Alternative Energy Know-How

with

Professor Cleanfields

A Phoenix Voyage Production

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CONTENTS:

INTRODUTION

WHAT IS ALTERNATIVE ENERGY?

There is a lot of energy that we can harness if we only seek to research and develop the technologies needed to do so. We can get away from the fossil fuels and the old electrical grids by turning to alternatives from these energy sources.

One of these alternative energy resources is wind power. Wind powered turbines continue to be developed that are progressively more energy efficient and less costly. “Wind farms” have been springing up in many nations, and they have become more strategically placed over time so that they are not jeopardizing birds as former wind turbines did.

Another alternative energy resource is the one that is most well-known: solar energy. This involves the manufacturing of solar cells which gather and focus the energy given off directly by the sun, and translate it into electricity or, in some cases, hot water. As with wind energy, solar energy creates absolutely zero pollution.

Ocean wave energy is seen by governments and investors as having enormous energy generating potential. A generator in France has been in operation for many years now and is considered to be a great success, and the Irish and Scots are running experimental facilities. Tidal generators are already designed and waiting implementation that can generate power for whole communities.

Hydroelectric power has been with us for a while and where it is set up, it is a powerful generator of electricity and cleaner for the grid. However, there are certain limitations to the availability of the right places to set up a large dam. Many run-of-the-river, or small and localized, hydroelectric generators have been set up in recent times due to this limitation.

Geothermal energy is extremely abundant, since it lies directly beneath our feet-- just a few miles below the earth's surface. This energy is produced by the heating of water through the actions of earth's fantastically hot molten core. The water turns to steam, which can be harnessed and used to drive turbine engines which in turn generate electricity. Great amounts of research and development have been put into geothermal energy tapping. Nikola Tesla actually proposed using this as a non-polluting way of generating electricity.

Waste gas energies, which are essentially methane, reverse the usual energy-pollution relationship by creating energy from waste that lies in the dumps and from some air pollutants. This gas is used in fuel cells and can be used in standard gasoline generators.

Ethanol is a gasoline substitute and can be created from such things as wheat, sugarcane, grapes, strawberries, corn, and even wood chips and wood cellulose. There is controversy over this fuel with regards to it becoming truly economical or practical except in localized areas, but technologies for its extraction are continuously being refined.

Biodiesel energy is created out of the oils contained in plants. So far, the commercial stores of biodiesel have been

created using soybean, rapeseed, and sunflower oils. At the time of this writing, biodiesel is typically produced by entrepreneurial minded individuals or those who want to experiment with alternative energy, but commercial interest from companies is on the rise. It burns much cleaner than oil-based diesel.

Nuclear energy is created in facilities using the process of nuclear fission. This energy is extremely efficient and can generate huge amounts of power. There is concern from some people about what to do with the waste products of this method of power generation, as it is accumulating in dangerous amounts in some areas. In some facilities, it is stored on-site, and must be cooled to prevent an accident, as in the infamous Fukushima reactor. In that case, sea water is flushed through to cool the rods, and the contaminated water discharged into the sea.

WHAT YOU SHOULD KNOW ABOUT GREEN ENERGY

Green energy refers to the use of power that is not only more efficient than fossil fuel but that is friendly to the environment as well. Green energy is generally defined as energy sources that don't pollute and are renewable.

There are several categories of green energy. They are anaerobic digestion, wind power, geothermal power, and hydro-power on a small scale, biomass power, solar power, tidal power, and wave power. Waste incineration can even be a source of green energy if the waste products are handled without creating pollution.

Nuclear power plants claim that they produce green energy as well, though this source is fraught with controversy, as we all know. While nuclear energy may be sustainable, may be considered renewable and does not pollute the atmosphere while it is producing energy, its waste does pollute the biosphere as it is released. Unfortunately, many nuclear plants vent radioactive gases on a periodic basis, and therefore cannot be considered "green".

The transport, mining and phases before and after production of nuclear energy does produce and release carbon dioxide and similar destructive greenhouse gases. When we read of green energy, therefore, we rarely see nuclear power included.

Those who support nuclear energy say that nuclear waste is not, in fact, released into our earth's biosphere during its normal production cycle. This is not correct. They stress as

well that the carbon dioxide that nuclear energy production releases is comparable, in terms of each kilowatt hour of electricity, to such sources of green energy as wind power. Unfortunately, this is comparing apples to oranges, as radioactive pollution is quite different, and more difficult to remediate than carbon sequestration.

As an example of the green energy production the average wind turbine, such as the one in Reading, England, can produce enough energy daily to be the only energy source for 1000 households.

Many countries now offer household and commercial consumers to opt for total use of green energy. They do this one of two ways. Consumers can buy their electricity from a company that only uses renewable green energy technology, or they can buy from their general supplies such as the local utility company who then buys from green energy resources only as much of a supply as consumers pay for.

The latter is generally a more cost-efficient way of supplying a home or office with green energy, as the supplier can reap the economic benefits of a mass purchase. Green energy generally costs more per kilowatt hour than standard fossil fuel energy.

Consumers can also purchase green energy certificates, which are alternately referred to as green tags or green certificates. These are available in both Europe and the United States, and are the most convenient method for the average consumer to support green energy. More than 35 million European households and one million American households now buy these green energy certificates.

While green energy is a great step in the direction of keeping our environment healthy and our air as pollutant free as possible, it must be noted that no matter what the energy, it will negatively impact the environment to some extent if not carefully managed.

Every energy source, green or otherwise, requires energy to implement. The production of this energy will create pollution during its manufacture. Green energy's impact is minimal, however.

1 GEOTHERMAL ENERGY

1. LOOKING TO THE PAST OF GEOTHERMAL ENERGY

2. GEOTHERMAL POWER AS ALTERNATIVE ENERGY

3. OVERVIEW OF GEOTHERMAL ENERGY

4. PRODUCING ENERGY FROM GEOTHERMAL RESOURCES

1. LOOKING TO THE PAST OF GEOTHERMAL ENERGY

Geothermal energy is often viewed as a relatively new form of alternative energy. In truth, the use of geothermal energy stretches far back into the past.

