous capacity to generate energy from renewable sources. In fact, New Hampshire could displace more than three-fourths of the electricity generated by dirty energy with electricity generated by wind, clean biomass and landfill gas. New Hampshire’s total generation potential from these renewable sources is 10.5 billion kilowatt hours (kWh)—enough to power more than 1 million homes.

**Solar Energy Potential in New Hampshire**

New Hampshire also has important solar potential, although the precise amount is difficult to quantify. According to the National Renewable Energy Laboratory, if New Hampshire residents installed only a football-field sized amount of solar panels on their rooftops, the state could harness

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*aa* The Energy Information Administration calculations include municipal solid waste as a renewable energy source. U.S. PIRG and the State PIRGs do not consider municipal solid waste to be a clean form of biomass.

*bb* In order to quantify New Hampshire’s solar potential, we would have to make assumptions about cost and rooftop and other space available now and in the future for photovoltaics.
892,000 kilowatt-hours (KWh) of electricity, enough to power 89 homes. Similarly, if the state installed just one concentrated solar system covering approximately 200 acres, it could generate more than 30 million KWh of electricity, enough to power 3,034 homes.

**Renewable Energy Would Protect New Hampshire’s Environment, Create Jobs and Bolster the Local Economy**

In addition to reducing the air pollution created by burning fossil fuels and radioactive waste from nuclear power plants, increasing electricity generation from renewable sources could boost New Hampshire’s economy. According to a report by the Tellus Institute, investment in renewable energy and energy efficiency could create 2,800 jobs in New Hampshire by 2010 and 5,000 jobs by 2020.106

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**Renewable Energy and Energy Efficiency at Work**

Three New Hampshire post offices were designees of the Federal Energy Management Program’s “Energy Saver Showcase.” By upgrading to efficient lighting, each office realized an energy savings of 40%. Future installations will include setback thermometers and hot water heater timers. A total of 111 New Hampshire post offices have used these ideas to achieve greater energy efficiency.

Seventeen schools benefit from the sun’s energy as part of New Hampshire’s Solar on Schools program, which funds installation of solar electric panels on school roofs. Each school then receives monitoring tools to connect with the school’s computers, as well as readings and interactive software. Installed in 1999, the solar system at Hopkinton High saves the school more than $300 a year.

Since 1995, Public Service of New Hampshire has been providing an incentive for its customers to install geothermal heat systems and meet strict energy efficiency requirements. Customers receive incentives when building a new home of up to $7,500. To be eligible, homes must have an energy-efficiency rating higher than the Energy Star home program. This level of efficiency saves homeowners 50% on heating, hot water, and air conditioning costs.

Hanover, New Hampshire is home to the "Hanover House," a model of energy efficiency built in 1994. Solar space heating and super-insulation compliment the building’s efficient lights, appliances and high-performance windows and doors. Energy consumption at Hanover House is lower than almost any other home in the nation. The American Institute of Architects selected this home as one of its Earth Day 2000 "Top Ten" environmentally conscious building designs.

On November 12, 1998, a solar electric (photovoltaic) system was installed on the roof of the New Hampshire Technical Institute’s (NHTI) administration building in Concord. NHTI students, under the direction of Professor Tom Hopper, designed the photovoltaic system. The two kilowatt system is expected to produce 2,800 kilowatt hours of electricity a year and reduce global warming emissions by more than 86,000 pounds over its 30-year life.
New Mexico deserves a safe, clean, affordable energy future. To fully develop the clean energy potential available in the state, we need to encourage smart energy choices that will help our health, our environment and our economy.

New Mexico’s Electricity Generation

New Mexico is too dependent on dirty energy sources. In 2000, New Mexico generated 99% of its electricity from fossil fuels and only none from renewable sources such as wind and solar. Coal, the dirtiest of fossil fuels, accounted for 85% of New Mexico’s energy mix, making it one of the most coal-dependent states in the country despite its vast renewable resource potential.

New Mexico’s Renewable Energy Potential

Potential Energy from Wind, Geothermal, Clean Biomass and Landfill Gas
New Mexico has tremendous capacity to generate electricity from renewable sources. In fact, New Mexico could generate nine times the electricity currently generated from dirty energy using wind, geothermal, clean biomass and landfill gas resources. New Mexico’s total potential from these renewable sources is 305 billion kilowatt hours (kWh)—enough to power more than 30 million homes.

Solar Energy Potential in New Mexico
New Mexico also has some of the country’s best solar potential, although the precise amount is difficult to quantify. According to a recent study done by Princeton University, solar panels on 20% of New Mexico’s landmass could displace all the coal, oil and gas the entire United States uses each year. The National Renewable Energy Laboratory estimates that if New Mexicans installed only a football-field sized amount of solar panels on their rooftops, the state could harness 1.2 million kilowatt-hours (kWh) of electricity, enough to power 122 homes. Similarly, if the state installed just one concentrated solar system covering approximately 200 acres, it could generate more than 60 million kWh of electricity, enough to power 6,086 homes.

In order to quantify New Mexico’s solar potential, we would have to make assumptions about cost and rooftop and other space available now and in the future for photovoltaics.
Renewable Energy Would Protect New Mexico’s Environment, Create Jobs and Bolster the Economy
In addition to reducing the air pollution created by burning fossil fuels, increasing electricity generation from renewable sources could boost New Mexico’s economy. According to a report by the Tellus Institute, investment in renewable energy and energy efficiency could create 4,200 jobs in New Mexico by 2010 and 7,100 jobs by 2020.110

Spotlight on New Mexico’s Renewable Energy Standard
As part of New Mexico’s “Electric Utility Industry Restructuring Act of 1999” the legislature required the Public Regulation Commission (PRC) to look at establishing a renewable portfolio standard for the state. In May 2000, the PRC issued an order calling for retail electric suppliers to meet 5% of their standard offer service with renewables. Eligible renewables must come from New Mexico and include wind, solar, geothermal, biomass, hydropower and fuel cells. The Land and Water Fund of the Rockies estimates that the renewable portfolio standard will create 60 to 120 MW of new renewable energy for New Mexico. However, the PRC also ruled that compliance with the renewable portfolio standard is waived if the renewable portfolio standard would result in the cost of electricity increasing more than $0.001 per kWh. In the same order, the PRC required utilities to offer an optional green power tariff for standard offer customers who are willing to pay more for renewable energy.111

Renewable Energy and Energy Efficiency at Work
Xcel Energy’s Windsource program sells wind power in 100 kilowatt-hour blocks, allowing customers to decide how much they use. Since it was first introduced in 1997, Windsource has grown to be the country’s largest customer-driven wind program. Wind power for Windsource customers in New Mexico comes from a 660-kilovolt turbine located at the Llano Estacado Wind Ranch at Texico, New Mexico, near the Texas/New Mexico state line. Xcel Energy’s Windsource program in New Mexico offers the first commercially available energy from wind generation in the state.112

In 1999, Southwestern Public Service Co. installed a 700 kW wind turbine on Llano Estacado Wind Ranch and began offering its customers green power. The turbine produces enough energy to allow 1,540 customers to purchase 100 kW blocks.113

Ongoing renovations at Ironstone Gardens in Santa Fe, New Mexico, are incorporating passive solar heating, heavy insulation, and other structural improvements to increase energy efficiency. The commercial development includes seven live-in artist studios. Excess heat from two glassblowing furnaces will be used to keep the rest of the studios warm in the winter. Through energy-conscious building techniques, Ironstone Gardens will save 25% in heating costs and 50% on cooling.

The Indian Pueblo Cultural Center in Albuquerque installed a solar photovoltaic system on the carport adjacent to the Cultural Center’s main building. When the system produces more energy than the building uses, the Center’s electric meters run backwards, resulting in a net savings of more than $3,400 per year. Each year, the photovoltaic system reduces greenhouse gas emissions by more than 27 tons, soot emissions by more than 347 pounds, and smog emissions by more than 200 pounds. The solar carport also has some unique features. The Center designed the carport with a center panel to provide additional shading to the cars parked underneath while trapping the blocked sunlight. The carport’s center panel is inscribed with the Pueblo of Zia tribal sun symbol to add artistic value to the photovoltaic system.114
North Dakota deserves a safe, clean, affordable energy future. To fully develop the clean energy potential available in the state, we need to encourage smart energy choices that will help our health, our environment and our economy.

**North Dakota’s Electricity Generation**

North Dakota is too dependent on dirty energy sources. In 2000, North Dakota generated 93% of its electricity from fossil fuels and 0.02% from renewable sources such as wind and solar. Coal, the dirtiest of fossil fuels, accounted for 93% of North Dakota’s energy mix—making it one of the most coal-dependent states in the nation. Hydroelectric power, which is less polluting than fossil fuels but causes its own set of environmental problems, accounted for 7% of the state’s total.

**North Dakota’s Renewable Energy Potential**

**Potential Energy from Wind and Clean Biomass**

North Dakota has tremendous capacity to generate energy from wind power and clean biomass. In fact, using wind and clean biomass, North Dakota could generate more than 51 times the electricity currently generated by dirty energy sources. North Dakota’s total generation potential from these renewable sources is 1.6 trillion kilowatt hours (kWh)—enough to power more than 160 million homes.

**Solar Energy Potential in North Dakota**

North Dakota also has significant solar potential, although the precise amount is difficult to quantify. The National Renewable Energy Laboratory estimates that if North Dakotans installed only a football-field sized amount of solar panels on their rooftops, the state could harness 971,000 kilowatt-hours (KWh) of electricity, enough to power 97 homes. Similarly, if the state installed just one concentrated solar system covering approximately 200 acres, it could generate 36 million KWh of electricity, enough to power 3,593 homes.

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**dd** The Energy Information Administration calculations include municipal solid waste as a renewable energy source. U.S. PIRG and the State PIRGs do not consider municipal solid waste to be a clean form of biomass.

**ee** In order to quantify North Dakota’s solar potential, we would have to make assumptions about cost and rooftop and other space available now and in the future for photovoltaics.
Renewable Energy Would Protect North Dakota’s Environment, Create Jobs and Bolster the Local Economy

In addition to reducing the air pollution created by burning fossil fuels, increasing electricity generation from renewable sources could boost North Dakota’s economy. According to a report by the Tellus Institute, investment in renewable energy and energy efficiency could create 1,900 jobs in North Dakota by 2010 and 3,300 jobs by 2020.\textsuperscript{118}

Renewable Energy and Energy Efficiency at Work

In September 2001, North Dakota was selected to participate in a new program sponsored by Wind Powering America, a U.S. Department of Energy (DOE) initiative to promote regional economic development by increasing wind energy use in the United States. Under the program, Wind Powering America is loaning ten 20-meter wind-monitoring systems, called anemometers, to the state for use as economic development prospecting tools, with the intent of increasing wind energy development in North Dakota. The North Dakota Department of Commerce Division of Community Services (DCS) will manage the Anemometer Loan Program, collecting and processing applications from those who want to install one of the monitoring systems on their land. The Energy & Environmental Research Center (EERC) at the University of North Dakota will monitor equipment installation and maintenance. The EERC will also collect and report the resulting new wind energy data. The anemometers being made available through this program are valued at about $1500 and will be installed and monitored free of charge to approved applicants. The Division of Community Services will choose specific anemometer locations based on a balance between the state’s need for additional wind data and its desire to serve a cross section of applicants. Applicants will likely include private land owners, economic development organizations and businesses.\textsuperscript{119}

A group of Benedictine nuns has cut utility bills nearly in half by using wind power. Two turbines generate electricity for the Sacred Heart Monastery in Richardson, North Dakota. On some days, the turbines produce more than the Monastery can use, and the local utility pays the nuns for the kilowatt hours returned. Total energy savings for the Monastery amount to $15,800 per year.

The Turtle Mountain band of Chippewa Indians has operated a 100kW wind turbine west of Belcourt, North Dakota, since 1997. The wind provides energy for a nearby water treatment plant, and an identical turbine helps to power the Spirit Lake Casino near Devils Lake. Each turbine can generate enough electricity for 50 homes. The Chippewa save an estimated $500-$1,000 per month, and the Spirit Lake Sioux realize up to $2,000 in energy cost savings each month.
Ohio deserves a safe, clean, affordable energy future. To fully develop the clean energy potential available in the state, we need to encourage smart energy choices that will help our health, our environment and our economy.

