Fact Sheet: Renewable Energy Certificates

Renewable Energy Certificates (RECs) are a renewable energy product that every U.S. business, college, non-profit organization, government agency and individual can purchase to reduce the environmental impact of everyday activities. Purchasing RECs is an effective way to *green up* electricity and *avoid carbon dioxide emissions*.

Renewable Energy Certificates (RECs), also known as Green Tags, are tradable environmental commodities that represent proof that one (1) megawatt-hour (MWh) of electricity was generated from an eligible renewable energy source. These sources include projects that use the sun, wind, water and biomass to generate electricity, in contrast to nonrenewable sources that rely on conventional fuels such as coal, oil and natural gas.

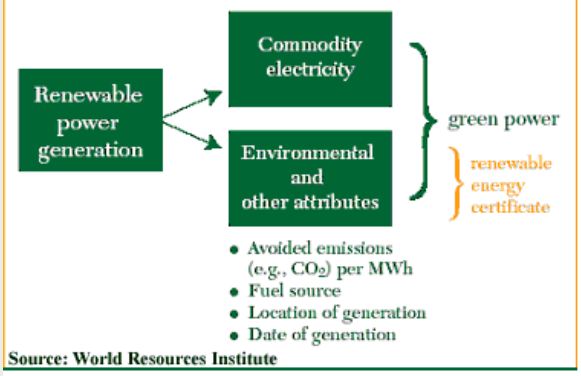
Renewable power projects generate more than electricity. Each MWh of power generated from renewable sources means there is one less MWh of electricity from conventional sources, which are mostly fossil fuels. By avoiding electricity generated from fossil fuels, renewable power plants reduce the emissions of carbon dioxide, particulate matter and other pollutants that fossil-fueled plants would have released. In this way, renewable power plants create two distinct products:

1. Commodity electricity
2. Environmental attributes, including avoided carbon dioxide emissions

RECs can provide many benefits to consumers, including reducing greenhouse gas emissions, meeting renewable energy targets, strengthen stakeholder relations and differentiating products and brands. Since RECs can be sold independently from its associated electricity, they offer several advantages relative to traditional green power products, including:

- Lower cost
- Simplified transactions
- Ability to interact directly with renewable projects

Figure 1 What Is a Renewable Energy Certificate (REC)?



Source: World Resources Institute

A REC represents all the environmental attributes – for example, avoided carbon dioxide emissions – that are created when electricity is generated using renewable sources. As the graphic above shows, RECs can be sold along with their associated electricity as renewable electricity ("green power" or commodity electricity bundled with RECs). They can also be sold separately. This ability to acquire RECs independent of electricity means buyers can "green up" with a variety of renewable resource options using simplified transactions, clear of geographical constraints.

Major Benefits of Purchasing Renewable Energy

- Environmental Protection
- Sustainability
- Energy Security
- Economic Stimulus

Environmental Protection

Renewable energy sources have the ability to reduce the air pollution that results from burning fossil fuels, which include coal, oil and natural gas. The debate over air pollution from vehicles is evident, but fewer people are aware that the generation and use of electricity produced from fossil fuels typically lowers air quality. In the United States, approximately 52% of electricity is generated by coal and 17% by natural gas, and both are a source of harmful emissions when used to generate power. In fact, the U.S. Environmental Protection Agency reports that electricity generation alone accounts for more than 40% of all U.S. carbon emissions, 26% of smog-producing nitrogen oxide emissions, 33% of mercury emissions and 64% of sulfur dioxide emissions, which result in acid rain.

Renewable energy technologies, which include wind, solar, hydro, geothermal and organic bioenergy, are a lot friendlier to the environment than conventional energy technologies, which rely on fossil fuels. Fossil fuels contribute significantly to many environmental problems - greenhouse gases, air pollution, and water and soil contamination - while renewable energy sources contribute very little or not at all. Greenhouse gases (carbon dioxide, methane, nitrous oxide, hydrocarbons, and chlorofluorocarbons) surround the Earth's atmosphere like a clear thermal blanket, allowing the sun's warming rays in and trapping the heat close to the Earth's surface. This natural greenhouse effect keeps the Earth's average surface temperature at about 60°F (33°C). But scientists believe the increased use of fossil fuels has significantly increased greenhouse gas emissions, particularly carbon dioxide, creating an enhanced greenhouse effect known as global warming. Energy use from fossil fuels is also a primary source of air, water, and soil pollution. Pollutants such as carbon monoxide, sulfur dioxide, nitrogen dioxide and particulate matter take a toll on the environment.