Geothermal energy is literally “earth heat”. This type of energy's name comes from two Greek words: “geo” meaning earth, and “thermo”, which means heat. While it may seem that the use of geothermal energy is a relatively new idea, it is actually an ancient practice. Many different cultures have used geothermal power to their advantage, dating back to some of the Earth's earliest civilizations.

In order to use geothermal energy, the energy source itself must be tapped into. Geothermal energy comes from heat located in the Earth's layer of magma. Magma, otherwise known as molten rock, is an extremely hot substance that springs directly from the Earth's core, which is a scalding 9,000 degrees Fahrenheit. Magma heats the reserves of water located in its crust and upper mantle to very high temperatures, around 700 degrees Fahrenheit. These geothermal reservoirs, as they are known, can be drilled into or can escape naturally through cracks in the Earth's crust. These natural formations create such places on Earth as hot springs and geysers.

Geothermal energy can be traced back to 10,000 years ago when Native Americans used geothermal water found in hot springs to cook and for use as medicine. The geothermal energy found in hot springs was also used by the Romans. The ancient city of Pompeii used geothermal energy to heat homes. Romans also were known to use geothermal water for

its medicinal properties; such as in the treatment of skin and eye diseases. Romans and other ancient civilizations also used the soothing geothermal waters found in hot springs for relaxation and natural bathing places. In more recent times, France started using this type of energy in the 1960's to heat their homes. More than 200,000 homes in France are now heated by geothermal water. Iceland also uses geothermal energy in a very large scale, and also uses this to split water to obtain hydrogen to power vehicles.

Scientists and other researchers are constantly coming up with new ways to use the Earth's latent powers. While geothermal energy has not yet shown us all it can do, it is evident that many cultures have enjoyed its power already. From the comfort of a hot springs bath to the warmth of geothermal water heated home, the Earth has just begun to use the energy contained within its crust.

2. GEOTHERMAL POWER AS ALTERNATIVE ENERGY

We should be doing everything possible to develop geothermal energy technologies. This is a largely untapped area of tremendous alternative energy potential, as it simply taps the energy being naturally produced by the Earth herself. Vast amounts of power are present below the surface crust on which we move and have our being. All we need do is tap into it and harness it.

At the Earths' core, the temperature is 60 times greater than that of water being boiled. The tremendous heat creates pressures that exert themselves only a couple of miles below us, and these pressures contain huge amounts of energy. Superheated fluids in the form of magma, which we see the power and energy of whenever there is a volcanic eruption, await our tapping. These fluids also trickle to the surface as steam and emerge from vents. We can create our own vents, and our own containment chambers for the magma and convert all of this energy into electricity to light and heat our homes. In the creation of a geothermal power plant, a well would be dug where there is a good source of magma or heated fluid. Piping would be fitted down into the source, and the fluid surging to the surface to produce the needed steam. The steam would turn a turbine connected to a generator, which would provide the electricity.

There are criticisms of geothermal energy tapping which prevent its being implemented on the large scale which it should be. Critics say that study and research to find a resourceful area is too costly and takes up too much time. Then there is more great expense needed to build a geothermal power plant, and there is no promise of the plant turning a profit. Some geothermal sites, once tapped, might be found to not produce a large enough amount of steam for the power plant to be viable or reliable. And we hear from the environmentalists who worry that bringing up superheated, mineralized water can also bring up potentially harmful materials along with it. These concerns are eliminated with a closed-loop system that does not come into contact with the corrosive materials inside the earth’s crust. Such a plant only uses the heat, and does not vent potential corrosive materials.

The fact that geothermal energy is merely the energy of the Earth herself means it does not produce any pollutants. Geothermal energy is extremely efficient—the efforts needed to channel it are minimal after a site is found and a plant is set up. Geothermal plants, furthermore, do not need to be as large as electrical plants, giant dams, or nuclear energy facilities—the environment would thus be less disrupted. And, needless to say, it is an alternative form of energy—using it would mean we become that much less dependent on oil and coal. Perhaps most importantly of all—we are never, ever going to run out of geothermal energy, and it is not a commodity that would continuously become more expensive in terms of real dollars as time passes, since it is ubiquitous. Geothermal energy would be, in the end, very cheap, after site investigation and power plant building costs are recouped.

3. OVERVIEW OF GEOTHERMAL ENERGY

As we look to alternative energy sources for our power hungry world, geothermal energy is getting attention. Here is a brief overview of geothermal energy:

There are many different types of energy available to power our world. For years, people have used the power of burning fossil fuels, such as coal (also used to produce steam power) to create energy. In recent times, there has been a shift to using renewable resources to create the energy we need. These resources include hydroelectric, solar, wind, biomass

and geothermal energy. While many people know about the first four of these resources, geothermal energy is less well-known.

Geothermal energy comes from the heat of the Earth, deep underground. The Earth's core, where energy of the decay of isotopes create massive amounts of heat, is 4,000 miles below the Earth's surface. In this core, temperatures can reach up to 9,000 degrees Fahrenheit, and this extreme heat can be used to produce energy.

While these are the basics of geothermal energy, there are many other parts in the process to make this sort of energy usable. We can't tap directly into the Earth's core to receive this heat, for many reasons. So instead, people must create systems that harness the residual heat that is in the magma (molten rock) under the Earth's crust. This heat is able to be used by tapping into the water reservoirs that are within the magma – these water stores can reach up to 700 degrees Fahrenheit. Think of Old Faithful in Yellowstone.

A well can be drilled down into the superheated water contained within the Earth's crust - the geothermal reservoir. Once these geothermal reservoirs are tapped into, the heated water and steam can rise to the surface, and be used to power geothermal power plants as well as in smaller scale projects for personal household use. When used in geothermal power plants, the steam from the heated underground water is often used to power turbines, which then generate energy that can be harnessed as electricity.

By using the Earth's own heat and water, energy can be generated and used on a small or large scale. This renewable resource (you can't deplete the Earth's heat!) is also cleaner

and safer than many other types of energy, making it a great type of ecologically sound energy source.

4. PRODUCING ENERGY FROM GEOTHERMAL RESOURCES

Geothermal energy is a platform tapping the inherent energy found within the Earth. Here is an overview of how the process works from a practical perspective.