**Ohio's Electricity Generation**

Ohio is too dependent on dirty energy sources. In 2000, Ohio generated more than 99% of its electricity from fossil fuels and nuclear and only .2% from renewable sources such as wind and solar.\(^{120}\) Coal, the dirtiest of fossil fuels, accounted for more than 87% of Ohio's energy mix—making it one of the most coal-dependent states in the country.\(^{121}\)

**Ohio's Renewable Energy Potential**

**Potential Energy from Wind, Clean Biomass and Landfill Gas**

Ohio has tremendous capacity to generate electricity from renewable sources. In fact, Ohio could almost double the state's current electricity generation from petroleum, gas, nuclear and hydroelectric power with generation from wind, clean biomass and landfill gas. Ohio's total generation potential from wind, clean biomass and landfill gas is 32.8 billion kilowatt hours (kWh)—enough to power more than 3 million homes.\(^{122}\) Ohio’s renewable energy potential from these three sources could displace more than 22% of the state’s current generation from all dirty energy sources, including coal.

**Solar Energy Potential in Ohio**

Ohio also has significant solar potential, although the precise amount is difficult to quantify.\(^{88}\) The National Renewable Energy Laboratory estimates that if Ohioans installed only a football-field sized amount of solar panels on their rooftops, the state could harness 850,000 kilowatt-hours (KWh) of electricity, enough to power 85 homes.

\(^{120}\) The Energy Information Administration calculations include municipal solid waste as a renewable energy source. U.S. PIRG and the State PIRGs do not consider municipal solid waste to be a clean form of biomass.

\(^{121}\) In order to quantify Ohio’s solar potential, we would have to make assumptions about cost and rooftop and other space available now and in the future for photovoltaics.
Renewable Energy Would Protect Ohio’s Environment, Create Jobs and Bolster the Economy

In addition to reducing the air pollution created by burning fossil fuels, increasing electricity generation from renewable sources could boost Ohio’s economy. According to a report by the Tellus Institute, investment in renewable energy and energy efficiency could create 34,600 jobs in Ohio by 2010 and 59,900 jobs by 2020.123

Renewable Energy and Energy Efficiency at Work

Between March 1996 and March 1997, U.S. EPA’s Green Lights and Energy Star programs helped save 500 million kilowatt-hours of energy in Ohio. This saved consumers $36 million in energy bills and prevented more than 950 million pounds of carbon dioxide emissions. Cost savings through the year 2000 were approximately $132 million.124

The American Lung Association installed a geothermal heating and cooling system when building its Health House in Dublin, Ohio. The House provides high quality air for asthma and allergy sufferers. The geothermal system saves 58% in energy costs over natural gas heating and conventional air conditioning.

On January 29, 1999, American Municipal Power (AMP)-Ohio announced it will provide up to 35 megawatts of renewable electric power generated from landfill gas in Ohio. Landfill gas energy is the recovery of landfill gas that otherwise must be "flared" in an environmentally safe way. The electricity will be generated from nine landfill sites in Ohio. AMP-Ohio's partners are Browning-Ferris, Inc. and Energy Developments, Inc.

"The Solar Power in the Woods at Camp Kern” project received the 1998 Governor’s Award for Excellence in Energy Efficiency. A stand-alone solar power station delivers up to 400 watts peak demand and 1800 watt-hours (1.8 kilowatt-hours) electricity over two days for outdoor lighting and sound amplification in the wooded "Outdoor Chapel" theatre at Dayton YMCA’s Camp Kern facility in Oregonia, Ohio.

On March 15, 2001, The Northeast Ohio Public Energy Council (NOPEC) signed a contract with the Green Mountain Energy Co. that will provide lower electric rates for more than 600,000 residential customers. This environmentally friendlier electricity is sold at a premium in other states, but NOPEC consumers will receive it at a discounted price. Green Mountain also will establish a "wind farm" and a commercial solar facility to help service the NOPEC contract.
Oregon deserves a safe, clean, affordable energy future. To fully develop the clean energy potential available in the state, we need to encourage smart energy choices that will help our health, our environment and our economy.

**Oregon’s Electricity Generation**

Oregon is too dependent on dirty energy sources and hydroelectric power. In 2000, Oregon generated 24% of its electricity from fossil fuels and only 1% from renewable sources such as wind and solar. Although hydroelectric power, which accounted for 75% of the state’s total energy mix, is less polluting than fossil fuels, it causes its own set of environmental problems that could be avoided by turning to renewable energy.

**Oregon’s Renewable Energy Potential**

Oregon has tremendous capacity to generate energy from renewable sources. In fact, Oregon could generate 73% more electricity from wind, geothermal, clean biomass and landfill gas than what it currently generates from dirty energy sources, including hydropower. Oregon’s total generation potential from these renewable resources is 88 billion kilowatt hours (kWh)—enough to power almost 9 million homes.

**Solar Energy Potential in Oregon**

Oregon also has significant solar potential, although the precise amount is difficult to quantify. The National Renewable Energy Laboratory estimates that if Oregon residents installed only a football-field sized amount of solar panels on their rooftops, the state could harness 983,000 kilowatt-hours (KWh) of electricity, enough to power 99 homes. Similarly, if the state installed just one concentrated solar

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h) The Energy Information Administration calculations include municipal solid waste as a renewable energy source. U.S. PIRG and the State PIRGs do not consider municipal solid waste to be a clean form of biomass.

ii) In order to quantify Oregon’s solar potential, we would have to make assumptions about cost and rooftop and other space available now and in the future for photovoltaics.
system covering approximately 200 acres, it could generate 42.3 million KWh of electricity, enough to power 4,249 homes.

Renewable Energy Would Protect Oregon’s Environment, Create Jobs and Bolster the Economy  
In addition to reducing the air pollution created by burning fossil fuels, increasing electricity generation from renewable sources could boost Oregon’s economy. According to a report by the Tellus Institute, investment in renewable energy and energy efficiency could create 8,600 jobs in Oregon by 2010 and 15,600 jobs by 2020.128

<table>
<thead>
<tr>
<th>Renewable Energy and Energy Efficiency</th>
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<tbody>
<tr>
<td>The Stateline Wind Project is the Northwest’s largest commercial facility to generate electricity using wind. The project is located on Vansycle Ridge, a crest of land straddling the Washington/Oregon border, near Touchet, Washington and approximately 20 miles north of Pendleton, Oregon. Both the Washington and Oregon portions of the project have been constructed. Washington will have about 300 turbines, with an additional 80 turbines in Oregon. The Stateline Wind Project will produce a maximum output of 263 megawatts (MW) of electricity. On average, the Oregon portion of the project is expected to receive enough wind to deliver 30-35% of its peak capacity year round, enough power for more than 21,600 Northwest homes. Construction alone will infuse more than $15 million into the local economy, and ongoing maintenance and operations will employ at least 15 permanent staff.129</td>
</tr>
<tr>
<td>The City of Portland, Oregon, has realized more than $1 million in annual energy savings since 1991 through its City Energy Challenge program. Hired staff perform an energy audit for each city bureau and provide training and advice in selecting efficient appliances. Each bureau receives an annual energy use report with analysis for further cost-cutting. Portland also has an agreement with the local utility to receive 5% of its electricity from wind power, replacing energy from coal and saving an additional $175,000 annually.</td>
</tr>
<tr>
<td>The Oregon Institute of Technology (OIT) has been using geothermal energy to meet its heating and hot water needs since 1964. The system has been growing continuously for 35 years, now heating 11 buildings. Additionally, the school cools uses a new geothermal chiller to cool five of its buildings. The school saves $225,000 each year on energy costs, the equivalent of tuition for 46 Oregonians at OIT.</td>
</tr>
<tr>
<td>Emerald People's Utility District, a local consumer-owned utility serving the county's rural areas, has operated a landfill gas-to-electricity facility at its Short Mountain Landfill in Lane County, Oregon since 1992. The facility generates 1.6 megawatts of electrical power, enough for about 800 homes, and will increase its capacity to 4 megawatts by 2010. Lane County receives a minimum royalty of $15,000 per year and avoids having to build and operate an expensive methane collection system. Revenue from the project helps keep Emerald’s rates stable, and because Emerald is a consumer-owned utility, the benefits are passed directly on to the consumers.130</td>
</tr>
<tr>
<td>Portland’s Pearl District is developing green buildings in the historical “Brewery Blocks” area, the former location of the Blitz Weinhard Brewery. Blocks 1, 2, and 4 meet the highest environmental standards in the country, and the buildings are 30% more energy efficient than Oregon’s energy code requires. In addition, Portland plans to install about 380 solar panels on the buildings in Block 4.</td>
</tr>
<tr>
<td>The University of Oregon is installing solar panels on the student union building, the Erb Memorial Union. Students invested $100,000 seed money, which corporate sponsors matched. The panels will produce 72,577 kWh a year saving about $4,136. Money raised by selling back electricity will go to a green student fund.</td>
</tr>
</tbody>
</table>
Pennsylvania deserves a safe, clean, affordable energy future. To fully develop the clean energy potential available in the state, we need to encourage smart energy choices that will help our health, our environment and our economy.

**Pennsylvania’s Electricity Generation**

Pennsylvania is too dependent on dirty energy sources. In 2000, Pennsylvania generated more than 98% of its electricity from fossil fuels and nuclear power and 1% from renewable sources such as wind and solar.\(^{[1]}\) Coal, the dirtiest of fossil fuels, accounted for more than half of Pennsylvania’s energy mix.\(^{[2]}\) Pennsylvania also relied on nuclear power for more than a third of its energy needs, making it one of the most nuclear-dependent states in the country.

**Pennsylvania’s Renewable Energy Potential**

**Potential Energy from Wind, Clean Biomass and Landfill Gas**

Pennsylvania has tremendous capacity to generate electricity from renewable sources. In fact, using wind, clean biomass and landfill gas, Pennsylvania could displace the state’s generation from nuclear power; alternatively, generation from these renewable resources could displace two-thirds of the electricity generated by coal-fired power plants. Pennsylvania’s total generation potential from wind, clean biomass and landfill gas is 79.6 billion kilowatt hours (kWh)—enough to power almost 8 million homes.\(^{[3]}\)

**Solar Energy Potential in Pennsylvania**

Pennsylvania also has significant solar potential, although the precise amount is difficult to quantify.\(^{[4]}\) The National Renewable Energy Laboratory estimates that if Pennsylvanians installed only a football-field sized amount of solar panels on their rooftops, the state could harness 874,000 kilowatt-hours (KWh) of electricity, enough to power 88 homes. Similarly, if the state installed just one concentrated

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\(^{[1]}\) The Energy Information Administration calculations include municipal solid waste as a renewable energy source. U.S. PIRG and the State PIRGs do not consider municipal solid waste to be a clean form of biomass.

\(^{[2]}\) In order to quantify Pennsylvania’s solar potential, we would have to make assumptions about cost and rooftop and other space available now and in the future for photovoltaics.
solar system covering approximately 200 acres, it could generate 29 million KWh of electricity, enough to power 2,954 homes.