Both pollution and global warming pose major health risks to humans. According to the American Lung Association, air pollution contributes to lung disease, including asthma, lung cancer and respiratory infections. Nearly 335,000 people in the United States die from lung disease annually.

Sustainability – Energy for Future Generations

The International Energy Agency projects that the world's electrical generating capacity will increase to nearly 5.8 million megawatts by the year 2020, up from about 3.3 million in 2000. However, the world's supply of fossil fuels - our current main source of electricity - will start to run out from the years 2020 to 2060, according to the petroleum industry's best analysts. The best answer for meeting those electricity needs could be renewable energy.

Shell International predicts that renewable energy will supply 60% of the world's energy by 2060. The World Bank estimates that the global market for solar electricity will reach $4 trillion in about 30 years. Biomass fuels could also replace gasoline. It is estimated that the United States could produce 190 billion gallons per year of ethanol using available biomass resources in this country.

Unlike fossil fuels, renewable energy sources are sustainable. They will never run out. According to the World Commission on Environment and Development, sustainability is the concept of meeting "the needs of the present without compromising the ability of future generations to meet their own needs." Actions taken today to use renewable energy technologies provide benefits now, and will also benefit generations to come.

Solar **Wind** **Small Hydro** **Geothermal** **Organic Bioenergy**

Energy Security

Energy security, another factor that contributed to the original emergence of renewable energy, has re-emerged as a current concern that increased renewable energy development could help alleviate. Especially since the terrorist attack of September 11, 2001, foreign oil dependence has resurfaced as a concern that carries significant political and economic risks for the nation. This conventional energy source is vulnerable to political instabilities, trade disputes, embargoes and other disruptions. The potential for disruption exists as the United States depends on foreign countries, including mainly Saudi Arabia, Venezuela and Mexico, for approximately 54% of its oil, which is up from 34% in 1973. It is estimated that 75% of oil could come from foreign sources by 2010. Our nation's energy security continues to be threatened by our dependency on fossil fuels. Most of the world's oil reserves are now in the Middle East. U.S. vulnerability was clear during the Arab Oil Embargo in 1974, the Iranian Oil Embargo in 1979 and the Persian Gulf War in 1990. These events resulted in periods of negative economic growth and a rising trade deficit.

But with renewable energy, the nation can decrease dependency on foreign oil imports. For example, the U.S. Department of Energy (DOE) estimates that if the nation displaces 10% of petroleum use for transportation with biofuels, which are produced from organic material, the savings would be about $15 billion over 10 years. A 20% displacement could save about $50 billion. This would strengthen energy security, as well as economic and national security.

In addition to possible disruptions that could result from foreign oil dependence, significant security risks are present in many of the country's domestic energy systems. These systems, which provide for the transport, storage and production of energy resources, include the electricity transmission grid, pipelines, hydropower dams, nuclear power plants, refineries and fuel tankers. The risks are numerous and varied. Petroleum tankers and refineries can release great quantities of flammable, dangerous substances if damaged. An accident at a nuclear plant has the potential to result in the death of a large number of people and the contamination of an area larger than several states. The destruction of large hydropower facilities could result in severe flooding. Indeed, much of the current energy infrastructure is vulnerable.

While our current energy system cannot be changed instantly, renewable energy sources can be employed in a manner that avoids compounding the problem and contributes to the reliability and reduced vulnerability of our power systems. Renewable energy systems are smaller, more dispersed, and less prone to disruption than conventional electricity systems. In addition, renewable energy systems powered by wind, solar, hydro or geothermal resources cannot be easily disrupted and use fuel stocks that are not explosive or flammable. Therefore, many energy security concerns could be lessened by the increased development of renewable resources.