There are several types of energy used in the world that are considered eco-friendly. These energy types include solar, which harnesses the power of the sun, and hydroelectric, which uses the power of water to generate electricity. One often neglected ecologically sound energy source that should be grouped with the others is geothermal energy. Geothermal energy involves using the Earth's own heat to create energy and warmth to be used by people.

Extreme amounts of heat are generated in the Earth's core, which reaches temperatures of up to 9,000 degrees Fahrenheit. The Earth's inner core then transfers heat to the outer core, a liquid rock surrounding the core. This rock remains molten due to the intense heat becoming magma (molten rock). Above this is the mantle, which is semi-molten and plastic, and above this the crust.

In the crust-mantle boundary, water collects in columns or reserves. This trapped water, which can be heated to temperatures of about 700 degrees Fahrenheit, is known as a geothermal reservoir. When engineers want to use

geothermal energy, they “tap” in to this geothermal water and use the resulting hot water and steam for various purposes.

Geothermal energy plants work by using the steam resulting from tapping into the geothermal water reservoirs to power turbines. These turbines spin producing electricity which can then be used to power industries or even residential areas. The first geothermally engineered power plant was built in Italy in 1904.

These days, roughly 7000 megawatts of electricity is produced by geothermal power plants per year. Geothermal power plants are located in 21 countries throughout the world. In the United States alone, enough geothermal power is generated per year to be the equivalent to the burning of 60 million barrels of oil, to wit, geothermal energy is a major source of power.

Geothermal energy has been used by cultures throughout history for thousands of years. The process used to harness geothermal energy has always been relatively simple compared to that of other energy processes, and the components used are familiar to everyone. The concept of using super-hot water from the Earth's interior may seem high tech, but once you have tapped into this resource, it is easy to maintain and use as a continual power source.

The best analogy for geothermal energy production is another alternative energy source: hydropower. Water is used to spin turbines which produce electricity. In the case of geothermal energy, however, the water comes from the internal chambers of the Earth in, most often, the form of steam.

2 BIOMASS ENERGY

5. BIOMASS… What the heck is it?!

6. IS BIOMASS REALLY A CLEAN ENERGY RESOURCE?

7. WHY USE BIOMASS FOR OUR ENERGY NEEDS?

8. ENERGY - WHAT YOU NEED TO KNOW ABOUT BIO FUELS

9. BIOFUELS AS ALTERNATIVE SOURCES OF ENERGY

5. BIOMASS... What the heck is it?!

Did you know that there are alternative ways of getting the energy and fuel we need to power our cars, homes, and other fuel/energy-dependent things?

Sure, you've heard about electric cars before, but have you taken the time to delve deeper into the many, many different forms of alternative energy? Because a lot of it comes down to a thing called Biomass, and it may be the proverbial alternative to our energy problems!

Essentially, Biomass is renewable and sustainable energy source that is derived from organic materials, plants, and other living things to create electricity and other forms of power that is cleaner and safer than the various chemicals and other harmful energy/fuel/power supplements that we use on a regular basis.

How does it work?

Well, a Biomass plant produces electricity and heat through the burning of Biomass (wood, plants, other organic materials) in a boiler, using the same methods that you would see with coal and other natural gases and oils to produce the same product. The difference is we are using a cleaner, more direct from the earth source for our fuels, essentially embracing the natural cycle of how we should be conducting and consuming our fuels and other energy sources.

And, what if I told you that you could make your very own Biomass Digester at home?! It's the real thing and it's a lot simpler to put together than you may think!

6. IS BIOMASS REALLY A CLEAN ENERGY RESOURCE?

As we strive to find alternative energy resources, many potential solutions are on the table. Is biomass one such solution?

Biomass energy is unique in that it has existed in primitive forms since the early days of mankind. Burning wood in a cave is a form of biomass energy, which is simply the conversion of an organic material in a manner that produces heat. For example, a fire converts the organic wood into heat. Therein, however, lays the problem.

Global warming is a much debated issue with everyone having a strong opinion and no one seemingly willing to listen to the other side. Whatever your view on this subject, what is clear is we are producing an absolute massive amount of carbon-based gases in our modern civilization. This is a key issue since the amount of carbon in the atmosphere is a key factor in climate regulation on our planet.

To understand the problems of biomass as an energy form, one has to understand the biomass cycle that occurs on the planet. Simplified, the biomass cycle regulates the amount of carbon in our atmosphere. The biomass, primarily in the form of plants, uses carbon to grow and the biosphere effectively acts as a sponge for carbon. This sponge effect, however, has limits. As with a sponge in your kitchen, the biomass can only suck up so much carbon at one time. When there is too much carbon dioxide in the atmosphere or we shrink our “sponge” with deforestation and such, we run the risk of overwhelming the atmosphere with carbon dioxide. If our atmosphere has excessive CO2, heat is

trapped and all hell begins to break loose. From a practical standpoint, this means our relatively mild climate on Earth will start becoming more chaotic. After the most recent hurricane season, that definitely is not a good thing.

Taking the biomass cycle into consideration, the negatives of all biomass energy production are that they do generate carbon dioxide when they are burned. A caveman sitting next to a fire in a cave is using biomass energy to produce heat, but the black smoke is a very nasty carbon pollutant. In modern terms, biomass energy doesn't really resolve the amount of CO2 we are putting into the atmosphere. Yet, there is an argument on the other side of the biomass coin.

Proponents of biomass argue it is a better energy source than fossil fuels. The basis of this argument is that plants [biomass] have taken in much smaller amounts of carbon gases over a shorter period of time than fossil fuels. Thus, burning them is a carbon neutral situation. The problem, of course, is that even if this concept is correct, we are not cutting down our carbon emissions. At this point in time, we need to be reducing carbon gases, not maintaining our current output.

It is indisputable biomass has its problems. However, it is a better alternative than fossil fuels, but how much so?

7. WHY USE BIOMASS FOR OUR ENERGY NEEDS

The last five years has seen a revolution in how governments, people and industry view energy. The positive aspects of biomass energy have come to the forefront in this discussion.

Why Use Biomass for Our Energy Needs: The Pros

The primary positive aspect of biomass is it is part of the cycle of life. This means it isn't toxic to the environment because it is more or less part of the environment. An additional benefit is the fact biomass almost always breaks down relatively quickly to its natural elements. This means a biomass fuel spill would be far less damaging than an oil spill, particularly in the long run.