**Renewable Energy Would Protect Pennsylvania’s Environment, Create Jobs and Bolster the Local Economy**

In addition to reducing the air pollution created by burning fossil fuels and radioactive waste from nuclear power plants, increasing electricity generation from renewable sources could boost Pennsylvania’s economy. According to a report by the Tellus Institute, investment in renewable energy and energy efficiency could create 31,600 jobs in Pennsylvania by 2010 and 55,500 jobs by 2020.\(^{134}\)

**Spotlight on Pennsylvania's Renewable Energy Standard**

Pennsylvania’s December 1996 electricity restructuring law did not establish a renewable portfolio standard. But, as with the state’s public benefits funds for renewables, a renewable portfolio standard was subsequently established through individual utility restructuring settlements. Twenty percent (20%) of all residential customers have to be assigned to a provider of last resort-default supplier other than their local electrical distribution company. The Competitive Default Service bidding process is being used to select the Energy Generator Supplier (EGS), and in order to qualify for the CDS bidding process EGSs must supply at least 2% renewables increasing by 0.5% each year. Eligible renewables include photovoltaic, solar thermal, wind, low head hydro, geothermal, landfill and mine-based methane gas, and energy from waste and sustainable biomass. The start dates for the Competitive Default Service bidding processes are: 6/1/00 for General Public Utilities (GPU), 6/1/01 for PECO and West Penn Power, and 6/1/02 for Pennsylvania Power & Light (PP&L).\(^{135}\)

## Renewable Energy and Energy Efficiency at Work

Pennsylvania, home to wind power facilities totaling more than 35 megawatts, is now one of the leading states in the nation for wind power development. Pennsylvania’s wind industry continues to grow, with more than 110 megawatts of wind energy to be installed in the next several years. More than 150 high-tech wind turbines in the state will soon produce enough power to meet the electric needs of 53,000 homes.\(^{136}\)

Over the next two years, the American wind industry expects to install more than $170 million worth of wind equipment in rural Pennsylvania. According to the American Wind Energy Association, these new wind farms will result in tax payments to counties and schools totaling $1.2 million each year.\(^{137}\)

The Interfaith Coalition on Energy (ICE) was created in 1980 to reduce energy costs for communities of faith, enabling churches and religious institutions to fund additional human services. ICE is composed of 20 engineers, architects and clergy who provide their services to 4,200 congregations in Pennsylvania, helping to cut their collective annual energy bill by more than $1 million dollars. Interested parishes contact ICE for an on-site energy survey that compares the parish’s energy consumption with that of similar buildings, determines the parish’s energy cost per square foot and offers specific recommendations to reduce energy costs. Participants usually see their annual energy bill reduced by $1,500 annually.\(^{138}\)

The Pennsylvania Department of Transportation (PENNDOT) operates approximately 63 small solar panels that sit atop poles lining highways across the state. These panels deliver the electricity needed to collect traffic data, and many have been operating successfully for more than six years. According to PENNDOT officials, the panels are expected to last 15-20 years and only require inexpensive battery changes every five years or so.

In December, Governor Mark Schweiker announced that the Commonwealth will purchase renewable energy to supply 5% of the state government’s power needs for two years beginning in 2002. The power, will be a mix of wind power, landfill gas, hydroelectric, and solar energy. According to the Governor’s office, nearly 120,000 Pennsylvanians now use “cleaner and greener forms of power” through participation in the state’s Electric Choice program.
Texas deserves a safe, clean, affordable energy future. To fully develop the clean energy potential available in the state, we need to encourage smart energy choices that will help our health, our environment and our economy.

**Texas’s Electricity Generation**

Texas is too dependent on dirty energy sources. In 2000, Texas generated 99% of its electricity from fossil fuels and nuclear power and only 1% from renewable sources such as wind and solar. Texas relies on coal, the dirtiest of fossil fuels, for more than a third of its electricity needs.

**Texas’s Renewable Energy Potential**

**Potential Energy from Wind, Clean Biomass and Landfill Gas**

Texas has tremendous capacity to generate electricity from renewable sources, particularly from wind. In fact, Texas could exceed the state’s current generation from dirty energy sources by more than four times using wind power, clean biomass and landfill gas. Texas’s total generation potential from wind, clean biomass and landfill gas is 1.7 trillion kilowatt hours—enough to power 170 million homes.

**Solar Energy Potential in Texas**

Texas also has some of the best solar potential in the country, although the precise amount is difficult to quantify. The National Renewable Energy Laboratory estimates that if Texans installed only a football-field sized amount of solar panels on their rooftops, the state could harness 1.2 million kilowatt-hours (KWh) of electricity, enough to power 121 homes. Similarly, if the state installed just one concentrated solar system covering approximately 200 acres, it could generate 61 million KWh of electricity, enough to power 6,086 homes.

**Renewable Energy Would Protect Texas’s Environment, Create Jobs and Bolster the Economy**

In addition to reducing the air pollution created by burning fossil fuels and radioactive waste from nuclear power plants, increasing electricity generation from renewable sources could boost Texas’s
economy. According to a report by the Tellus Institute, investment in renewable energy and energy efficiency could create 71,500 jobs in Texas by 2010 and 123,400 jobs by 2020.142

Spotlight on Texas’s Renewable Energy Standard  
So far, Texas boasts the most successful state renewable energy initiative. On December 16, 1999, the Public Utility Commission of Texas issued the Renewable Energy Mandate Rule, which requires 2,000 MW of new renewable generating capacity to be installed by 2009. This translates in a 2.2% increase by 2009. In addition to setting a percentage, the law establishes a renewable energy credits trading program and defines the renewable energy purchase requirements for competitive retailers in Texas. Qualifying renewable energy sources include solar, wind, geothermal, hydroelectric, wave or tidal energy, or biomass or biomass-based waste products, including landfill gas. Because of this law, utilities installed more than 800 MW of wind power in 2001, more than had been installed during any one year in the entire country.143

### Renewable Energy and Energy Efficiency at Work

President Bush uses geothermal heat pumps on his ranch in Crawford, Texas to heat and cool his air and provide hot water. Compared to the area average, the heat pumps are expected to save the President 75% on heating costs and between 45 and 50% on cooling costs.

Public education, the environment and electricity consumers in Central Texas are all benefiting from the Texas Wind Power Project in West Texas, located on land dedicated to the Permanent School Fund (PSF) in the Delaware Mountains of Culberson County. The Texas General Land Office (GLO) is leasing the land to the Lower Colorado River Authority, which pays a royalty to the PSF based on electricity production. A fleet of 112 wind turbines produce approximately 35 megawatts of electricity, enough to supply 12,000 homes. During the project’s first three years, the PSF earned nearly half a million dollars from the Texas Wind Power Project. The project is expected to earn more than $3 million for the PSF and create $300 million in increased economic activity over the 25-year lease period.144

State legislation to promote renewable energy, plus improved technology that has reduced costs and a surge in natural gas prices last winter, have all contributed to the Texas wind boom. As of July 2001, Texas had just under 200 megawatts of wind power capacity up and running and had an additional 900 megawatts planned, much of it slated to come on line by the end of the year. One of those projects, the 278 megawatt King Mountain wind farm in Upton County, near President George W. Bush’s boyhood home of Midland, will be among the largest in the world and is backed by some big players from the traditional electric power industry. The facility will have 214 wind turbines and provide enough power for almost 140,000 homes.145

The Southwest Mesa Energy Project in West Texas operates 107 wind turbines that generate enough electricity to meet the demand of more than 20,000 households. The construction of the wind farm created more than 200 on-site jobs in addition to work for numerous sub-contractors.146

"Watts On Schools" is American Electric Power’s way of bringing solar power to schools in communities throughout Texas, Arkansas and Louisiana. Through Watts On Schools, AEP has installed nineteen solar energy systems totaling 76 kW at public elementary, middle, and high schools located within the service areas of three of its electric utility operating companies. Each system is capable of producing enough energy each month to power a typical Texas home. Participating schools receive the energy produced by the systems for free, lowering the schools’ electric bills every month.147

More than 1,000 families, individuals and businesses have joined Austin Energy’s Solar Explorer program. For just $3.50 per month, Austin Energy customers can join the Solar Explorer program to help drive down the cost of producing solar power and bring clean, renewable solar energy to Austin and other American communities. Members share the cost of three solar power systems built in Austin while helping to expand the use of this non-polluting electric generation resource.148
Washington deserves a safe, clean, affordable energy future. To fully develop the clean energy potential available in the state, we need to encourage smart energy choices that will help our health, our environment and our economy.

Washington’s Electricity Generation

Washington is too dependent on dirty energy sources and hydroelectric power. In 2000, Washington generated 25% of its energy from fossil fuels and nuclear power and only 1% from renewable sources such as wind and solar. Although hydroelectric power, which accounted for 74% of the state’s total energy mix, is less polluting than fossil fuels, it causes its own set of environmental problems that could be avoided by turning to renewable energy.

Washington’s Renewable Energy Potential

Wind, Geothermal, Clean Biomass and Landfill Gas Potential in Washington

Washington has tremendous capacity to generate electricity from renewable sources. In fact, Washington could almost triple the state’s current generation from fossil fuels and nuclear power using wind, geothermal, clean biomass and landfill gas resources instead. By tapping into this potential, Washington could displace 65% of the electricity currently generated by all dirty sources, including hydroelectric power. Washington’s total generation potential from these renewable sources is 68.5 billion kilowatt hours (kWh)—enough to power almost 7 million homes.

Solar Energy Potential in Washington

Washington also has significant solar potential, although the precise amount is difficult to quantify. The National Renewable Energy Laboratory estimates that if Washington residents installed only a football-field sized amount of solar panels on their rooftops, the state could harness 911,000 kilowatt-hours (KWh) of electricity, enough to power 91 homes. Similarly, if the state installed just one

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The Energy Information Administration calculations include municipal solid waste as a renewable energy source. U.S. PIRG and the State PIRGs do not consider municipal solid waste to be a clean form of biomass.

In order to quantify Washington’s solar potential, we would have to make assumptions about cost and rooftop and other space available now and in the future for photovoltaics.
concentrated solar system covering approximately 200 acres, it could generate 37 million KWh of electricity, enough to power 3,753 homes.

Renewable Energy Would Protect Washington’s Environment, Create Jobs and Bolster the Economy
In addition to cutting air pollution and radioactive waste, increasing electricity generation from renewable sources could boost Washington’s economy. According to a report by the Tellus Institute, investment in renewable energy and energy efficiency could create 16,600 jobs in Washington by 2010 and 29,700 jobs by 2020.152

Renewable Energy and Energy Efficiency at Work

The Stateline Wind Project located near Walla Walla, Washington is largest single wind-powered renewable energy development in the Northwest. Just completed in January 2002, it consists of almost 400 wind turbines with the capacity to produce about 300 megawatts of electricity—enough energy to power about 70,000 homes or about one-third of the residences in the city of Portland, Oregon. The project will create an average of 150 construction jobs with a peak need of 350 workers, and for ongoing operations provide eight to 15 full-time jobs and four to seven part-time jobs.153

Towering 200 feet over Washington state, Maiden Wind Farm will produce 150 megawatts of clean energy when completed, generating enough power to meet the needs of more than 36,000 homes. Bonneville Power and Washington Winds, which will operate the plant, hope to install another 250 megawatts in the future. The initial phase of the project will create 100 local construction jobs.

The Mt. Ranier National Park in Washington State has just installed a hybrid solar energy system in its White River facility. Along with the new solar system, the station replaced lighting, refrigerators and water pumps with newer, more efficient models. Because of the increased efficiency, the building can run solely on the solar hybrid system.

The City of Seattle has pledged to meet 5% of its power needs from renewable energy. In 2001, the city announced a 50 megawatt wind power purchase, which could increase to as much as 175 megawatts by 2004.

Seattle City Light received approval from the City Council to offer a green pricing program to its 340,000 customers. The green pricing program will focus on the development of “smaller and more local demonstration projects” to help City Light gain experience in new and emerging technologies. Residential customers can choose to contribute $3, $7 or $10 extra each month to a utility-managed fund that will be used to purchase power from resources such as solar, wind, and biomass. Business customers also can participate, but at different contribution levels. Under a law enacted in 2001, all Washington-based utilities are required to offer a green power option to their customers beginning in 2002.

After installing a geothermal system in 1982, heating costs for the Grant County Courthouse in Ephrata, Washington dropped by nearly 80%. The Courthouse is now three times more energy efficient than the Law and Justice Center right across the street.
Wisconsin deserves a safe, clean, affordable energy future. To fully develop the clean energy potential available in the state, we need to encourage smart energy choices that will help our health, our environment and our economy.

Wisconsin’s Electricity Generation

Wisconsin is too dependent on dirty energy sources. In 2000, Wisconsin generated 95% of its electricity from fossil fuels and nuclear power and only 2% from renewable sources such as wind and solar. Coal, the dirtiest of fossil fuels, accounted for three-fourths of the state’s energy mix—making it one of the most coal-dependent states in the country.155

Wisconsin’s Renewable Energy Potential

Wind, Clean Biomass and Landfill Gas Potential in Wisconsin

Wisconsin has tremendous capacity to generate electricity from renewable sources. In fact, Wisconsin could generate from wind, clean biomass and landfill gas almost twice the electricity it currently generates from dirty energy sources. Wisconsin’s total generation potential from these renewable sources is 111.8 billion kilowatt hours (kWh)—enough to power more than 11 million homes.156

Solar Energy Potential in Wisconsin

Wisconsin also has significant solar potential, although the precise amount is difficult to quantify.99 The National Renewable Energy Laboratory estimates that if Wisconsin residents installed only a football-field sized amount of solar panels on their rooftops, the state could harness 888,000 kilowatt-hours (kWh) of electricity, enough to power 89 homes. Similarly, if the state installed just one

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99 The Energy Information Administration calculations include municipal solid waste as a renewable energy source. U.S. PIRG and the State PIRGs do not consider municipal solid waste to be a clean form of biomass.