In addition, since renewable energy sources are continuously replenished by inexhaustible resources, they contribute to energy security. Because renewable supplies are predictable and abundant, they can also help stabilize energy costs and free consumers from the volatile price swings in the natural gas and oil markets due to supply and demand. Also, technological improvements and federal production incentives have made the cost of electricity from some renewables, such as wind, more cost-competitive compared to generating power from conventional sources, such as coal and natural gas. In fact, all renewable sources are becoming more cost-competitive.

Economic Stimulus

Some states are using renewable energy as one way to encourage economic development and stimulate local economies. In many instances, money spent on energy leaves a community, going to outside utilities or energy suppliers. By developing renewable energy sources, which often employ native resources and local production, energy dollars are spent in the local economy, helping to generate local revenue.

Recently, some states have contributed heavily to the growth of renewable energy through several different types of policies and programs. These include public benefits funds and renewable portfolio standards. Many U.S. communities have to import fossil fuels, such as oil and natural gas, to provide electricity, heating and fuel. The cost of these fossil fuels can add up to billions of dollars. And every dollar spent on energy imports is a dollar that the local economy loses. Renewable energy resources, however, are developed locally. The dollars spent on energy stay at home, creating more jobs and fostering economic growth.

Renewable energy technologies are labor intensive. Jobs evolve directly from the manufacture, design, installation, servicing and marketing of renewable energy products. Jobs even arise indirectly from businesses that supply renewable energy companies with raw materials, transportation, equipment and professional services, such as accounting and clerical services.

In turn, wages and salaries from these jobs provide additional income in the local economy. Renewable generators also contribute more tax revenue locally than conventional energy sources.

Renewable Energy Sources

Solar Energy can be either *solar electric or solar thermal*. Solar electric includes photovoltaics (PV), which convert the sun's rays into electricity. Solar thermal uses the sun's heat to produce hot water or air. PV is best for running motors, pumps, electric appliances and lighting, while solar thermal is best for space and water heating. Solar is the most costly renewable energy type, but is becoming more affordable.

Wind Energy converts moving air into electricity. Wind turbines mounted on a tower capture the most energy. At 100 feet or more up, they use faster, less turbulent wind and catch the wind's energy with propeller-like blades. Since 1980, the cost of electricity from utility-scale wind systems has dropped more than 80%. California and Texas lead the U.S. in wind power. Other states with sizable wind plants are Colorado, Iowa, Kansas, Minnesota, Nebraska, New York, North Dakota, Oklahoma, Oregon, Pennsylvania, South Dakota, Washington, West Virginia, Wisconsin and Wyoming.

Small or Low Impact Hydro uses the energy of flowing water to create electricity. The most common hydropower plant uses a river dam to store water. Released water flows through a turbine, spins it and activates a generator to produce electricity. But a large dam isn't required. Some hydropower plants use a small canal to channel the river water through a turbine. Small hydro projects are typically 30 megawatts of capacity or less. The Low Impact Hydropower Institute (LIHI) certifies some projects as low impact, having little or no impact on wildlife and river dynamics.

Geothermal Energy generators use steam from reservoirs of hot water a few miles below the Earth's surface. The steam rotates a turbine that activates a generator, which makes electricity. One type of geothermal plant is dry steam, in which steam is piped from underground wells to the power plant, where it's sent into a turbine/generator unit. The only dry steam plants in the country are at The Geysers in northern California. Most U.S. geothermal reservoirs are located in the West and in Alaska and Hawaii.

Organic Bioenergy or biomass from organic matter has been an energy source since people started burning wood to cook food or keep warm. Wood is the largest bioenergy resource, but other sources have emerged, including methane captured from landfill gas. Bioenergy using clean wood residues comes from logging and milling operations and would otherwise be land-filled.

Landfill gas is the natural byproduct of bacterial digestion of organic garbage and is mostly methane. However, using landfill gas to generate electricity traps methane and prevents its release into the atmosphere. Landfill gas (LFG) is created as solid waste decomposes in a landfill. Landfill gas is comprised primarily of carbon dioxide and methane, a gas that is approximately 23 times more detrimental than carbon dioxide in global warming potential. Preventing emissions of this powerful greenhouse gas, methane, through the development of landfill gas energy projects benefits the environment and promotes sustainability.