The burning of biomass does kick out carbon dioxide among other gases. Carbon dioxide, of course, is a greenhouse gas. Proponents of biomass energy, however, argue that the gases produced are not really a problem because they are part of the current cycle. By this, they are arguing that carbon dioxide is a natural element produced in nature and they are correct.

Fossil fuels, on the other hand, are outside of the natural cycle in the world because they are buried in the ground, which effectively means they are not part of naturally occurring process. As we dig and drill fossil fuels out of the ground, we are adding the harmful elements to a system that cannot withstand the massive influx. In the ancient past, the earth had large forests that were buried before microorganisms evolved to break down the lignin, and this resulted in large coal deposits. These coal deposits, if they remained in the ground would not be a problem. But we are

burning them, and reconverting sequestered carbon into carbon dioxide.

We already use many biomass fuels in our daily lives. The first cavemen used them to light fires for warmth, protection and cooking. Today, we use them to power our automobiles in the form of biodiesel and bioethanol. Whether you realize it or not, these two fuels have been going into our cars at gas stations since 1990 in parts of the country. The reason is they are used as additives in gasoline for the purpose of reducing harmful carbon dioxide emissions. In fact, federal law mandates their use in certain cities such as Los Angeles as well as in most government vehicles.

Carbon dioxide produced from vehicles makes up over a third of all the greenhouse gases produced in our country. Bioethanol made from corn cuts these emissions by over 20 percent compared to your basic gasoline. Biodiesel made from soybeans cuts emissions by as much as 80 percent. Any way you cut it, using biomass fuel is a step in the right direction.

8. ENERGY - WHAT YOU NEED TO KNOW ABOUT BIO FUELS

Agro fuel commonly known as bio fuel is derived from a biomass. It can be a solid, liquid or gaseous fuel. Bio fuel is now a common means of decreasing the greenhouse gas emissions and is now used as fossil fuel alternative. It is eyed to replace fossil fuels in the near future.

Bio fuels are now used in many countries and are now extensively expanding in places such as Europe, Asia and America. The production of bio fuels is derived from any carbon source--particularly plants. According to studies, it is environmentally safe to produce bio fuels because these sources are easily replenished.

The most common use of bio fuels is for the automotive and transportation industries.

Bio fuels are made in three generations. The first generation bio fuels are made from crop goods such as sugar and starch, vegetable oil and animal fats. With the help of conventional technology, these components are used to manufacture some bio fuels. In countries with warm climate, bio fuels made from vegetable oil are now being used as fuel for automobiles with diesel engines. Because vegetable oil is difficult to use on its own for fuel, it has to be mixed with conventional diesel fuel. Bio diesel is a common first generation bio fuel. It is similar to a mineral diesel. Bio diesel is made from vegetable oil that is mixed with sodium hydroxide and methanol in a controlled reaction.

Another type of first generation bio fuel is the bio alcohol. It is produced biologically and the products are ethanol, butanol and propanol. It is done through fermentation. Of all the three, butanol is the only bio alcohol that can produce high energy. An automobile should be first modified before using butanol. Otherwise, it can cause the engine to overheat when used directly with existing gasoline engines. Ethanol fuel is used worldwide. It is now considered as a replacement for gasoline and it is safe to mix it with gasoline at any percentage. Methanol is produced from natural gas which is a kind of fossil fuel. Hydrogen has long been used by many countries but is now being replaced by methanol. Bio gas is also a very effective product of bio fuels. It is produced from biodegradable waste materials through the process of anaerobic digestion. Solid bio fuels are made from wood, charcoal, dried animal waste and any carbon rich material.

The second generation of bio fuels is produced using the biomass to liquid technology that extracts bio fuels from non-food crops. Bio hydrogen is one common type of the second generation fuel. It is now used in fuel cells to produce electricity. DMF is manufactured from fructose and glucose using the biomass to liquid process. DMF is now widely used in vehicles.

Bio methanol, almost the same as methanol is now being used in automobiles and can mix with petrol up to 20% by volume without any significant changes. FT diesel or Fischer-Tropsch diesel is not used with fossil diesel. Wood diesel, another type of the second generation bio fuels is extracted from wood chips. The oil produced is mixed with unmodified diesel engines and the charcoal byproduct is used as a fertilizer.

The third generation bio fuel is from algae. In some countries, algae farming is now a growing industry to supplant the need for cheaper oil.

The industry for bio fuel is now growing in some countries. Resources for bio mass are continuously being discovered as the demand for bio fuels increases. Other uses for bio fuel are also continuously being discovered. In some countries where oil is expensive, bio fuels have been applied for cooking indoors.

A number of benefits are noted upon the use of bio fuels. Reduction of greenhouse gases, fossil fuel use, increase in energy security, increase in rural development and poverty reduction are some of them. With industrialization widely being embraced by many countries, the need for fuel is increasing. With the high cost of current fuels being used, some countries cannot accommodate competition with rich countries. But with the bio fuel, it is now possible.

However, the use of bio fuel is not unlimited. It has limitations like other sources of energy. Manufacturers and producers of bio fuels should know well that the resources should be replaced or replenished rapidly. Otherwise, a more negative effect will come into the picture. Though some negative effects were mentioned with the use of bio fuels, the advantages are still greater.

With proper knowledge and understanding of bio fuel, everyone worldwide will surely benefit from bio fuels.

9. BIOFUELS AS ALTERNATIVE SOURCES OF ENERGY

Biofuels are produced by converting organic matter into fuel for powering our society. These biofuels are an alternative energy source to the fossil fuels that we currently depend upon. The biofuels umbrella includes under its aegis ethanol and derivatives of plants such as sugar cane, as well as vegetable and corn oils. However, not all ethanol products are designed to be used as a kind of gasoline. The International Energy Agency (IEA) tells us that ethanol could comprise up to 10 percent of the world's usable gasoline by 2025, and up to 30 percent by 2050. Today, the percentage figure is two percent.

However, we have a long way to go to refine and make economic and practical these biofuels that we are researching. A study by Oregon State University proves this. We have yet to develop biofuels that are as energy dense as gasoline made from petroleum.