99 In order to quantify Wisconsin’s solar potential, we would have to make assumptions about cost and rooftop and other space available now and in the future for photovoltaics.
concentrated solar system covering approximately 200 acres, it could generate 30 million KWh of electricity, enough to power 3,034 homes.

**Renewable Energy Would Protect Wisconsin’s Environment, Create Jobs and Bolster the Economy**

In addition to reducing the air pollution created by burning fossil fuels and radioactive waste from nuclear power plants, increasing electricity generation from renewable sources could boost Wisconsin’s economy. According to a report by the Tellus Institute, investment in renewable energy and energy efficiency could create 14,900 jobs in Wisconsin by 2010 and 26,300 jobs by 2020.157

**Spotlight on Wisconsin’s Renewable Energy Standard**

The Wisconsin renewable portfolio standard became effective October 27, 1999, making Wisconsin the first state to have a renewable portfolio standard in advance of retail competition. Wisconsin’s renewable portfolio standard calls for generating 2.2% of the state’s energy from renewable sources by 2010. Qualifying renewables include fuel cells that use a renewable fuel, tidal or wave action, solar thermal electric or photovoltaic energy, wind power, geothermal technology, biomass, and hydro power (less than 60 MW). The state has established a credit trading program such that electric service providers may sell to other electric providers renewable credits for any renewable energy in excess of the percentage specified for a given year. Violation of the renewable portfolio standard or misleading certification of renewable resources can lead to penalties up to $500,000.158

**Renewable Energy and Energy Efficiency at Work**

State facilities in Wisconsin consume 21% less energy than they did in 1973, even though square footage has increased by 27%. The Wisconsin Energy Initiative has reduced fossil fuel consumption, created jobs at 60 companies in the state, and saved taxpayers $8.1 million annually. The program combines upgrading of old, inefficient equipment with energy auditing and recycling. State power plants also have introduced wastepaper fuel pellets, which save 20% in energy costs compared to coal. The paper pellets are manufactured in Wisconsin from non-recyclable paper, which helps create jobs for people in state, reduces landfill use and substantially reduces emissions from the power plants.

Wisconsin Public Service Corporation installed 14 wind turbines in Kewaunee County, completing construction in June 2000. The wind farm will provide enough electricity for 3,600 homes for the next 30 years and generate $200,000 in tax revenue for the Town of Lincoln and $375,000 for Kewaunee County over 30 years.

Two other Wisconsin-based utilities have installed wind turbines. Madison Gas and Electric Company operates 17 turbines located in Kewaunee County, producing at 11 MW of power, and Wisconsin Electric operates two turbines located in Fond du Lac County, producing at 1.2 MW of power.

A new crop of generators along U.S. Highway 18 west of Dodgeville doubled Wisconsin’s wind power fleet. Florida-based FPL Energy (FPLE) installed 20 units; when all are on-line, the Iowa County project will produce an estimated 52,000 megawatt-hours of electricity per year, which will more than double existing production. Wisconsin’s 35 utility-scale wind turbines pumped 45,000 MWh in 2000, an amount equivalent to the annual electrical requirements of 5,600 households. As long as the turbines produce electricity, host landowners will receive annual payments for the land rented to FPLE, ceding slightly less than 16 acres to build all 20 turbines.159

In the Town of Byron on the Douglas and Cynthia Decker farm, two low-speed wind turbines have been operating since June 14, 1999. Each turbine can generate 660 kilowatts of electricity, enough combined electricity to supply about 600 homes. The wind turbines generate approximately 3,450 megawatt-hours of electricity annually. This project prevents 1,956 tons of global warming emissions, the equivalent of 260 people driving sport utility vehicles for a year.
CONCLUSION AND RECOMMENDATIONS

We need to change the current pattern of dirty energy dependence that has damaged public health, polluted the environment, and compromised the U.S. economy. Instead, we need a proactive policy that rejects more drilling and more spilling and advances cleaner, more sustainable energy solutions. We can move towards a clean energy future by requiring significant energy production from renewable energy sources and increasing energy efficiency.

States must continue their local efforts to generate more electricity from renewable sources, but we also need national standards to ensure that all Americans can enjoy the benefits of clean, renewable electricity. In order to encourage increased energy production from renewable sources, we need to implement policies at the state and national level that include the following:

Clean Energy Standard
If we truly want to encourage clean renewable energy, we should create state and national “renewable portfolio standards” (RPS) to increase the amount of electricity from renewable sources of energy. A renewable portfolio standard diversifies the portfolio, or mix, of our energy supplies. Arizona, Connecticut, Iowa, Maine, Massachusetts, Nevada, New Jersey, New Mexico, Pennsylvania, Texas, and Wisconsin \(^{160}\) have passed state renewable energy standards to encourage development of clean energy technologies (see Appendix A for more details on the states profiled in this report). Hawaii, Illinois and Minnesota have set strong goals for the percentage of electricity that would come from renewable energy. At the national level, decision-makers should set the standard at 20% of power generation by 2020. A national renewable standard of 20% of power generation by 2020, combined with energy efficiency policies, could save consumers an additional $70 billion per year by 2020 compared to business as usual.

Public Benefits Fund
Utility companies used to be responsible for generating, transmitting, and selling energy to consumers. Since they were responsible for making sure the system could handle the amount of electricity sent, the companies encouraged energy efficiency and some off-the-grid production, including solar panels. Because of electricity restructuring, the utility companies have shed most responsibility for transmitting electricity, focusing instead on generating and selling the electricity. As a result, utilities no longer have the same incentives to encourage programs that ensure the electricity grid remains reliable. A public benefits fund would offset these declines by charging consumers a small amount, usually one tenth of one cent per kilowatt-hour, and using the money in the states for:

- energy efficiency programs;
- investments in promising renewable energy technologies;
- low-income assistance programs; and
- clean energy research and development.
States that already have some form of systems benefit fund in place include: Arizona, California, Connecticut, Delaware, Illinois, Maine, Massachusetts, Michigan, Montana, Nevada, New Hampshire, New Jersey, New Mexico, New York, Ohio, Oregon, Pennsylvania, Rhode Island, Texas, Vermont, and Wisconsin (refer to Appendix A for a detailed description of the programs implemented in the states profiled in this report). According to the American Council for an Energy-Efficient Economy, spending on these programs has dropped almost 50% while energy use has climbed.\textsuperscript{161} A federal level public benefits fund could save 50 quadrillion British thermal units (btus) of electricity by 2020.\textsuperscript{162} This is equivalent to the output of 500 average sized power plants.

**Net Metering**

A net metering standard would allow consumers who generate their own electricity from renewable technologies (e.g. a small wind turbine, a rooftop solar panel) to reduce their electric bill by getting credit for any excess power generated. Thirty-three states and the District of Columbia already have varying net metering standards in place, including Arizona, Arkansas, California, Connecticut, Delaware, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Maine, Maryland, Massachusetts, Minnesota, Montana, Nevada, New Hampshire, New Jersey, New Mexico, New York, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, Texas, Vermont, Virginia, Washington, Wisconsin, and Wyoming. Net metering programs vary widely by state; refer to Appendix A for a detailed description of the programs implemented in the states profiled in this report. In Colorado, Florida and Illinois, some utilities have implemented net metering programs independent of state action. A national standard would ensure that this benefit is applied consistently across the country.

**Production Tax Credits**

The Production Tax Credit (PTC) allows builders of renewable energy sources to get a tax credit for investment in renewable energy. The current structure of energy production tax incentives skews the economic benefits of energy towards dirty fossil fuels and nuclear power. The production tax credit is an important factor in making the cost of renewable energy more competitive by offsetting the relatively high front-end capital costs of renewable energy, thus allowing renewable energy to compete on a more level playing field with fossil fuels and nuclear power. A national credit should last for at least five years and include wind, solar, geothermal energy, and clean biomass within the credit’s parameters--specifically excluding municipal solid waste incinerators. The PTC should not include hydroelectric power or so-called “clean coal” programs.

These measures would reduce pollution, save money, create jobs, and reduce our vulnerability to energy supply disruptions. Given all the benefits of pursuing a clean energy path, there is no reason to drill in our last wild places, darken our skies with pollution and threaten public health and the environment by continuing to rely on dirty fuel sources.
APPENDIX A. STATE INCENTIVES FOR RENEWABLE ENERGY

The following information is taken directly from the Database of State Incentives for Renewable Energy (DSIRE). DSIRE is a comprehensive source of information on state, local, and utility incentives that promote renewable energy and is available online at http://www.ies.ncsu.edu/dsire/index.htm. The following is a sampling of policies enacted by states, municipalities and utilities and is intended to be representative, not all-inclusive.

U.S. PIRG and the State PIRGs have not attempted to analyze the efficacy of each of these programs. In addition, U.S. PIRG and the State PIRGs do not necessarily support all of the components of the projects detailed below, in particular programs that include hydroelectric power, “clean” coal, and municipal solid waste under the umbrella of renewable energy sources.

CALIFORNIA

Financial Incentives
Anaheim Advantage Residential PV Buydown Program: Anaheim Public Utilities is encouraging residents to install home photovoltaic (PV) systems by offering a rebate. Through the Anaheim Advantage Residential PV Buydown Program, customers with qualifying PV systems of a minimum 300 watts in size and a maximum output not exceeding the electric needs of the electricity consumer, are eligible for the rebate.

Emerging Renewables Buydown Program: The California Energy Commission provides rebates for the purchase of four types of renewable energy generating systems (photovoltaics, small wind turbines--10 kilowatts or less, fuel cells using renewable fuels, and solar thermal systems) through its Emerging Renewables Buydown Program. The program offers a rebate of $4.50/watt or 50% off the price of purchasing the system, whichever is less. This rebate is offered to all grid-connected utility customers within the electric utility service area of Pacific Gas and Electric, San Diego Gas & Electric, Southern California Edison, or Bear Valley Electric Company.

Glendale Solar Electric Rebate: Glendale Water & Power (GWP) is a municipally-owned utility. The City Council decided on August 21, 2001 to provide residential electric customers a rebate for photovoltaic (PV) installations. The one-time rebate is $3 per watt up to 10,000 watts. Funding for this rebate is $150,000, and the city hopes to assist about 25 homeowners with rebates for 2,000-watt systems estimated at $6,000 each.

Los Angeles - Residential and Commercial PV Buydown Program: In June 2000, the LADWP Board of Commissioners approved a solar buydown program designed to encourage the use of renewable energy through the installation of photovoltaic systems by residents and businesses in Los Angeles. The rebate program began September 1, 2000. In August 2001, the rebate was increased, and will continue until August 31, 2005. The program, which could be extended beyond the initial five-year period, also seeks to entice PV manufacturers to locate their businesses in Los Angeles. LADWP’s goal is to have 100,000 systems on rooftops in Los Angeles by the year 2010. The current financial incentives include a maximum of $4.50/watt for systems manufactured outside the City of Los Angeles, and a maximum of $6.00/watt for those manufactured within the City. The maximum payment per site is $50,000 for residential and $1 million for commercial customers. Developers may receive a maximum incentive payment of $1,000,000 a year.

Pasadena - Solar Power Installation Rebate: Pasadena Water & Power (PWP) is a community-owned utility. Currently, PWP is providing its residential electric customers (and commercial customers on a case-by-case basis) a rebate for photovoltaic (PV) installations. The one-time rebate is $5 per watt or $10,000, based upon available funding.
Public Interest Energy Research Grants (PIER): Signed into law in 1996, Assembly Bill 1890 provided authority for a fundamental restructuring of California’s electric services industry. Among other things, AB 1890 requires that at least $62.5 million be collected annually from investor-owned utility ratepayers for “public interest” energy RD&D efforts not adequately provided by competitive and regulated markets. The legislation required that the program portfolio focus on projects in five subject areas: renewable energy technology, environmentally preferred advanced generation, energy-related environmental research, strategic energy research, and end-use efficiency.

