

Design Brief

Theme/Problem:

Develop a website that compiles information for homeowners on green and clean energy home solutions and other initiatives. The website should provide basic information, cost, tax rebate information, and clean/green energy practices.

Mission:

Root4Green is dedicated to addressing the importance of eliminating the negative effects of fossil fuels in the environment and implementing cost efficient and environmentally clean energy solutions in residential buildings for homeowners. We aim to promote green practices and the various taxed-based incentives provided for investments in green energy.

Website Details:

Name: Root4Green

Home Page : On this page you will find our mission statement as stated above. Below you will see an interactive widget that leads to the other three subpages providing information about the basics of green energy, the technology we can implement into our homes using clean energy, and the tax credit information. Then, there is also a section where you can input your name and email address to subscribe to a newsletter where you will get updates on green energy news, government incentives, and more. Each subpage also comes with a return to the top function.

Green Basics Page:

- **What is green energy?**
 - Refers to the technologies that provide the greatest environmental benefit and it is defined as electricity generated from renewable resources, sources that are able to be restored in a short period of time and not diminish. Such resources include: solar, wind, geothermal, hydro, and biomass.
- **Why should we implement green energy into our homes?**
 - Most homes rely on nonrenewable energy sources like natural gas, oil, and coal. By eliminating fossil fuels in homes, there is a reduction in greenhouse gas emissions and air pollution. It will allow people to be less dependent on imported fuels.
- **What about costs compared to nonrenewable energy?**
 - Resources from nature are abundant, as a result, they are relatively cheaper than the high demand and depleting supply of nonrenewable energy.
- **What about costs compared to nonrenewable energy?**
 - Resources from nature are abundant, as a result, they are relatively cheaper than the high demand and depleting supply of nonrenewable energy. While installation costs can be expensive, there are tax credits and incentives. Plus you won't have to pay your monthly electricity bill.
- **Advantages:** never run out, don't harm the planet, low maintenance, low operating costs
- **Disadvantages:** unreliable weather, solar needs clear skies and sun, wind turbines need wind, hydro needs steady supply of water

- **Why is energy efficiency important?**

- Energy efficiency is the use of less energy to perform the same task or produce the same result. Energy-efficient homes and buildings use less energy to heat, cool, and run appliances and electronics, and energy-efficient manufacturing facilities use less energy to produce goods.
- It is one of the easiest and most cost-effective ways to combat climate change, reduce energy costs for consumers, and improve the competitiveness of U.S. businesses. It's also a vital component in achieving net-zero emissions of carbon dioxide through decarbonization.

- **What are the Different Types of Green Energy Sources?**

- SOLAR

- Solar energy is from the sun and is converted into thermal or electrical energy. It's one of the cleanest and most abundant renewable energy sources available. The most widely known application are rooftop solar panels. Solar technologies convert sunlight into electrical energy either through photovoltaic (PV) panels or through mirrors that concentrate solar radiation. This energy can be used to generate electricity or be stored in batteries or thermal storage. This energy can be used for all the electrical uses in the home and also to heat water. Most commercially produced solar panels have an efficiency of about 20%. Not all the sunlight that reaches the solar panels is converted into electricity and it can be a variety of factors such as temperature, wavelength, and reflection.

- HYDRO

- Hydropower is one of the oldest and largest sources of renewable energy. It uses the natural flow of moving water to generate electricity. The greater the flow and the higher the head, the more the electricity that can be generated. It works by water flowing through a pipe—also known as a penstock—and then spins the blades in a turbine, which, in turn, spins a generator that ultimately produces electricity.

- GEOTHERMAL

- Geothermal uses the heat energy from the earth. Resources come from reservoirs of hot water or human made at varying temperatures and depths below the earth's surface. Wells, ranging from a few feet to several miles deep, can be drilled into underground reservoirs to tap steam and very hot water that can be brought to the surface for use.

- WIND

- Wind energy harnesses the power of wind. Wind energy is actually a byproduct of the sun. The sun's uneven heating of the atmosphere, the earth's irregular surfaces (mountains and valleys), and the planet's revolution around the sun all combine to create wind. Since wind is in plentiful supply, it's a sustainable resource for as long as the sun's rays heat the planet. The most popular technology used to harness wind are wind turbines. The propeller-like blades of a turbine around a rotor, which spins a generator, which creates electricity.