Recently, oil futures have been down on the New York Stock Exchange, as analysts from several different countries are predicting a surge in biofuel availability which would offset the value of oil, dropping crude oil prices on the international market to $40 per barrel or thereabouts. The Chicago Stock Exchange has a grain futures market which is starting to “steal” investment activity away from the oil futures in NY, as investors are definitely expecting better profitability to start coming from biofuels. Indeed, it is predicted by a consensus of analysts that biofuels shall be supplying seven percent of the entire world's transportation fuels by the year 2030. One certain energy market analyst has said, growth in demand for diesel and gasoline may slow down dramatically, if the government subsidizes firms

distributing biofuels and further pushes to promote the use of eco-friendly fuels.

There are several nations which are seriously involved in the development of biofuels.

There is Brazil, which happens to be the world's biggest producer of ethanol derived from sugars. It produces approximately three and a half billion gallons of ethanol per year.

The United States, while being the world's greatest oil-guzzler, is already the second largest producer of biofuels behind Brazil.

The European Union's biodiesel production capacity is now in excess of four million (British) tons. 80 percent of the EU's biodiesel fuels are derived from rapeseed oil. Soybean oil and a marginal quantity of palm oil comprise the other 20 percent.

3 SOLAR POWERED ENERGY

10. AN UNTAPPED SOURCE OF ETERNAL ENERGY: WHAT IS SOLAR ENERGY?

11. AN OVERVIEW OF SOLAR CELLS THROUGH THE YEARS

12. HARNESSING THE SUN'S ENERGY

13. BRIGHT HOPES FOR THE FUTURE OF SOLAR ENERGY

14. ADVANTAGES OF USING SOLAR ENERGY TO PRODUCE POWER

15. BIPV: BUILT-IN PHOTOVOLTAICS: SOLAR ENERGY THAT TAKES THE PLACE OF CONVENTIONAL GLASS AND ROOFING

16. CONCENTRATING SUNLIGHT FOR ENERGY

17. EFFECTS OF CLOUDS ON A SOLAR PANEL

18. EVERYBODY CAN NOW GENERATE THEIR OWN SOLAR ENERGY!

19. EVERYTHING YOU WANTED TO KNOW ABOUT SOLAR PANELS

20. FINANCIAL INCENTIVES FOR USING SOLAR POWER IN YOUR HOME

21. HEATING YOUR HOME WITH SOLAR, BUT WITHOUT PANELS

22. HOME IMPROVING WITH SOLAR – THE IMPORTANT CONCEPT OF GAIN

23. HOW SOLAR THERMAL WORKS IN YOUR HOME

24. HOW TO SELECT AN INSTALLER FOR YOUR SOLAR PANELS

10. AN UNTAPPED SOURCE OF ETERNAL ENERGY: WHAT IS SOLAR ENERGY?

The most exact definition of Solar Energy is plainly – "the energy from the sun". It is a term used to classify the electromagnetic radiation emitted by the sun and intercepted by the Earth. It is the world's most permanent and reliable source of energy and the most copious.

The uses of solar energy on earth include solar heating for buildings, solar heat for manufacturing or industry and electricity production. So what is solar energy? How does it affect us?

Solar energy is responsible for weather systems and ocean currents. It provides light, heat, and energy to all living things on Earth. It has many uses. It supplies electricity; it can be used to power cars.

Solar energy is also used as a power for satellites in space and in space shuttles. It could also power boats, generators during emergencies, toys, and even security systems.

The amount of solar energy that the earth receives is about 770 trillion kilowatts (kW), an amount 5,000 times bigger than the sum of all other energy, may it be nuclear or geothermal energy.

There are two types of solar energy. These are:

1. Thermal Energy

2. Electric Energy

What is the difference between the two types of energy?

Thermal energy is kinetic energy. It is everywhere. It makes the earth hot and even heats up our homes. It helps us to dry our clothes. It is used as well to heat up water for household use or even pools. That is why thermal energy is called heat energy because it is in the center of the earth as well.

Electric energy is widely known to us as electricity. It is an essential part of nature and it is one of our most widely used forms of energy. Sunlight is converted to alternating current to power ordinary electrical equipment, such as household appliances, computers, and lighting.

Most applications of solar energy depend on systems including collectors, storage and controllers. Storage is needed because solar energy is only available at daylight hours, but the demand for energy is needed both day and night. Charge controllers are used to guarantee that the storage system works safely and efficiently.

The accessibility of solar energy is determined by three factors:

- The location is usually measured by latitude, longitude and altitude.
- The time.
- The weather.

Aside from knowing that solar energy is a free energy, you have to realize that it also has advantages and disadvantages.

The advantages are:

- Solar energy is almost limitless; it will be available for as long as there are still humans in the earth.
- It is abundant. You will not worry about running out of it.
- It could provide more power than all known fossil fuel reserves.
- Solar energy is available during the day when electricity usage is really important.
- It is the most inexhaustible, renewable source of energy known to man.
- Solar energy can be absorbed, reflected, transmitted, and insulated.
- It can be collected, converted to electricity and stored in batteries.

The disadvantages are:

- It is not suitable in cloudy areas.
- It is not available at night time.
- It may require large land areas.

Considering geography, season is an important determinant of solar energy levels because the Sun's position and the weather vary greatly from summer to winter.

11. AN OVERVIEW OF SOLAR CELLS THROUGH THE YEARS

When solar cells first came on the scene in the 1950s, they were simple. Now, there are a wide variety of cells and more are coming as technology improves.

Solar cells are the basic component of any active system used to convert sunlight into a form of energy. Traditionally, solar cells were used as the key part of panel systems that generated electricity or heat for homes. These days, the technology is used in a wide variety of applications, which means the style of solar cells vary per application.

A traditional solar cell consisted of some very basic components. The cell was typically a flat square made up of a glass or plastic panel attached over a crystallized silicon substrate. The silicon was embedded with metal wires and worked by having the sunlight strike the upper surface, which by the photoelectric effect emitted electrons. The electrons produced an electrical current that was collected by the conductors on either side of the unit. The electricity was in the form of direct current, which had to be converted to AC with an inverter. The electricity was either stored in batteries or fed into the grid of the local utility company, called net metering.

The problem with the first solar cells involved efficiency. Initial cells converted sunlight at a rate of one to six percent. More energy was lost in the conversion from direct current to AC. It worked, but was so inefficient that huge surface areas of solar cells were required to make significant energy.