Sacramento - Solar Water Heater Program: SMUD offers rebates and loan financing to customers who install solar water heating units. The program was started in 1991 as part of the utility’s demand-side management program. Performance-based rebates, typically around $700, are available for SMUD residential customers who have electric water heating. In addition to the rebate, SMUD offers 100% financing, with an 8.5% interest rate over a ten-year repayment period. Most loans come to an average of $2,300. To date, approximately 3,000 solar water heating units have been installed under this program, which comes to over half the systems currently installed in the city of Sacramento.

Self-Generation Program: On March 27, 2001, the California Public Utilities Commission announced new incentive programs to encourage residential and commercial customers to install grid-tied renewables and clean distributed generation resources. The Self-Generation Program provides incentives to encourage customers to produce energy using microturbines, small gas turbines, wind turbines, photovoltaics, fuel cells, and internal combustion engines. The incentives include payments of $1 - $4.50/Watt depending on the technology used.

Solar Tax Deduction: California SB 75 became effective on October 1, 2001. This personal tax deduction allows taxpayers to deduct the interest paid on loans used to purchase energy-efficient products or equipment for a residence in California. The deduction is for loans from a publicly owned utility company for the purchase of energy-efficient heating, ventilation, air-conditioning, lighting, solar, advanced metering of energy usage, windows, insulation, zone heating products, and weatherization systems. Customers of publicly owned utility companies that do not offer customer financing may be able to deduct the interest from a home equity or home improvement loan used to purchase energy efficient products and equipment.

Rules and Regulations

Los Angeles - Net Metering Rules: The Los Angeles Department of Water and Power (LADWP) offers net metering to residential and commercial customers under 10 kW.

Net Metering: California’s net metering law requires that all California electric utilities, regulated and unregulated, allow net metering for all customer classes. Bi-directional time-of-use pricing means that net metering customers are entitled to deliver electricity back to the system for the same time-of-use (including real-time) price that they pay for power purchases. Eligible systems are not to exceed 1,000 kW (1 MW) of peak generating capacity.

Renewable Energy Trust Fund: California set the bar for all other renewable energy funds with the creation of a $540 million fund for renewables back in 1996. The success of that program lead to legislation to extend that funding—at the same annual levels—another ten years through 2012 creating an additional $1.35 billion in renewables funding. California Energy Commission (CEC) manages the renewables funds through the following four accounts:

1. Existing technologies account. The existing technologies account (45% or $243 million) is divided into three subaccounts: (a) biomass and solar thermal, (b) wind, and (c) geothermal, small hydro, digester gas, landfill gas, and municipal solid waste. This account is intended to support the development and maintenance of existing renewable energy projects.
3. Emerging technologies account. The emerging technologies account is being allocated through a rebate program. Senate Bill 90, the enabling legislation for the emerging technologies account,
specifies that the eligible technologies under this account are photovoltaics, solar thermal electric, fuel cell technologies that use renewable fuels, and wind turbines up to 10 kW.

(4) Consumer side account. The consumer side account provides rebates to consumers who choose to buy green power from power marketers and marketing for renewables.

*Retail Electricity Disclosure Program and Green Labeling:* California’s energy suppliers must disclose to all customers the energy resource mix used in generation. Providers must use a standard label created by the California Energy Commission (CEC), and this information must be provided to end-use customers at least four times per year.

**COLORADO**

**Rules and Regulations**

*Aspen Electric - Net Metering:* Aspen Electric’s and Holy Cross Electric’s net metering policies allow customers to get full retail credit (7¢/kWh) for any net excess generation supplied to the grid. The two utilities have agreed to net meter the first 50 kilowatts of PV in their service territories. In addition, customers of Aspen Electric and Holy Cross Electric who install solar photovoltaic systems can now receive up to $4,000 in "solar production incentives." This program "Sun Power Pioneers" is sponsored by the Community Office for Resource Efficiency (CORE), in partnership with the City of Aspen and Holy Cross Energy. Sun Power Pioneers will earn 25 cents per kilowatt-hour for all the power their systems produce for four years.

*Fort Collins - Net Metering Rules:* Fort Collins Utilities offers net metering for solar energy systems up to 3 kW.

*Fuel Mix Disclosure:* Colorado is one of several states to require disclosure without having restructured its electricity market. In January 1999, the Colorado Public Utility Commission (PUC) adopted regulations requiring the state's investor-owned utilities to disclose information regarding their fuel mix to retail customers. Utilities with a total system load of more than 100 MW are required to provide this information as a bill insert or as a separate mailing twice annually, beginning October 1999.

*PSCo - Net Metering:* Public Service of Colorado's (PSCo) net metering tariff was approved by the Colorado Public Utility Commission in 1988. All customer sectors are eligible to participate, and there is no statewide limit to the amount of net metering generating capacity.

**FLORIDA**

**Financial Incentives**

*Gainesville - Solar Rebate Program:* Gainesville Regional Utilities (GRU) began the GRU Solar Rebate Program in early 1997 as part of its demand-side management initiatives. The program provides rebates to residential customers who replace their electric water heaters with solar units. The range for rebates is $150 to $450, depending on the size and cost of a unit.

*Lakeland Electric - Solar Water Heater Leasing Program:* Lakeland Electric offers its residential customers a pilot leasing program that replaces electric water heaters with metered solar water heaters at no cost for installation. The utility owns the solar water heater that it installs, and charges the customer for usage. A meter on the equipment determines the fee according to hot water use. An electric water heater is kept in the house as a backup for the system. After a certain number of years, Lakeland Electric will offer the customer the option to buy the solar water heater. The utility aims to fund up to one hundred test cases under this program.

*New Smyrna Beach Utilities Commission - PV Program:* The City of New Smyrna Beach Utilities Commission is helping residential customers to become owners of rooftop PV systems through a buydown incentive. The utility pays one-third of the cost of the installation, the Florida Solar Energy
Center pays one-third, and the homeowner pays one-third. At the current system cost, participants pay approximately $1.82/watt. This program has proven to be very popular and the Commission currently has a waiting list of 60 homeowners.

Rules and Regulations

Demand-Side Management (DSM) Programs Incorporating Renewables: The Florida Public Service Commission (FPSC) has set a goal of saving 1,300 MW of capacity and 1,800 GWh of energy by 2009 through the use of conservation and demand-side management measures. Florida’s five investor-owned electric utilities and two largest municipal utilities, Jacksonville Electric Authority and Orlando Utilities Commission, are required to perform conservation measures pursuant to the requirements of the Florida Energy Efficiency and Conservation Act of 1980. The FPSC is required to encourage the use of renewables as part of the demand side management programs.

Fuel Mix Disclosure: On March 30, 1999, the Florida Public Service Commission issued a rule requiring the state’s investor-owned electric utilities (which supply about 80-85% of the state’s customers) to provide information on their fuel mix to customers on a quarterly basis, effective April 18, 1999. Information must be provided either as a bill insert or on the bill itself and must be based on data available for the most recent 12-month period. Florida was the first state to institute an environmental disclosure requirement without restructuring its electricity market.

Jacksonville - Net Metering: JEA (formerly Jacksonville Electric Authority) offers net metering and will provide, at the customer’s expense, a second meter to measure energy deliveries to the utility.

New Smyrna Beach - Net Metering: New Smyrna Beach Utilities Commission offers net metering and follows the Florida Solar Energy Center and industry standards regarding standards of equipment.

GEORGIA

Rules and Regulations

On April 28, 2001, Governor Roy Barnes signed into law Georgia’s Cogeneration and Distributed Generation Act of 2001. While resembling a standard net metering law on the surface, Georgia’s legislation helps pave the way for a new relationship between utility and customer-generator by combining net metering with green pricing. The law draws from the work in many other states with the following typical net metering features:

- Eligible technologies include PV, fuel cells, and wind systems up to 10 kW for residential applications and 100 kW for commercial applications;
- Purchasing of energy continues until renewable capacity reaches 0.2% of the utility’s system peak;

The key to the law is the provision that power flows to and from the home are separately measured with the intent that customers will see added value because the utility can package the excess kilowatts as part of its green pricing offering. Georgia Power and the state’s other utilities have not yet established their green pricing program, and the green pricing tariffs still need to be filed.

Although this is the first state law designed to accommodate the net metering-green power symbiosis, this concept is already being used by at least four utilities: Tampa Electric Company (investor owned), the City of Ashland, Oregon, San Juan County, Washington, and the City of Aspen, Colorado.

ILLINOIS

Financial Incentives

Alternative Energy Bond Fund Program: This grant program funds capital projects of any renewable energy technology. Grants range from $60,000 to $1,000,000, and current appropriations for the program are $5 million.
Generating Solutions

Renewable Energy Resources Program Grants and Rebates: The Renewable Energy Resources Program (RERP) fosters investment in and the development and use of renewable energy resources within the state of Illinois. This program is funded by the Renewable Energy Resources Trust Fund, the state's public benefits fund and administered by the Illinois Department of Commerce and Community Affairs (Department). RERP distributes funds in the form of grants (for large systems) and rebates (for small systems).

Rules and Regulations

ComEd Wind and Photovoltaic Generation Pricing Experiment: In April 2000, Commonwealth Edison (ComEd), the investor-owned utility serving the city of Chicago and surrounding areas, established a special billing program that allows for net metering of photovoltaic and wind energy systems up to 40 kW. ComEd will pay the customer, on a monthly basis, the utility's avoided costs for any net excess generation. In addition, as an incentive for customers to participate in the program, ComEd will make an annual payment for the customer's total excess power put back into ComEd's system during the year (up to the amount of power the customer took from ComEd during the year). Customers will be paid at a rate representing the difference between the average avoided cost paid to the customer and the average retail rate paid by the customer during the year.

Fuel Mix and Emissions Disclosure: As part of its 1997 electric utility restructuring legislation, Illinois included provisions for the disclosure of fuel mixes and emissions by all retail suppliers of electricity in the state. Electric bills must list by percentage electricity supplied by the following sources: biomass power, coal-fired power, hydropower, natural gas-fired power, nuclear power, oil-fired power, solar power, wind power and other resources, respectively. These percentages must also be presented in the form of a pie chart on customer bills. Emissions information must also be provided by electric suppliers on a quarterly basis listing of the following pollutants: carbon dioxide, nitrous oxides, sulfur dioxide emissions, and nuclear waste.

Renewable Energy Resources Trust Fund and Clean Energy Community Trust (CECT): Through its 1997 electric utility restructuring law, the Illinois legislature created the Illinois Public Benefit Program. The overall program funds low-income rate assistance and weatherization, the Renewable Energy Resources Trust Fund, and the Energy Efficiency Program. The Renewable Energy Resources Trust Fund supports renewables through grants, loans, and other incentives administered by the Department of Commerce and Community Affairs. The ten year program is slated to end in 2007. In addition to the Renewable Energy Resources Trust Fund, a $250 million Clean Energy Community Trust Fund was established through a settlement with Commonwealth Edison. Of the $250 million, $200-225 million is being spent on programs for efficiency and renewables. The mechanisms the CECT is using include grants, loans, venture capital support, and other financial incentives.

Renewables Portfolio Goal: On June 22, 2001, Illinois Governor George H. Ryan signed legislation (HB 1599) creating the Illinois Resource Development and Energy Security Act. The legislation states as an explicit goal that at least 5% of the State's energy production and use be derived from renewable forms of energy by 2010 and at least 15% from renewable forms of energy by 2020. However, it does not include an implementation schedule, compliance verification, or credit trading provisions. HB 1599 also authorizes up to $500 million of new state revenue bonding to support the development of technologies for wind, biomass, and solar power in Illinois.

INDIANA

Financial Incentives

Alternative Power & Energy Grant Program: The Energy Policy Division (EPD) of the Indiana Department of Commerce offers this grant program to enable businesses and institutions to install and study alternative and renewable energy system applications. Businesses, non-profit institutions and units of local government (including public schools) are eligible to apply for grants. Eligible projects include non-transportation applications of solar, wind, geothermal, hydropower, alcohol fuels, waste-to-energy and biomass technologies. These applications may be applied to the direct generation of
electricity (for either on-site use or placement of power onto a utility grid), heating and/or cooling of
buildings, or the production of fuels.

**Indiana Biomass Grant Program:** This grant program was created to assist with research, development
and production of biomass energy systems. Goals include increasing the role of biomass in Indiana's
energy mix, deploying cost-effective biomass energy technologies and promoting private and public
sector investment in biomass technology and resources. Grants of up to $20,000 per project will be
available to successful applicants.

