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# *Green Energy Technologies as a Solution for Home Improvement In Saving Energy Cost and Environment*

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***Abstract***

*Heating and cooling our home, gassing up our car and watering our lawn, energy costs are one of the most significant expenses that many of us face on a monthly and annual basis. There are numerous ways to reduce both our carbon footprint and our recurring energy costs. In this paper we will discuss simple and common sense techniques that do not require major changes, construction, installation, or upfront expenses. We will discuss there a number of ways to save energy at home and slash our home energy consumption and costs. Instituting one or all of these methods may be just the key to reducing our energy costs and ecological impact to the lowest possible level.*

***Keywords:*** *Green Energy Technology, Green Technology, Energy Conservation, Low cost Energy*

## INTRODUCTION

Addressing the wide-ranging environmental impact of global population growth and industry has become critical to the survival and prosperity of human civilization. Green Energy Technology (also known as "green tech" clean technology, or "clean tech") refers to the development of processes, practices, and applications that improve upon or replace existing technologies that allow us to meet our needs while substantially decreasing our impact on the planet. Focusing on the goals of green technology is becoming increasingly important to a diverse range of industries that includes energy, agriculture, manufacturing, and more.

## PROBLEMS

Currently, the vast majority of the world's energy needs are met by burning hydrocarbon-based fossil fuels. In addition

to requiring non-renewable natural resources that will eventually be depleted, this method of energy production produces greenhouse gases that contribute to climate change, releases toxic gases that comprise the smog that plagues modern cities, and requires expensive and often highly-polluting methods of fuel extraction, refining, and transport. Some of these problems have grown more pressing as fossil fuels have become more scarce, requiring drilling in more remote locations, use of less-ideal raw materials such as tar sands that require more intensive processing, and increasingly complex extraction techniques such as frocking.

**SOLUTIONS**

In the long term, the solution to the many problems with fossil fuels is to transition to using solely renewable energy sources including solar, wind, geothermal, hydropower, biofuels, and waste-to-energy technologies. Maximizing the potential of these power sources will require innovation in areas such as photovoltaic materials to lower the cost and increase the efficiency of solar power, gas separation materials for efficient use of gaseous fuels, and improved heat-resistant materials for use in solar power plants. The use of cleaner power sources to power automobiles will require improved battery technology for electric vehicles and better fuel cell technology for fuel cell-powered vehicles.

In the short to medium term, however, fossil fuels will remain a significant source of energy, and therefore every effort should be made to make the use of these fuels less damaging to the environment. Efforts aimed at achieving this include the use of “clean coal” technologies to reduce pollution from power plants, as well as technologies such as catalytic converters that reduce emissions from automobiles.

**SOLUTIONS FOR HOME IMPROVEMENT**

It is argued that facilities built according to the Green Technology, are not only environmentally friendly, but also, economically more productive than other comparable ordinary ones. If we find our self looking for some major green technologies that can help us save money while saving the environment, then there are following ten major new technologies. Instituting one or all of these methods may be just the key to reducing our energy costs and ecological impact to the lowest possible level.

**Solar Array**

Solar panels, or photovoltaic cells, are one of the best ways to reduce pollution and lower our electricity expenses (if we have the cash to spend). The average cost of installation for the typical solar array comes in at around $30,000, before green energy tax credits, rebates, and incentives, which help us recoup much of the initial expense.

For example, a typical family in New York state that spends $32,000 on a solar array can expect to receive a 30% federal rebate on the expense in addition to a $12,000 rebate through the New York State Energy Research and Development Authority. Between federal and state incentives, the overall cost of the solar array will come to around $5,400 for that family.

Initial cost: Around $18,000 (after tax rebates)
Time to recoup initial expense: 6-10 years (on average)

***Figure 1: A Solar Array***

**Solar Water Heater**

It's not always necessary to install a complete solar array to achieve some of the benefits of solar technology. Installing a solar water heater can be a great way to cut down on energy costs at a much lower initial expense. The costs associated with the installation of a solar water heater are actually recouped much faster than the costs associated with photovoltaic technology for power generation. This is due to the increased efficiency of solar water heating systems, as well as their reduced expense when compared to the large solar array required for powering a home.

Initial cost: Around $2,000 to $5,000
Time to recoup initial expense: 2 years (on average)

***Figure 2: A Solar Water Heater***

**Wind Generator**

When we think of wind generators, the first thing that comes to mind is likely the huge windmill farms found offshore and in the windswept plains of the western Countries.

The costs of a home wind generator vary greatly. Some have built their own wind generators with off-the-shelf parts from their local hardware stores. Others have purchased kits or paid for professional installation to supplement the power purchased from their local electrical grid.

The power production capability of a home wind generator varies about as much as the initial expense. Many kit based generators will produce only enough power to offset 10-15% of our home energy costs. Other, more expensive wind generators can cost up to $45,000 dollars to purchase and install but can offset almost 90% of our home energy needs.