As technology improved, the components of solar cells became more efficient. A silicon base was still used, but modified to convert more of the spectrum of sunlight. As efficiency rose, the cost of using solar cells dropped because less where needed. Still, efficiency was relatively low, making the systems cheaper but not really cost effective compared to buying power from a utility.

These days, referring to solar cells is somewhat misleading. Much of the new technology is abandoning the traditional concept of cells. Instead, companies are thinking out of the box and coming up with entirely new platforms. Options include nanotechnology whereby quantum dots are developed to convert the sunlight to energy. When fully developed, the dots will be part of the paint you use on your house. Technically, you can call the dots cells, but they are not in the traditional understanding of the term. Other options include the use of germanium as an alternative to silicon, but this hasn't been released into the market. Thin solar cell technology is also popular, but involves the basic pieces of a traditional system.

Solar cells used to be fairly uniform with silicon, glass cells being the standard. The future of these solar cells is dubious, however, as companies seek out dramatic leaps in solar technology.

Solar power technologies, the harnessing of the renewable energy of the sun for our electrical power, include the use of either photovoltaics or implementation of passive solar heating. Let's take a look at each.

Photovoltaics (PV) for solar power are solar cells whose purpose is to convert the light from the sun directly into electricity. These photovoltaic cells are made of materials that have semiconductive properties. In their simplest forms these solar power cells energize calculators and watches. The more complex photovoltaics can provide the lighting for entire homes and provide solar power to the local electric grid for a large portion of the local community.

Photovoltaics work any time that the sun shines, although you'll get more solar power when it is a bright sunny day and when the rays of the sun are shining perpendicular to the solar power panels. Unlike a solar power system that is used to heat water, the technology of photovoltaics use the rays of the sun to make the electricity. What it does instead is produce electricity from the electrons that are liberated by the sunlight's interaction with the PV cells' semiconductive materials.

It's not necessary for you to be a whiz at physics, however, for you to implement this solar power and take advantage of all its benefits. Investing in PV gives you the chance to produce your own power noiselessly, pollution-free and without any moving parts to worry about. Solar power is a renewable energy resource that is entirely clean.

Solar power will also help the United States or whichever country you are in reduce its dependence on foreign countries for its energy supplies. Many manufacturers of solar power panels and other products might be right in your home town, or at least a nearby community. You can generally support local firms for the batteries, glass and other parts that make up your photovoltaic solar power supply.

The second source of solar power, passive solar power, can heat your home and light it as well. Residences and commercial buildings that have implemented this passive solar power use simple methods such as windows that face south and building materials that absorb the heat of the sun and then release it slowly. Passive solar power is not about mechanical implementations.

With these simple passive processes and implementations residences can realize a reduction of up to half of their home heating bill. Natural ventilation to cool that home is also part of passive solar power as well.

The basic and most important premise of new home solar power implementation is that the longest wall of your newly constructed home should be built to face true south within 15 degrees. This will provide the most gain in winter solar heating power and the best advantage for summer solar power cooling.

13. BRIGHT HOPES FOR THE FUTURE OF SOLAR ENERGY

Research is shedding new light on an unexpected source of energy for heating homes and generating electricity-the sun.

The sun-directly or indirectly-is the primary source for most forms of energy found on Earth. Solar energy is clean, abundant and renewable.

Though we think of solar power as a new discovery, ancient civilizations found innovative ways to use solar energy. Among them, the Greeks, Romans and Chinese all developed ways to use solar warmth for their homes, including using southern exposures to maximize solar heating and making use of solar lighting.

Now, thanks to innovative technologies, it's possible to capture this energy, concentrate it, store it and convert it into electricity.

Sunlight is converted into electricity using solar cells. Solar cells are also called photovoltaic cells, or "PV cells" for short. PV cells were first developed in the 1950s for use in American space satellites. Today, they are used for power needs ranging from telecommunications to rural electrification. PV cells can be found on items we use daily, such as calculators, flashlights, radios, landscape lighting and children's toys.

Portable PV units are also available for emergency and disaster use, such as keeping cell phones and small

appliances charged when the user is away from the grid or during blackouts.

Consumers can harness the power of the sun for themselves more easily than ever. Solar panels you see on buildings and homes have been available on the market for decades. New systems-which incorporate solar into roofing shingles-are now aesthetically pleasing, efficient and durable.

Sunlight isn't only used to generate electricity. It is also used to heat water, which can be used to warm homes and businesses. Solar-powered radiant heating systems run some industrial processes and drive turbines to generate electricity. Many solar thermal technologies have been used in homes for decades and can last more than 20 years.

Experts believe that solar energy technologies can benefit this nation in many ways. They have the potential to help diversify this country's energy supply, reduce the dependence on imported fuels, improve air quality, offset greenhouse gas emissions and stimulate the economy by helping to create jobs in the manufacturing and installation of solar energy systems.

14. ADVANTAGES OF USING SOLAR ENERGY TO PRODUCE POWER

Solar energy is very clean and an alternative to conventional heating and electrical systems.

When considering the choice of using solar energy to produce power you should understand how it works. You can imagine that it works much the same way that leaving

your garden hose laying in the sun all day on a hot sunny day. When you go to use it the first thing that comes out is hot water having been heated by the sun all day.

This is a simplified version of one way to utilize solar energy. There is usually a water container that collects the sun's rays in the form of heat. After this is heated to a pre-determined temperature it is then properly utilized elsewhere.

Some common applications of this have been to heat water in swimming pools and ponds with water moved into large containers that are basked in the sun all day. The mechanism will then move the water back into the pool or pond once the water reaches a pre-set temperature which in turn helps heat the rest of the water.

Another way is considering using solar energy to produce power by gathering solar power through photovoltaic cells that in turn convert energy obtained from the sun DIRECTLY into electricity. This electricity produced is in Direct Current or (DC) format. This (DC) can then be stored directly into storage batteries. After this (DC) is converted to Alternating Current (AC) it can be used to operate lights and any other common appliance.

Silicon from just one ton of sand used in photovoltaic cells could produce as much electricity as burning five hundred thousand tons of coal.