**Renewable Energy Demonstration Project Grants:** This program makes small-scale grants for projects
that demonstrate applications of renewable energy technologies.

**Rules and Regulations**

**Demand-Side Management (DSM) Programs Incorporating Renewables:** The Indiana Utility Regulatory
Commission's 1995 ruling on demand side management programs allows for the inclusion of renewable
energy systems in such utility programs. Renewable energy programs are treated in a similar manner as
efficiency in terms of utility cost recovery. This applies to all renewable energy technologies including
passive solar design.

**Net Billing Rules:** As part of the Indiana Utility Regulatory Commission's overall cogeneration and small
power production rules, Indiana has adopted net billing rules for generators producing less than 1,000
kWh per month. Indiana is the only state with net metering rules that has set the individual system
limit based on kilowatt hours (actual output) instead of kilowatts (rated capacity). Qualifying facilities
must be renewable energy generators including waste methane recovery systems. There is no
statewide limit on the total capacity that may be generated by qualifying facilities engaged in net
metering. For generators producing less than 1,000 kWh per month, net excess generation is granted to
the utilities. For systems producing more than 1,000 kWh per month, generators can request that the
utility purchase the net generation, in which case two meters are installed. Thus far, this program has
been used primarily by owners of small wind turbines.

**IOWA**

**Financial Incentives**

**Alternate Energy Revolving Loan Program:** The Alternate Energy Revolving Loan Program (AERLP) is
administered by the Iowa Energy Center at Iowa State University and funded by the state’s investor-
owned utilities. The AERLP provides loans to any individual or organization who wants to build
renewable energy production facilities in Iowa. Renewable energy includes technologies such as solar,
biomass, wind, and hydro. Successful applicants receive a single, low-interest loan that consists of a
combination of AERLP funds and lender-provided funds. The AERLP provides 50% of the total loan, up to
a maximum of $250,000 at 0% interest.

**Grants for Energy Efficiency and Renewable Energy:** This is a competitive grants program sponsored by
the Iowa Energy Center. Research grants are awarded in three categories: renewable energy, energy
efficiency, and information transfer.

**Rules and Regulations**

**Alternative Energy Law:** This law requires investor-owned utilities to purchase a combined total of 105
MW of their generation from renewable and small hydropower sources. The Iowa Utilities Board has
allocated the one hundred five megawatts among the state's three investor-owned utilities -- Mid-
American, IES Utilities, and Interstate Power -- based upon each utility's percentage of the total Iowa
retail peak demand. This requirement is being met mostly with wind power and biomass applications.

**Mandatory Utility Green Power Option:** Iowa enacted a statute requiring all electric utilities operating
in the state, including those not rate regulated by the Iowa Utilities Board (IUB), to offer green power
options to their customers beginning January 1, 2004. The statute requires utilities to offer programs
that allow customers to make contributions to support the development of alternate (renewable) energy sources in Iowa. Utilities must then file program plans and tariff schedules with the IUB.

*Net Metering:* Created by the Iowa Utilities Board in 1983, Iowa’s net metering rule allows customers with alternative energy generation systems to sell electricity to their investor-owned utilities on a netted basis against their metered retail usage. An Iowa district court order (issued 8/24/99) currently prevents the IUB from enforcing its net metering rule.

**LOUISIANA**

Louisiana has no significant financial incentives or regulations encouraging development of renewable energy.

**MAINE**

*Rules and Regulations*

**Customer Net Energy Billing:** Since 1987, Maine’s Public Utility Commission Code provided for net metering for the state’s qualified facilities with a maximum capacity of 100 kW.

**Fuel Mix and Emissions Disclosure:** Maine’s restructuring legislation called for the state’s Public Utility Commission (PUC) to establish disclosure rules for retail electric billing and required that the Commission consider the use of standard billing information. This rule requires electric service providers to distribute uniform disclosure labels to their customers prior to the initiation of service and then on a quarterly basis. The label must disclose specified information about price, price variability, fuel mix and emissions.

**Public Benefits Program:** The Maine public benefits program was enacted as part of the state’s 1997 electric restructuring law. In general, the law provides funding for energy efficiency and low-income assistance programs based on 1999 levels. Renewables receive funding only through voluntary customer contributions. Despite there being no mandated funding level for renewables as part of the Maine public benefits program, the law directed the MPUC to develop a voluntary program allowing consumers to contribute to a renewable energy program. Funds from this program can go toward renewable energy R&D at the University of Maine System, the Maine Maritime Academy, or the Maine Technical College System. The MPUC has ruled that utilities must offer customers the option to check off a contribution of $1, $5, $10 or other amount each month on their electric bill. At least every six months, each utility must notify customers about the existence, purpose, means to contribute to the fund, and summaries of the projects that have been funded.

**Renewables Portfolio Standard:** The State of Maine Public Utility Commission adopted a Renewable Resource Portfolio Requirement rule on September 28, 1999 and became effective November 4, 1999. The rule requires electric providers to supply at least 30% of their total retail electric sales in Maine with electricity from eligible renewable resources. Eligible resources must be a “small power production facility” that produces electricity using only a primary energy source of biomass, waste, renewable resources, or a combination of these resources and has a production capacity of 80 megawatts or less including any other facilities at the same site. A renewable resource may also be a generation facility of 100 MW or less that uses fuel cells, tidal power, solar arrays and installations, wind power installations, geothermal installations, hydroelectric generators, biomass generators, or generators fueled by municipal solid waste in conjunction with recycling.

**MICHIGAN**

*Rules and Regulations*

**Fuel Mix and Emissions Disclosure:** Michigan’s Customer Choice and Electric Reliability Act of 2000 directs the Michigan Public Service Commission (MPSC) to establish a standard format for disclosure, explanations, or sales information disseminated by electric suppliers. Starting January 1, 2002, all
electric suppliers must disclose on the customer's bill, a bill insert, or customer contracts, or, for
cooperatives, periodicals issued by an association of rural electric cooperatives, information about the
environmental characteristics of electricity products, including the average fuel mix, including
categories for oil, gas, coal, solar, hydroelectric, wind, biofuel, nuclear, solid waste incineration,
biomass, and other fuel sources; the average emissions of sulfur dioxide, carbon dioxide, and oxides of
nitrogen; the average of the high-level nuclear waste generated; and the regional average fuel mix
and emissions.

**MONTANA**

Financial Incentives

*Alternative Energy Revolving Loan Account:* The alternative energy revolving loan account provides
loans to individuals and small businesses for the purpose of building alternative energy systems for
residences and small businesses to generate energy for their own use and for net metering.

*Commercial or Net Metering System Investment Credit—Alternative Energy Systems:* This statute
allows a 35% tax credit for an individual, corporation, partnership, or small business corporation which
makes an investment of $5,000 or more in a commercial system or a net metering system that
generates energy by means of an alternative renewable energy source.

*Residential Geothermal Systems Credit:* This statute allows residents to claim an income tax credit of
up to $1,500 for the installation cost of a geothermal energy system in their principal dwelling.

*Wind Energy System Credit:* This statute allows a 35% tax credit for an individual, partnership or
corporation which makes an investment of $5,000 or more in a wind electricity generating system or
facilities to manufacture wind energy equipment.

Rules and Regulations

*Fuel Mix and Emissions Disclosure:* Montana's 1997 restructuring law called for the disclosure of fuel
mix and environmental impact information. Regulations proposed by the Montana Department of Public
Service Regulation on November 8, 1999, have yet to be implemented. The proposed environmental
disclosure regulations would require retail electricity suppliers to disclose information on fuel mix and
emissions in a standard format at least twice a year along with product offers and advertisements.
Retail suppliers are also required to disclose carbon dioxide, sulfur dioxide, and nitrogen oxides
emissions as well as the amount of spent nuclear fuel generated compared to the regional average, as
represented by net system power.

*Mandatory Utility Green Power Option:* Montana has passed legislation requiring regulated electric
utilities to offer their customers an opportunity to purchase "a separately marketed product composed
of power from renewable resources," defined as biomass, wind, solar, or geothermal resources.

*Net Metering:* Montana's net metering law, enacted July 1, 1999, allows net metering for customers
with solar, wind, and hydropower systems of 50 kilowatts or less that are intended primarily to offset
part or all of the customer's requirements for electricity. Net excess generation is credited to the
customer's next monthly bill.

*Universal System Benefits Program:* As part of its 1997 restructuring legislation, Montana established
its Universal System Benefits Program (USBP). Beginning January 1, 1999, all electricity suppliers began
annually contributing 2.4% of their 1995 revenues to the USBP. This is an amount equivalent to $14.9
million annually. The funds support energy efficiency, renewable energy resources, low-income energy
assistance, and renewable energy R&D.

**NEVADA**

Financial Incentives
Boulder City Public Works - Energy Efficient Appliance Program: The Conservation Department of the City of Boulder City Public Works offers renewable energy rebates to its customers under its Energy Efficient Appliance Program. Both commercial and residential customers located in Boulder City, NV, are eligible for this program. These rebates only cover conversions from existing electric water heaters to solar water heaters. The utility offers $200 from its own funding reserves for each forty-gallon tank that is replaced.

Rules and Regulations
Disclosure: Beginning January 2002, each electric utility must disclose certain information to its customers in a standard format, provided in bill inserts twice a year, as well as on utility websites. The disclosure must include the average mix of fuel sources used to create electricity, average emissions, customer service information, and information on low-income energy programs.

Net Metering: This law allows net metering for those customers with solar and wind generation units of 10 kW or less.

Renewable Portfolio Standard: As part of its 1997 restructuring legislation, the Nevada legislature established a renewable portfolio standard. Under the standard, the Utilities must derive a minimum percentage of the total electricity they sell from renewable energy resources. In 2001, the legislature revised the minimum amounts to increase by 2% every 2 years, starting with a 5% renewable energy requirement in 2003 and achieving a 15% requirement by 2013 and each year thereafter. Not less than 5% of the renewable energy must be generated from solar renewable energy systems. Beyond solar, qualifying renewable energy resources include wind, geothermal, and biomass that occurs naturally or that is regenerated.

NEW HAMPSHIRE

Financial Incentives
Renewable Energy Technology Grants Program: The Renewable Energy Technology Grants Program, administered by the Governor’s Office of Energy and Community Services, offers a small number of grants of up to $5,000 for renewable energy projects to non-profit organizations and businesses with fewer than 25 employees.

Rules and Regulations
Net Metering: On June 25, 1998, Governor Shaheen signed into law a net metering bill which directs all utilities selling power in New Hampshire to credit homeowners and small businesses that generate a portion of their own electricity through wind turbines, solar (photovoltaic) electric systems or hydro power. On January 12, 2001 the New Hampshire Public Utilities Commission approved net metering and interconnection rules for homeowners and small businesses with grid-tied renewable energy systems under 25kw in size. Customers generating more electricity than they use in a given billing period receive credit for excess power generated.

NEW MEXICO

Rules and Regulations
Fuel Mix and Emissions Disclosure: As part of New Mexico’s Electric Utility Industry Restructuring Act of 1999, the legislature requires the NM Public Regulation Commission (PRC) to “promulgate rules governing competitive electric suppliers for the protection of customers, including required disclosure to a potential customer of unbundled prices, generation sources and fuel mix, and associated emissions.”

Net Metering: The New Mexico Public Regulation Commission Rule 571 differs from the NM Administrative Code as Title 17.10.571. The Rule 571 details a net metering calculation that credits net energy generation to the consumer from month to month. Annually the excess credit is zeroed out. The administrative code offers a second option for calculating the net energy generation credit which
essentially pays the customer the utilities avoided cost, “crediting or paying the customer for the net energy supplied to the utility at the utility’s energy rate pursuant to NMPRC Rule 570.17.” The utility gets to choose which method they want to use.

Renewable Portfolio Standard: As part of New Mexico’s “Electric Utility Industry Restructuring Act of 1999” the legislature required the Public Regulation Commission (PRC) to examine a renewable portfolio standard for the state. In May 2000, the PRC issued an order calling for retail electric suppliers to meet 5% of their standard offer service with renewables. Eligible renewables must come from New Mexico and include wind, solar, geothermal, biomass, hydropower and fuel cells. It has been estimated by the Land and Water Fund of the Rockies (LAW) that the RPS will lead to 60 to 120 MW of new renewable energy for New Mexico. However, the PRC also ruled that compliance with the RPS is waived if the RPS would result in the cost of electricity increasing more than $0.001 per kWh.