Initial cost: Varies widely

Time to recoup initial expense: Depends on the type of system and power production capability

***Figure 3: Home wind turbine***

**Rainwater Harvesting System**

Rain collector systems are extremely simple mechanical systems that connect to a gutter system or other rooftop water collection network and store rain water in a barrel or cistern for later non-potable use (like watering plants, flushing toilets, and irrigation). These systems are extremely inexpensive, provided us purchase and assemble the rain collection equipment our self. If someone pays a contractor to install the rain collection system, it could cost anywhere from several hundred dollars and up.

Initial cost: Variable depending on type and installation – typically $50 and up

Time to recoup initial expense: Depends on type of system, initial expense, and extent of use

***Figure 4: Rainwater harvesting system***

**Replacement of HVAC System with an Energy Star HVAC**

Heating and cooling of homes typically costs homeowners a whopping 43% of their household energy consumption annually. According to Energy Star, the typical HVAC system over 10 years old costs approximately 30% per year more to run and maintain than a current model Energy Star HVAC system. With the majority of homes paying around $1,000 a year in energy costs for heating and cooling, the old systems can quickly cost us a great deal more than a current model system.

Initial cost: Around $4,000.

Time to recoup initial expense: Around 7 years.

***Figure 5: HVAC vents***

**House Insulation**

Based on EPA estimates, 10% of household energy usage or around $200 a year is due to energy loss from poor insulation. As a do-it-yourself project or a project for local contractor, we will get an excellent return on investment from sealing our home to prevent energy escape.

Initial cost: Around $2,500 to $5,000 (contractor estimate)

Time to recoup initial expense: 12.5- 25 years on average.

***Figure 6: Home insulation***

**Double Pane Windows**

Like poor insulation, energy escape due to single pane or inadequately sealed windows contributes a great deal to energy loss annually. In fact, 25% of annual heating and cooling costs can be attributed to the installation of non-energy efficient or single pane windows.

Double pane windows are not cheap, and outfitting the entire house with new double pane windows will cost a great deal of money and inconvenience as it is a fairly major construction project. Estimated costs per window are around $600, but when we consider that replacing all of our home's windows with double paned glass could save up to$5o0 a year, one will certainly see how double pane windows can be a solid investment.

Alternatively, we can buy a home window insulator kit that essentially seals windows with a plastic film over them (e.g. 3M Indoor 5-Window Insulator Kit for $15 each). This solution costs significantly less than double pane windows, but is obviously much less durable.

Initial cost: Around $600 per window (around $6,000 for a 10-window home)
Time to recoup initial expense: Around 12 years

***Figure 7: Double pane windows***

**Energy Monitor**

One of the easiest things we can do to decrease energy consumption around the house is to install an energy monitor. Household energy monitors are easy to use and inexpensive, and allow us to see a minute by minute presentation of our energy use. These devices work by clipping onto the power cable coming in to our home and transmitting a wireless signal to a display that shows precisely the amount of power being consumed. In studies conducted in the British Isles, households with energy monitors saved between 10 to 15% annually by instituting the simple and inexpensive device.

Initial cost: Between $20 and $150 (e.g. P3 International P4400 Kill A Watt Electricity Usage Monitor for around $20)
Time to recoup initial expense: Around 6 months


***Figure 8: a watt energy monitor***

**Energy Star Appliances**

Like the new HVAC system recommended above, Energy Star appliances have become all the rage in recent years, and for good reason. A new energy star appliance generally uses a great deal less power and water (depending on the type of appliance) than its historical predecessor. For example, purchasing an Energy Star refrigerator will generally conserve 15% more energy than the typical non-Energy Star rated fridge on the market. In addition, an Energy Star clothes washer can generally wash clothes more effectively than older models, resulting in lower fabric wear, better stain removal, and briefer drying times all while saving up to 50% more energy than typical top-loading models and reducing your utility bills.

Initial cost: Depends on type of appliance

Time to recoup initial expense: Varies based on type of appliance and model (generally included in Energy Star disclosure data associated with the appliance)

***Figure 9: Energy star appliances***

**Smart Power Strips**

Smart power strips are a simple and elegant solution to a major energy problem. Energy vampires (devices that are plugged in and shut off or fully charged) are generally blamed for around 20% of all energy wasted in America annually. Smart power strips sense energy demand and cut off power supply to fully charged or not in use devices, and can almost eliminate vampire power drawdown.

Initial cost: Around $30 each (e.g. Smart Strip LCG3 Energy Saving Surge Protector with Autoswitching Technology, 10-Outlet)

Time to recoup initial expense: Around 8 months each


***Figure 10: Smart strip outlet***

## CONCLUSION

There are a number of ways to reduce both our carbon footprint and our annual recurring energy costs. Many of them are low-tech, common sense methods that we have likely heard about since we were a child, while others are high-tech and expensive, but can result in significant savings over time.

It's important to realize, when we're considering making some of the changes discussed above, the time required to justify the associated upfront costs. Although many of these projects can save us a bundle over time, many of them are expensive and require years before they justify the initial expense. Consider making small, sustainable changes before you make a major energy-saving investment.

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