There are areas that have more average days of sunshine, where using solar energy to produce power can be a good source. When you couple this with the fact that you are dealing with a power source which is clean, cheap and renewable it just makes sense. However, understanding how

it works, you can see how using solar energy to produce power may not be a good solution in areas of the country with many days of overcast skies and insufficient sunlight.

15. BIPV: BUILT-IN PHOTOVOLTAICS: SOLAR ENERGY THAT TAKES THE PLACE OF CONVENTIONAL GLASS AND ROOFING

A promising renewable energy technology that breaks down pre-existing concerns and hesitation about solar energy is called Building Integrated Photovoltaic (BIPV). These systems actually build solar cells into the construction of a building. They look as natural as what would have been a conventional roof, window, awning, and even concrete. They are often made of flexible "thin film", which is also a relatively new and exciting technology.

BIPV systems can provide savings in electricity costs for years to come. In some areas solar energy can almost completely replace conventional electric sources, but in almost every area the electricity provided can at least provide enough benefit to make conversion to photovoltaic worthwhile. In fact, the cost of the technology is coming down so fast that even a minimally effective BIPV system can bring financial reward.

BIPV systems can be made to be "on-grid", or interfaced with the local electric utility. That way, not only does the homeowner get "free" electricity for their own usage, they also can automatically sell it back to the utility. Not only

might you receive no electric bills, you might actually receive a check back from the electric company some months! The on grid system also guarantees a back-up source of power as necessary.

BIPV systems can be designed to blend in and look like conventional building materials and designs, such as:

- The façade of a building, such as traditional view or decorated glass. This is an emerging technology that has not been perfected, but can still have a significant impact.

- Photovoltaics can be incorporated into external structures such as awnings. In this case they are obviously most effective in areas or sides of the building that get the most sun.

- The most common use of building integrated photovoltaics are in roofing systems, where solar shingles or panels are substituted for traditional roofing. Again, these solar cells can often be made of flexible thin film.

- Skylights made of solar cells can be a very effective form of BIPV, particularly if the face a direction where the sun is strong.

BIPV has become so advanced that you have likely driven by a structure that uses it and you probably had no idea. In fact, the technology encourages the use of more windows, skylights, and built-ins like stained glass. Building and houses with BIPV, far from being less attractive, may actually be the most attractive on the block.

As exciting as the above technologies are, there has even been research into building photovoltaic solar cells into

concrete and other building materials. Soon this technology may be widespread and conventional, but for now you can get a head start while saving electricity, reducing your carbon footprint, and serving as a model for others.

16. CONCENTRATING SUNLIGHT FOR ENERGY

One of the consistent problems with solar platforms has been the inefficient conversion of sunlight to electricity. New technology and strategies are dealing with this issue.

Concentrate, Concentrate

Traditional power generating plants work by using a fuel, often fossil, to heat a liquid until it expands or turns into a gas. The pressure or gas than rotates a turbine, which cranks up a generator and produces the massive amounts of electricity we all take for granted. This is a time tested method and is used in coal, nuclear, hydropower and most major power sources. The concept is now being transferred to solar platforms in an effort to get more bang for the buck out of these clean energy platforms.

The problem with solar is sunlight is converted to energy at a rate of 10 to 15 percent efficiency, a truly uninspiring number. Put in sports terms, the best batter in baseball would have a batting average of 150, a quarterback would complete 1.5 of his attempted throws and Michael Jordan would have missed 9 out of every 10 dunks. The numbers simply aren't pretty.

The problem with solar power is the base construct of solar cells. Various forms of silicon are used to convert sunlight into energy. The material is simply inefficient and improvements are slow and incremental. The situation is similar to trying to turn a moped into a high performance racing bike. You don't have much to work with. Given the limitations of silicon, solar producers are trying new strategies.

One of the major new strategies is to use the sun as a direct heating component to produce power. Instead of trying to directly convert the sunlight with silicon wafers, producers are trying to use reflective panels to focus it onto a specific spot. This spot then contains a pipe or pool of liquid. The concentrated focus of the sun heats the liquid up and the traditional turbine to generator to electricity strategy is undertaken. If you've ever sat in a car in traffic on a summer day without air conditioning, you'll understand the concept.

Generating energy from the sun on a large scale has always been a bit of a head scratcher. Early returns on the concentrated energy strategy, however, have been extremely positive. Major fields are being used in Germany and the future appears…bright.

17. EFFECTS OF CLOUDS ON A SOLAR PANEL

Solar panels hold a wealth of benefits, both for individuals and for the world at large. Economically, solar panels promise to lower the cost of electrical power. Environmentally, solar panels can give us cleaner power, sustainable power that will not require further damage to the environment. Solar power can reach remote areas. It can carry education, or urgently needed medical information.

The effects of clouds on a solar panel, though, might diminish those and other promising benefits.

The effects of clouds on a solar panel might make it far less efficient in certain parts of the world and at certain seasons.

For that reason, people who are considering solar panels for their homes are often heard to ask: will clouds affect my solar panels?

Will Clouds Affect My Solar Panels?

Clouds do affect solar panels. The amount of power your solar panels can produce is directly dependent on the level of light they receive.

In full, bright sunlight, solar panels receive maximum levels of light. During those "peak" sunlight hours, your solar panels will produce power at their maximum capacity.

When clouds cover the sun, light levels are reduced. This does not shut down power production, however. If there is enough light to cast a shadow, in spite of the clouds, your solar panels should operate at about half of their full capacity. Thicker cloud cover will reduce operations further. Eventually, with heavy cloud cover, solar panels will produce very little useful power.

The Good News!

The effects of clouds on a solar panel can be surprising good, however. Incredibly, your solar panels will put out their ultimate amount of peak power during cloudy weather!

As the sun moves into a hole between the clouds, your solar panels will see something wonderful. They will see full direct sunlight "plus" reflected light from the clouds! They will drink in more energy than they could on a cloudless day!

The effects of clouds on a solar panel could then produce peaks at or above 50 percent more than its direct-sun output!

18. EVERYBODY CAN NOW GENERATE THEIR OWN SOLAR ENERGY!

If you have already ruled out home solar panel as an alternative means of power because of its expensive price, better think again. Indeed, solar panels nowadays, especially those that can be used to provide enough power for most of your appliances, are exorbitantly priced. The price of a system can run from $20,000 up to $50,000 depending on your energy needs. This is why many

regrettably have to give up plans of setting up home solar panels on their rooftops.