System Benefits Charge: As part of New Mexico’s “Electric Utility Industry Restructuring Act of 1999” the legislature created the Electric Industry System Benefits Fund for renewable energy, customer education, and low-income assistance. The fund is created through a charge of 0.03¢/kWh beginning January 1, 2002 and doubling in 2007. The funds will support renewable energy up to $4 million to be used by school districts, cities, towns, villages, or counties. Renewable technologies to be supported include solar, wind, geothermal, biomass, landfill gas, and hydropower.

NORTH DAKOTA

Financial Incentives
Geothermal, Solar, and Wind Credit: This statute allows any taxpayer - individual or corporation - to claim an income tax credit of 3% per year for five years for the cost of equipment and installation of a geothermal, solar, or wind energy device.

Large Wind Property Tax Incentive: North Dakota modified its property tax incentives for large wind systems with its 2001 bill that reduces property taxes by 70% for wind facilities of 100 kW or larger.

Rules and Regulations
Net Metering: Passed in 1991 by the North Dakota Public Utility Commission, this net metering ruling applies to both renewable energy generators and cogenerators up to 100 kW in capacity. When customers have excess generation in a monthly billing period, utilities must purchase net excess generation at the avoided cost.

OHIO

Financial Incentives
Renewable Energy Loans: The Ohio Energy Efficiency Revolving Loan Fund will take effect in the first quarter of 2002. Established by the Ohio General Assembly in 1999, the Fund was created to provide an incentive for purchasing and implementing energy-efficient and renewable energy projects. It reduces the interest rate--by approximately half--on standard bank loans for those qualifying Ohio residents and businesses that borrow money to implement energy efficiency or renewable energy projects.

Rules and Regulations
Fuel Mix and Emissions Disclosure: On April 6, 2000, the Ohio Public Utilities Commission adopted rules requiring electricity suppliers to disclose environmental information to retail customers in accordance with the state’s 1999 restructuring law. As of January 2001, retail providers must disclose fuel mix and emissions data for each electricity product offered. Fuel mix and carbon dioxide, sulfur dioxide, and nitrogen oxides emissions must be presented relative to the regional average. The amount of high-level and low-level radioactive waste generated must also be disclosed.
Net Metering: Enacted in 1999, Ohio's net metering rule requires utilities to offer a net metering option to customer-generators who own qualifying systems. Qualifying systems include wind, solar, biomass, landfill gas, hydropower, fuel cells and microturbines and must be intended primarily to offset part or all of the customer-generator's requirements for electricity.

Energy Efficiency Revolving Loan Fund Program: Ohio's 1999 electric restructuring law created the Energy Efficiency Revolving Loan Fund and Universal Service Board which consolidate low-income assistance programs and create a weatherization program targeted at low-income housing. The Fund will collect $100 million over 10 years to provide loans at below market rates or loan guarantees for energy efficiency improvements undertaken by residential, government, educational, small commercial, small industrial, or agricultural customers. Renewable energy projects are also eligible for loans through the fund.

OREGON

Financial Incentives
Ashland Electric - The Bright Way to Heat Water: The City of Ashland’s Electric Utilities Department offers a solar water heating program to its residential customers who are currently using an electric water heater. Under “The Bright Way to Heat Water Program,” qualified home owners may take advantage of the City’s zero-interest loan program or a cash rebate. The rebate amount varies depending on a system’s energy savings. The State of Oregon also offers residents with solar systems a renewable energy tax credit that is deducted from a person’s income tax bill.

Business Energy Tax Credit: Oregon’s Business Energy Tax Credit is for investments in energy conservation, recycling, renewable energy resources, or less-polluting transportation fuels. Any Oregon business may qualify.

Residential Energy Tax Credit: The Residential Energy Tax Credit is for premium-efficiency appliance and duct systems, closed-loop geothermal space or water heating systems, solar water and space heating systems, photovoltaics, wind, fuel cells, and alternative fuel vehicles and charging or fueling systems.

Utility Independent Home Rebate Program: The Oregon Office of Energy offers financial and technical support for people interested in buying a solar electric system for their home. In addition to the residential tax credits, the Oregon Office of Energy offers a rebate of up to $2,000.

Rules and Regulations
Ashland - Net Metering: In 1996, a net metering law was passed in Ashland which established a simple grid interconnection policy. It encourages solar systems by allowing net metering and committing the City to purchase, at full retail price, up to 1,000 kWs of excess electricity per month from small wind or solar generation resources.

Fuel Mix and Emissions Disclosure: Under Oregon’s 1999 electric utility restructuring legislation, electricity suppliers will be required to disclose their fuel mix and emissions beginning March 1, 2002. Power source and environmental impact information must be provided to all residential consumers at least quarterly. Power source information must be reported as the percentages of the total production supply, including coal, hydroelectricity, natural gas, nuclear, and other fuels. Pollutants that must be disclosed include carbon dioxide, sulfur dioxide, and nitrogen oxides.

Net Metering: Oregon's net metering law, passed July 1999, allows net metering for customers with solar, wind, or hydropower systems up to 25 kW.

Public Benefits Funds: Oregon’s 1999 utility restructuring legislation included a 3% public benefits charge to be paid by all electricity users. The charge is expected to generate about $60 million per year over the next 10 years for renewable resources, energy conservation and market transformation,
low income weatherization programs, and school energy programs. An additional $10 million was also authorized for assistance to low-income customers.

**PENNYSYLVANIA**

Financial Incentives

*Solar PV Grant Program*: The Sustainable Development Fund offers grants for PV systems that are purchased by PECO Energy distribution company customers.

Rules and Regulations

*Fuel Mix Disclosure*: In April 1998, the Pennsylvania Public Utility Commission (PUC) issued final rules requiring retail electricity suppliers to “respond to reasonable requests made by consumers for information concerning generation energy sources.” Suppliers must respond to these requests “by informing consumers that this information is included in the annual licensing report and that this report exists at the Commission.”

*Net Metering*: Pennsylvania's 1998 net metering rule covers all renewable electric technologies and fuel cells up to 10 kW and is available to all customer classes. Net excess generation at the end of each month is granted to the utility.

*Public Benefits Programs*: Pennsylvania's December 1996 electricity restructuring law did not establish renewable energy funds and did not set a specific funding level for low-income and energy efficiency programs. (However, it did require that low-income and energy efficiency programs be maintained at current levels or higher.) Renewables funding programs were subsequently created through individual settlements with the state’s major distribution utilities: General Public Utilities (GPU), West Penn Power Company, PECO, and Pennsylvania Power & Light (PP&L). Each utility created its own “Sustainable Energy Fund” with the goals of promoting (1) the development and use of renewable energy and advanced clean energy technologies, (2) energy conservation and efficiency, and (3) sustainable energy businesses. Each utility has established an oversight board and designated a fund administrator.

*Renewable Portfolio Standard*: Pennsylvania’s December 1996 electricity restructuring law did not establish a renewable portfolio standard. But, as with the state’s public benefits funds for renewables, an RPS was subsequently established through individual utility restructuring settlements. Twenty percent (20%) of all residential customers have to be assigned to a provider of last resort-default supplier other than their local electrical distribution company (EDC). The Competitive Default Service (CDS) bidding process is being used to select the Energy Generator Supplier (EGS), and in order to qualify for the CDS bidding process EGSs must supply at least 2.0% renewables increasing by 0.5% each year. Eligible renewables include photovoltaic, solar thermal, wind, low head hydro, geothermal, landfill and mine-based methane gas, and energy from waste and sustainable biomass. The start dates for the Competitive Default Service bidding processes are: 6/1/00 for General Public Utilities (GPU), 6/1/01 for PECO and West Penn Power, and 6/1/02 for Pennsylvania Power & Light (PP&L).

**TEXAS**

Financial Incentives

*Austin Energy - Home Energy Air Conditioning and Appliance Rebates*: The Home Energy Air Conditioning and Appliance Rebate program offers customers a rebate on solar water heaters and energy-efficient equipment, such as heat pump water heaters, heat recovery water heaters, and package air conditioners and heat pumps.

*Solar and Wind-Powered Energy Systems Exemption*: This statute exempts taxpayers from any value added by a qualified renewable energy source for property tax purposes. Qualified equipment includes any active solar equipment and any wind devices, as well as transmission equipment.
Rules and Regulations

**Alternative Energy in New State Construction:** Texas state law requires state government departments to compare the cost of providing energy to new state government office buildings from alternative energy sources. "Alternative energy" means a renewable energy resource and includes solar energy, biomass energy, and wind energy. If the use of alternative energy devices for a particular function (including space heating and cooling, water heating, electrical loads, and interior lighting) is economically feasible, then the use of alternative energy devices must be included in construction plans.

**Fuel Mix and Emission Disclosure:** The following disclosure information must be contained on an Electricity Facts label: (1) pricing; (2) contract terms (minimum contract term and early termination penalties, if any); (3) fuel mix (table showing percentages of net system power generated by coal and lignite, natural gas, nuclear, renewable energy [comprising biomass power, hydro power, solar power, and wind power], and other sources); and (4) air emissions and waste (bar chart showing the amounts of carbon dioxide, nitrogen oxide, sulfur dioxide, particulate emissions, and nuclear waste attributable to the aggregate known sources of electricity).

**Net Metering:** Texas's net metering rule was established by the Public Utility Commission of Texas in an effort to promote small wind power and photovoltaic generation in the state. The order requires utilities to offer a net metering option to qualified facilities of 50 kW or less that use renewable resources.

**Renewable Generation Requirement:** On December 16, 1999, the Public Utility Commission of Texas issued the Renewable Energy Mandate Rule. This standard establishes the state’s renewable portfolio standard, a renewable energy credits trading program (trading program), and defines the renewable energy purchase requirements for competitive retailers in Texas. The standard calls for 2,000 MW of new renewables to be installed in Texas by 2009, which is in addition to the 880 MW of existing renewables generation. Qualifying renewable energy sources include solar, wind, geothermal, hydroelectric, wave or tidal energy, or biomass or biomass-based waste products, including landfill gas.

**WASHINGTON**

**Financial Incentives**

**Plug and Play Off-Grid PV Buydown:** The Washington State 5,000 Solar Rooftops by 2005 Collaborative is introducing four pre-packaged, pre-engineered modular systems. Purchasers of up to one hundred of these off grid 'Plug and Play' solar electric systems will be awarded rebates by the Collaborative. Participants will receive a 25% rebate upon satisfactory installation of a solar electric system purchased under this program. These rebates are available to any Washington state resident.

**Whatcom 1000 Solar Rooftop Project:** This revolving loan fund makes solar electric systems (grid-tied photovoltaic solar panels and solar thermal hot water systems) affordable to home and business owners in Whatcom County, Washington. The Whatcom 1000 Solar Rooftop Project makes funds available at a low interest rate for up to a 25-year loan repayment period. The maximum loan per site is $5,000.

**Rules and Regulations**

**Disclosure:** Washington is one of several states that requires disclosure even though its electricity market has not been restructured. Beginning in May 2001, retail electricity suppliers in Washington must provide a disclosure label in a standard format to their retail customers at least semiannually. Disclosure of fuel mix information must be in a two-column, tabular format showing the percentages of each category of fuel used, including categories for coal, hydroelectric, natural gas, nuclear, and other generation identified by percentage and adding up to 100%.

**Mandatory Utility Green Power Option:** On May 8, 2001, the Governor signed EHB 2247, which requires investor and publicly owned utilities to offer customers the option to purchase power generated from renewable sources - defined as produced by wind, solar, geothermal, landfill gas, wave or tidal action.
wastewater treatment gas, some biomass and "qualified hydropower" that is fish-friendly. This offering will begin by January 2002.

Net Metering: Washington's net metering law, enacted March 1998, allows net metering for customers with solar, wind, and hydropower systems of 25 kW or less that are intended primarily to offset part or all of the customer's requirements for electricity. Net excess generation is credited to the customer's next monthly bill.

**Wisconsin**

Financial Incentives

**Renewable Energy Assistance Program (REAP):** The Wisconsin Energy Bureau in Madison administers this program, which consists of grant funds for renewable energy systems incorporated into construction projects. Construction grants fund 10-20% of a project up to $75,000 and are performance based whereby half of the grant is available on equipment purchase and the other half is available upon project completion. All renewable energy technologies are eligible for these grants though the majority of the projects funded have been wood energy projects with some hydropower and biogas.

