

Alternative Energy Sources

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Energy is the ability to do work or generate heat.

Energy is all around you. It's in the wind, the sunlight and the water. It's bound up in wood, coal and oil. And it powers civilization. Everything in every store everywhere got there in a truck powered by oil. Your lights, heat, hot water, appliances and phones run on energy. Our way of life depends on energy.

The hard part is harnessing the various sources of energy we find in nature, converting it into a useable form and distributing or transmitting it where it's needed. The various means and methods of accomplishing this task would fill a volume of books. We will focus on the basic available energy sources and the most common uses for these sources.

Nature delivers energy to us in a variety of ways. Each source of energy can be used in various ways and each source of energy is currently being used to varying degrees.

Solar Power

The first is the most basic; sunlight. It powers our world at the most basic of levels. To one degree or another, nearly all other forms of energy are derived from sunlight. Fossil fuels were once plants fed by sunlight, water for hydro-power is carried to high ground by evaporation from the heat of sunlight and the wind and water currents are driven by the warmth of sunlight.

We can use sunlight directly to generate electric power or to generate heat. Both uses depend on the intensity, duration and angle of the sunlight falling on the collection array. Some geographical areas are more predisposed to solar power than others.

Solar power is currently in use for large scale solar energy production, home solar power generation and a wide variety of small applications.

Photovoltaic cells convert sunlight directly into electricity. They are made of semiconductors like crystalline silicon or other thin-film materials. Photovoltaic cells can be used to generate power on nearly any scale from a calculator to a full-scale power plant.

They are especially valuable for home use if you are in a solar friendly area of the country. They can be expensive up front, but they will more than pay for themselves in the long run.

Concentrating solar power technologies employ reflective materials to direct and focus the sun's heat to drive a generator which produces electricity. These solar power generation systems are usually large plant constructions and use refractor dishes, parabolic troughs, and central power accumulator towers. Concentrated solar power generation is simply not practical on a small scale.

Low-temperature solar power generators collect solar heat energy over time to directly heat water for direct use as hot water or for residential or commercial space heating by circulating the solar heated water through networks of pipes in the floors and walls. Direct usage of solar heat energy in this way is very efficient.

Currently solar power accounts for about one tenth of one percent of total U.S energy consumption. Many households have installed solar generation capacity but solar is still too expensive for many Americans to afford.

Hydrocarbon and Biomass Fuel

The second source of energy is bound up chemically in natural hydrocarbons including, wood, oil, natural gas and coal. Hydrocarbons are compounds that burn, releasing heat, light and exhaust gasses in the process. Heat can be used directly or for generation of electricity. Combustibles, by their nature, are consumed as they release their energy while also producing smoke and gas pollution.

Wood

Wood is used primarily for residential home heating. A wood stove can generate room filling heat with a good degree of efficiency. Many people still rely on wood fired stoves for home heating. It is one of the most basic and reliable sources of energy available. Unfortunately it produces a variety of pollutants in the process.

Wood is attractive as a backup system for heating your home in the event of a failure of your supply of oil, natural gas or electricity. It is readily available in many geographic areas and will provide for basic power needs like heat, light and a cook fire.

Historically, wood is the first fuel. Humanity mastered fire by learning to ignite wood. To this day wood continues to be burned for heat and light even in the most advanced societies. Remote areas are also heavy users of wood fire heat.

Oil

Oil is found deep in the earth. It is the remains of decayed plant life and contains high concentrations of hydrocarbons. Oil is a prime fuel for combustion, a versatile lubricant and is widely used in the manufacturing process for a wide variety of products.

Oil is the basic unit of fuel for the American economy. There is currently no other energy source that can replace oil. We use a huge amount of the stuff for producing plastics, gasoline and diesel fuel as well as a whole host of industrial applications. Then there is the whole lubrication market from bearing grease to motor oil. Oil plays a role in virtually every aspect of our modern lives. Perhaps one day we will find a source of energy capable of replacing oil but we haven't yet.

Oil fired power plants account for about one and a half percent of the electricity generated in the United States. We burn about ten million barrels of oil a day fueling our cars and trucks. The largest source of oil consumption in America is the production of plastics. We use more oil to make plastic than we burn as fuel.

Coal

Coal is the single largest source of fuel for the production of electricity in the United States. Coal fired electricity accounts for just under half of all the electricity produced. Coal plants burn coal to heat water in a huge boiler tank until it produces steam which powers an electrical turbine.

Coal fired boilers stand about eight stories high and contain a huge volume of water. It takes three days to bring a cold boiler tank up to steam production temperature and once hot enough to produce steam the boiler must be continually heated with the fire from burning coal. Most of these plants have rail lines that allow trains with hundreds of cars heaping full of coal to enter the facility and unload their cargo very quickly. Some of the larger plants will burn the coal from three trains every day.

The United States has huge reserves of coal. It is one fuel source that we won't run out of no matter how much we burn. Unfortunately, burning coal produces a wide range of pollutants. Technology is being developed to clean the exhaust from burning coal and has had limited success to date.