Initiate Page:

There are four different types of green energy practices you can implement into your home. Solar panels, a micro hydropower system, geothermal heat pump, and wind turbines.

1. Microhydropower systems

You'll need a water source near your home. A 10-kilowatt micro hydropower system generally can provide enough power for a large home. A micro hydropower system needs a turbine, pump, or waterwheel to transform the energy of flowing water into rotational energy, which is converted into electricity. Typically, microhydropower systems cost between \$1,500 to \$4,000 per kilowatt of installed capacity. However, prices vary widely depending on your site and

the size of the system. You can keep the cost down by doing some work yourself, such as building and installing necessary components.

2. Rooftop Solar Panels

Photovoltaic (PV) systems, or solar panel systems, convert sunlight into electricity. With ample sunlight, PV systems can harness energy in hot and cold climates. The basic building block of a PV system is the solar cell. Multiple solar cells form modules called solar panels that range in output from 10 to 300 watts. Panels are designed to survive storm and hail damage and are resistant to degradation from ultraviolet rays. More than 20 years of industry experience with existing PV products has shown that they are highly reliable and require little maintenance.

Panels are typically grouped together on a building rooftop or at ground level in a rack to form a PV array. The array can be mounted at a fixed angle facing south (toward the sun), or mounted on a tracking device that follows the sun to maximize sunlight capture. This could cost about \$10 per watt installed. A 2,000 watt (2 kW) system therefore costs about \$20,000 to install. Such a system would provide 6 to 10 kilowatt hours (kWh) of electricity per day depending on climate, and could meet about half of a household's demand.

Make sure your roof is in good condition before installation. You can lease or buy your own solar panel system. If you buy it, you will be able to reap the benefits of the electricity produced and obtain tax credits or other incentives. However, you are responsible for system maintenance and you can sell the system, if you move.

If you lease it, the solar system company owns it and is responsible for its maintenance. You can enjoy cheaper electricity at very low costs.

3. Wind Energy Systems

Wind turbines use the motion of the wind to turn a shaft attached to a generator, which makes electricity. The size of the turbine and the speed of the wind determine how much electricity it will make. A small wind energy system will produce a power output of 100 kilowatts (kW) or less. Most systems are much smaller than that and have power ratings ranging from 2 to 10 kW, which can provide some, if not all, of a homeowner's electricity needs. This can cost anywhere from \$4,000 to \$8,000 per kilowatt to install. Purchasing and installing a system can range from \$10,000 to \$70,000, depending on local zoning, permitting, and utility interconnection costs. These systems can cut utilities by at least half, and earn homeowners money by producing extra electricity. To be a suitable candidate for a wind system, a homeowner should have at least ½ acre of land, no local zoning laws, building codes or other covenants that restrict structure heights, and live in an area that has an average annual wind speed of at least 10 MPH. The turbine towers must stand 30 to 140 feet tall so that nearby trees and other structures do not prevent wind from hitting the turbines.

4. Geothermal Heat Pumps

Geothermal heat pumps are one of the most efficient ways to heat and cool your home. They can achieve efficiencies two to three times greater than commonly used air source heat pumps because they rely on the relatively consistent ground temperatures to transfer heat to or from a home. Across much of the United States, the temperature of the upper 10 feet of the ground remains between 45°F and 75°F, and often between just 50°F and 60°F. By contrast, air temperatures can range over the course of a year from below 0°F to over 100°F. Geothermal heat pumps are long lasting and durable, and specially equipped systems can also supply domestic hot water during the summer. While purchasing and installing a geothermal heat pump costs more than installing an air source heat pump system, the additional costs can be recouped through energy savings in 5 to 10 years. This can cost about \$2,500 per ton of

capacity. An average home requires a 3-ton unit, which would cost about \$7,500, and could cut annual heating and cooling bills by 25 to 50%.

Benefits Page:

The benefits page provides detail on the Residential Clean Energy credit, which provides a 30 percent income tax credit for clean energy equipment, such as rooftop solar, wind energy, geothermal heat pumps and battery storage through 2032. To claim the credit, file Form 5695, Residential Energy Credits with your tax return to claim the credit. You must claim the credit for the tax year when the property is installed, not merely purchased. There are also lots of other equipment that you can get tax credit for as listed on the chart. You can claim the same or varying credits year after year with new products purchased, but some credits have an annual limit. You may also claim only if you reside in the home, whether you own or rent it. You can't claim the credit if you're a landlord