**Wisconsin Municipal Utility Solar Energy Cash Allowance:** Some of Wisconsin's municipal utilities support customer use of solar energy by providing cash incentives for qualifying projects. The solar incentives vary from community to community but may include up to:
- $1/watt installed for PV systems (maximum incentive of $1,000).
- $15/ft² of collector area for new solar hot water systems (maximum incentive of $1000).
- 50% of the repair cost for existing solar hot water systems (maximum incentive of $500).

Rules and Regulations

**Madison - Energy Management Strategy:** The City of Madison is one of more than 290 cities and counties around the world in the International Council for Local Environmental Initiatives (ICLEI) Cities for Climate Protection Campaign. With grant funding from ICLEI, the City developed a Climate Protection Plan. Among its strategies to reduce greenhouse gas emissions are plans to add a renewable energy source to one city building and to develop a green building program.

Net Metering: Net metering for customer-owned systems up to 20 kW was originally authorized by the Public Service Commission of Wisconsin through its January 1, 1993 ruling. Net metering is available to all customer classes and to customers of any utility type - municipal, cooperative, and investor-owned. All technologies--not just renewables and cogeneration units--are eligible. If a customer-generator operates a renewable energy facility, then the utility pays the retail rate for net excess generation; for non-renewable generation sources, the utility pays their avoided cost for net excess generation. Wisconsin Electric, one of the state's electric utilities, has reported that they have roughly seventy customers with eligible generating facilities.

**Public Benefits Fund:** With its October 1999 “Reliability 2000” law, Wisconsin became the second state to establish a public benefit fund without deregulating its electric utility industry. The Wisconsin public benefits fund provides funds for the state to award grants for (1) low income programs and (2) energy efficiency and renewable energy services.

**Renewable Portfolio Standard:** The Wisconsin renewable portfolio standard (RPS) became effective October 27, 1999 making Wisconsin the first state to have a RPS in advance of retail competition. Wisconsin’s RPS calls for generating 2.2% of the state’s energy from renewable sources by 2010. Qualifying renewables include fuel cells that use a renewable fuel, tidal or wave action, solar thermal electric or photovoltaic energy, wind power, geothermal technology, biomass, and hydro power (less than 60 MW). A credit trading program has been established such that electric service providers may sell to other electric providers renewable credits for any renewable energy in excess of the percentage specified for a given year.
APPENDIX B. METHODOLOGY

Renewable Energy Potential. The report’s state by state information on generation potential from renewable sources is based on data compiled by the Union of Concerned Scientists (UCS) from government agencies and laboratories, including the National Renewable Energy Laboratory. UCS used the National Energy Modeling System, maintained by the Energy Information Agency, to determine each state’s renewable energy potential by source. For a detailed explanation of the modeling assumptions, see the UCS report Clean Energy Blueprint.

Biomass. UCS collected its biomass data from the Oak Ridge National Laboratory. The numbers presented for each state’s clean biomass potential exclude urban waste, due to concerns about the environmental impact of municipal waste incineration. The data assumes biomass priced at $50 per dry ton.

Wind. UCS collected the data on wind power from the National Renewable Energy Laboratory (NREL), which includes Class 3, 4, 5, and 6 wind areas in its estimates of total wind potential. NREL bases its estimates on assumptions about how much land will be available for wind development and excludes urban areas and environmentally sensitive areas from its calculations. In addition, NREL’s wind data only includes wind potential within 20 miles of existing transmission infrastructure. For more information on NREL’s methodology, you can visit the U.S. Department on Energy, Energy Efficiency and Renewable Energy Network, State Energy Alternatives website at http://www.eren.doe.gov/state_energy.

Landfill Gas. UCS based its landfill gas estimates on data collected by the Environmental Protection Agency’s landfill methane outreach program.

Solar. This report uses estimates about the potential for solar generation compiled by the U.S. Department of Energy’s Energy Efficiency and Renewable Energy Network and collected by the National Renewable Energy Lab in collaboration with the National Conference of State Legislatures. We chose not to include data about each state’s total potential generation from solar energy; economic complexities of the solar industry and difficult assumptions about space available now and in the future for solar energy made accurate projections difficult at this time. Instead, this report uses small-scale potential as a snapshot of each state’s solar resources.

Homes Powered by Potential Renewable Energy Generation. To calculate the number of homes powered by each state’s potential generation from renewable resources, we first calculated the average electricity (measured in kilowatt-hours) used by the average home in each state. NREL’s solar data includes state-by-state estimates of how many homes a football-field sized flat plate collector system would power. We divided the state’s estimated solar generation potential from this collector system by NREL’s estimated number of homes powered to obtain for each state how many kilowatt-hours of electricity are needed to power the average home in that state. After obtaining that number (measured in kilowatt-hours per home) for each state, we then divided that into each state’s total potential for renewable energy generation (measured in million of kilowatt hours). We multiplied the final number by one million to arrive at the total number of homes that could be powered from renewable energy in each state.
## Appendix C. State Renewable Energy Potential (By Source)

All numbers are in millions of kilowatt-hours (kWh). Refer to Appendix B for a detailed description of the methodology and sources used to compile this data.

<table>
<thead>
<tr>
<th>State</th>
<th>Wind Potential</th>
<th>Geothermal Potential</th>
<th>Landfill Gas Potential</th>
<th>Clean Biomass Potential</th>
<th>TOTAL (mill. kWh)</th>
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</thead>
<tbody>
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<td>State</td>
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</tbody>
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END NOTES

4 Clean Energy: Jobs for America’s Future. Tellus Institute. October 2001: 11. These numbers are the results of looking at net benefits from implementing renewable and efficiency policies. Any potential job losses in the coal and traditional utility sector were subtracted from the expected gains. They are broken down from the national numbers in various sectors and calculated as if the results would be evenly distributed amongst the states. Text available at http://www.worldwildlife.org/climate/clean_energy_jobs.pdf.
5 The Economic Impacts of Renewable Energy Use in Wisconsin, Wisconsin Energy Bureau. For complete text email energy@doa.state.wi.us or call the WI Energy Bureau at (608) 266-8234.
12 Information on how solar energy works was collected from the Department of Energy’s Efficiency and Renewable Energy Network (EREN), located at http://www.eren.doe.gov/state_energy/technologies.cfm.
14 Glossary of Terms published by Dr. James Schombert professor at the University of Oregon Physics Department located at http://zebu.uoregon.edu/~js/glossary/photoelectric_effect.html For a demonstration of how this works visit http://wigner.byu.edu/Photoelectric/Photoelectric.html
15 Information on how wind energy works was collected from the Department of Energy’s Efficiency and Renewable Energy Network (EREN), located at http://www.eren.doe.gov/state_energy/technologies.cfm.
20 Unless otherwise noted, information about biomass was collected from Energy Efficiency and Renewable Energy Network (EREN), located at http://www.eren.doe.gov/state_energy/technologies.cfm.
22 Information on how landfill gas works was collected from the Department of Energy’s “Using Landfill Gas for Energy: Projects that Pay”, located at http://www.eren.doe.gov/cities_counties/landfil.html.
23 Energy Information Administration, www.eia.doe.gov. The definition of renewables in DOE data includes geothermal, wood, wind, photovoltaic, solar energy and biomass. Note that DOE’s definition of biomass includes...
municipal solid waste, which U.S. PIRG and the State PIRGs do not consider a clean, renewable resource. However, for the purpose of presenting the state’s energy mix, it was not possible to separate municipal solid waste from clean biomass.

24 “Dirty” energy in this context includes fossil fuels (petroleum, gas and coal), nuclear power and hydroelectric power.

25 Renewable potential based on analysis completed by the Union of Concerned Scientists. Numbers for biomass may differ slightly from the UCS analysis; U.S. PIRG deducted potential energy derived from urban waste from the total for biomass potential. The analysis for number of homes powered by the potential renewable energy is based on National Renewable Energy Laboratory estimates for how many kilowatt-hours it takes to power a home (slightly less than 10,000 kWh).

26 Clean Energy: Jobs for America’s Future. Tellus Institute. October 2001: 11. These numbers are the results of looking at net benefits from implementing renewable and efficiency policies. Any potential job losses in the coal and traditional utility sector were subtracted from the expected gains. They are broken down from the national numbers in various sectors and calculated as if the results would be evenly distributed amongst the states. Text available at http://www.worldwildlife.org/climate/clean_energy_jobs.pdf.


29 “Dirty” energy in this context includes fossil fuels (petroleum, gas and coal), nuclear power and hydroelectric power.

30 Energy Information Administration, www.eia.doe.gov. The definition of renewables in DOE data includes geothermal, wood, wind, photovoltaic, solar energy and biomass. Note that DOE’s definition of biomass includes municipal solid waste, which U.S. PIRG and the State PIRGs do not consider a clean, renewable resource. However, for the purpose of presenting the state’s energy mix, it was not possible to separate municipal solid waste from clean biomass.

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32 Clean Energy: Jobs for America’s Future. Tellus Institute. October 2001: 11. These numbers are the results of looking at net benefits from implementing renewable and efficiency policies. Any potential job losses in the coal and traditional utility sector were subtracted from the expected gains. They are broken down from the national numbers in various sectors and calculated as if the results would be evenly distributed amongst the states. Text available at http://www.worldwildlife.org/climate/clean_energy_jobs.pdf.


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Iowa Department of Natural Resources, [http://www.state.ia.us/dnr/energy/pubs/renewable/rcase/rcase01.htm](http://www.state.ia.us/dnr/energy/pubs/renewable/rcase/rcase01.htm).

Iowa Department of Natural Resources, [http://www.state.ia.us/dnr/energy/pubs/renewable/rcase/rcase02.htm](http://www.state.ia.us/dnr/energy/pubs/renewable/rcase/rcase02.htm).

Iowa Department of Natural Resources, [http://www.state.ia.us/dnr/energy/pubs/renewable/rcase/rcase07.htm](http://www.state.ia.us/dnr/energy/pubs/renewable/rcase/rcase07.htm).

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81 *Clean Energy: Jobs for America’s Future.* Tellus Institute. October 2001: 11. These numbers are the results of looking at net benefits from implementing renewable and efficiency policies. Any potential job losses in the coal and traditional utility sector were subtracted from the expected gains. They are broken down from the national numbers in various sectors and calculated as if the results would be evenly distributed amongst the states. Text available at [http://www.worldwildlife.org/climate/clean_energy_jobs.pdf](http://www.worldwildlife.org/climate/clean_energy_jobs.pdf).


83 Endless Energy website, [www.endlessenergy.com](http://www.endlessenergy.com).

84 “Dirty” energy in this context includes fossil fuels (petroleum, gas and coal), nuclear power and hydroelectric power.

85 Energy Information Administration, [www.eia.doe.gov](http://www.eia.doe.gov). The definition of renewables in DOE data includes geothermal, wood, wind, photovoltaic, solar energy and biomass. Note that DOE’s definition of biomass includes municipal solid waste, which U.S. PIRG and the State PIRGs do not consider a clean, renewable resource. However, for the purpose of presenting the state’s energy mix, it was not possible to separate municipal solid waste from clean biomass.

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88 DTE Energy website, [www.dteenergy.com](http://www.dteenergy.com).


90 “Dirty” energy in this context includes fossil fuels (petroleum, gas and coal), nuclear power and hydroelectric power.

91 Energy Information Administration, [www.eia.doe.gov](http://www.eia.doe.gov). The definition of renewables in DOE data includes geothermal, wood, wind, photovoltaic, solar energy and biomass. Note that DOE’s definition of biomass includes municipal solid waste, which U.S. PIRG and the State PIRGs do not consider a clean, renewable resource. However, for the purpose of presenting the state’s energy mix, it was not possible to separate municipal solid waste from clean biomass.

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130 http://www.eren.doe.gov/cities_counties/landfil.html.

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Lists of what state incentives are in place were all generated from the Database of State Incentives for Renewable Energy (DSIRE) located at [http://www.ies.ncsu.edu/dsire/summarytables/reg1.cfm?&currentPageID=7](http://www.ies.ncsu.edu/dsire/summarytables/reg1.cfm?&currentPageID=7).

“A Federal System Benefit Fund: Assisting States to Operate Efficiency, Renewable Low Income Programs,” presentation by Steve Nadel, Executive Director, American Council for an Energy-Efficient Economy.

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