The truth is, we need coal to power our society. It accounts for half of our electricity production. Take coal out of the equation and we will lose our standard of living. So the challenge becomes using coal in a way that causes as little impact to our environment as possible while still remaining a viable energy source.

Coal has another exciting application. Through a number of sophisticated processes we have the ability to transform coal into

diesel fuel. With refinements to the technology and economies of scale we have the potential to meet our entire demand for motor vehicle fuel with domestic supplies of coal converted into diesel fuel at prices that are very competitive with oil.

Coal can be and has been used for home heating and cooking but the pollution of raw coal smoke is undesirable so currently it is primarily burned almost exclusively in large power plants.

Natural Gas

Natural gas is found in places where oil and coal are found deep within the crust of the earth. Natural gas is methane combined with a number of other, less desirable, substances. Thorough processing cleans the gas until it is pure methane.

Natural gas accounts for about twenty percent of our electricity production in the US. These plants operate in much the same way as a coal fired plant. The gas is burned to heat water to a boil then the steam is used to power a turbine to create electricity. Natural gas burns much more cleanly than coal and can be transported via pipeline.

Recently there has been an increase in the number of natural gas fired power plants being constructed. As our energy demand grows it is likely that natural gas will account for an increasing percentage of our energy production.

There have been limited attempts to power vehicles with natural gas, however it is volatile and a gas at room temperature so it is much more difficult to work with than liquid fuels. Far and away the largest users of natural gas as fuel are bus fleets in some of the larger cities in America.

The most efficient use for natural gas is directly to produce heat. Natural gas is widely and safely used in households all around the world. It can be burned directly to warm your home, heat your water

and cook your food. Direct usage of the heat energy produced during natural gas combustion is the most efficient way to use natural gas.

Bio Fuel

Through a process of fermentation a wide variety of plants can be used to produce alcohol based diesel fuel. Bio fuel has potential but is currently costly to produce and reduces the amount of corn and other grain crops for use as food.

Brazil is a large consumer of bio diesel produced from sugar cane. The process they use is very efficient and cost effective but depends on the use of sugar cane because of its high sugar content.

Matter in Motion

The third source of energy is the power bound up in the kinetic energy of moving matter. The natural movement of wind and water contain vast untapped reserves of potential energy. These sources of energy offer the cleanest, lowest impact energy sources available.

Hydroelectric Power

Hydroelectric power has been a staple of power generation for decades. Currently in America most of the rivers that offer hydro potential are dammed and product power at capacity. Hydroelectric power accounts for about seven percent of US electricity consumption.

Harnessing the power of water in motion provided the power source for many of humanities oldest machines. From grain mills to stone saws, water has been used to power a vast array of creative inventions.

Today you can buy small application turbines that will generate a limited amount of power if you have a sufficient volume of water moving down a sufficient fall in elevation. Home hydro power generation is clearly a very limited option. If you don't have a creek or river moving through your property you're out of luck.

Wind Power

Wind has been used for centuries as a source of mechanical energy. Only in the last century have we harnessed the power of wind for electricity generation. Today wind accounts for less than two percent of our electricity production.

Wind energy is beginning to grow. Large wind farms have been built in areas where the sustained winds exceed eight miles an hour. These farms produce clean and sustainable energy. Unfortunately, we don't have anywhere near the capacity of wind power generation we need to meet our demand for electricity.

Home wind power generation is also a good option for those in windy areas. It can provide a steady source of electricity that can be used to offset your usage from the grid or even sold back to the power company if you produce more than you are using.

Splitting the Atom

Nuclear energy has proven to be a viable large scale source of electricity production. Splitting the atoms of heavy metals releases tremendous amounts of heat and radiation energy. The heat produced is used to boil water. The steam powers turbines that generate electricity.

The US has huge reserves of fissionable materials. Currently we get about nineteen percent of our electricity from nuclear fueled power plants. The newer plants are designed so they can't go critical and

melt down so they are one of the safest forms of fuel we have available to us until you get to the toxic waste they produce.

The spent fuel is highly radioactive and lethal. It must be very securely and remotely stored. The process is expensive and politically explosive because no one wants a radioactive waste dump in their back yard and with good reason. However, if we can figure out the waste storage problem, nuclear is a very good energy production option.

Heat from the Deep

Geothermal uses the heat from the earth to produce usable energy. Harnessing the natural heat energy from deep in the earth offers a clean, low impact source of power but it can be difficult to implement on a small scale. Some countries like Iceland rely heavily on geothermal energy production to power nearly eighty percent of their societies energy demand.

Geothermal power depends on the area you are in. It's currently being used successfully in California at several large electricity production plants. It accounts for less than two percent of US power generation.

Conclusion

Our civilization depends on energy to maintain our stand of living. We need it. Currently we get the vast majority of our energy from fossil fuels. We can't change this overnight without massive disruptions to our way of life. It must happen gradually and naturally or the toll in human suffering will be unacceptable. Alternative energy sources are out there but they are simply yet not ready to replace fossil fuels. Until they are we must take a practical approach to the energy policies we adopt as a society.

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