There are other means of acquiring solar gadgets without having to spend so much. First of all, there are many second hand or used solar panels that anyone can buy from solar dealers – these are priced much less than the brand new ones but are still in good running condition.

Is it okay to buy second-hand or used home solar panel for your home instead of buying a brand new one? Of course, especially if the used solar panel that you bought is still of good running condition. However, pass up on solar items that have major defects or damage on them.

You might also decide on passing up on the old model type of solar panels on sale. Better think again. The older, very first home solar panels are the ones that are durable and really functioning well. They simply are such great buys especially if used properly and well taken care of by the previous owner.

As for the lifespan of a used solar panel, it can really be hard to tell. Some take years and years before bogging down and needing some repair or a replacement on a spare part or two. Most of the time, the gadget is installed on the appropriate location or top of your roof and that's it. You let it be as it needs minimal maintenance.

The main thing to do when buying used home solar panels is to avoid those that have damage on them, such as cracks and broken glass, moisture on the glass and damaged lines and connections. Unless you have extra cash to repair these defects, then it is best to steer away from these used solar products.

If purchasing your own full system is outside your budget indeed there is a more affordable way to take advantage of solar for your electrical needs.

A product is now available where you can actually rent the whole solar panel system for no more than you pay the electric company for energy. A company called Citizenre (http://citizenreusa.weebly.com/about-us.html) has come up with an innovative way to make solar an affordable lifestyle choice. Citizenre program packages solar power for you in a simple and smart way. Plainly put, the Citizenre Corporation pays for, installs, owns and operates the solar installation. You don't have to worry about maintaining the equipment or any of the other concerns that come with making an investment into solar power.

All you have to do is pay a flat monthly rent. You generate your own, renewable energy from the solar panels you rent and this power offsets the power you were buying from your utility. Your savings can cover the monthly rent and even put money back in your pocket. And since your rent is locked in for up to 25 years, you can save significantly over time as electricity prices continue to rise.

These are some of the benefits the customers receive:

-No upfront investment, no need to become a financial expert to justify your investment.

-No waiting for rebates.

-No headaches with the city and the utility; let us handle the engineering, procurement, and construction.

-With our flat monthly rent and our "Performance Guarantee" you can generate your own, renewable electricity and pay for the rent with your savings. Since your Agreement will show the amount of energy your system can generate, it is simple to calculate your savings.

-Hassle-free operating and maintenance; it's handled by the experts.

-Actual hedge against future utility price increases: you can "lock in" your rates for the electricity generated from the solar system at your home for a period of up to twenty-five years, far longer than the guaranteed rates offered by other electricity providers.

Indeed, a solar panel, whether brand new, second hand or rented, is definitely a wise choice as it helps you in minimizing your electric bills, helps the worlds growing energy needs and is especially an environmentally healthy and helpful choice.

19. EVERYTHING YOU WANTED TO KNOW ABOUT SOLAR PANELS

The history of solar panels can be dated back to 1839 as this was the period when French physicist Antoine-Cesar Becquerel made the astonishing discovery of the photovoltaic effect. This surprising discovery took place during an experiment that involved an electrolytic cell made from two metal electrodes and was placed within an electrolyte solution. Antoine-Cesar Becquerel discovered during the experiment that when the electrolytic cells were exposed to light, it produced a certain amount of electricity. The more

the light, the more the production of electricity and that is how solar panels actually came into the picture.

Almost 50 years later in 1883, the first solar cell was developed by Charles Fritts and it was formed using selenium coating sheets with a micro-thin layer of gold. Between the period of 1883 and 1941 there were several scientists as well as inventors who with the help of companies started experimenting with solar energy. It was during this period that Clarence Kemp, an inventor from Baltimore patented the first ever commercial water heater that was being powered by solar energy. Apart from this, the great scientist Albert Einstein also published a thesis on photoelectric effect and within a short period of time received the coveted Nobel Prize for his thesis and valuable research.

Around 1941, an American inventor named Russell Ohl who was working for Bell Laboratories patented the first ever silicon solar cell. This new invention was spearheaded by Bell Laboratories and they went on to produce the first ever crystalline silicon solar panel in the year 1954. This was the most effective solar cell in that era as it achieved a 4 percent return on overall energy conversion. In the next few years several scientists from all over the world continued their research, study and experimentation to improve upon the original solar cells and started producing solar cells that gave 6% efficiency on overall energy conversion.

The first ever large scale deployment and use of solar energy ever recorded was in space satellites. USA was the first country to enable production of solar cells that gave 20% efficiency and this was in the year 1980. By 2000, USA had produced several solar cells that were producing 24% efficiency. Last year, two large companies, Emcore

Photovoltaics and Spectrolab rose to dominate the world of solar cell production by producing cells that gave 28% efficiency.

Working of Solar Panels

The solar panel basically consists of pure silicon. Silicon is first stripped of all its impurities and hence provides the most ideal neutral platform for enhancing the transmission of electrons. In its natural state, Silicon can carry at the max four electrons although it has the ability to carry eight. So mathematically speaking it has enough room for 4 more electrons.

When a silicon atom is made to come into contact with a second silicon atom then each of them receive each other's extra four electrons. So the 8 electrons satisfy a single silicon atoms' needs and this results in the creation of a strong bond but the fact is that there are no negative or positive charges. To produce a large piece of pure silicon, the silicon atoms have to go through the process of combination for years. Once the pure silicon is ready, it is applied on to the plates of solar panels. When silicon is combined with other elements then it produces a positive or negative charge. This is called “doping”, and consists of either donor (n-type) or receiver (p-type) elements.

Solar panels are being looked as the provider of tomorrow as the other forms of creating electricity are changing by the day. There are several online sources and websites who are selling solar panels with a power range that varies from 10 Watt/hours to 280 Watt/hours.

20. FINANCIAL INCENTIVES FOR USING SOLAR POWER IN YOUR HOME

It is undeniable that energy prices are going through the roof. Just take a look at your utility bill. The good news is using solar power can save your bank account, particularly with new incentives.

Personal Tax Credit and Deductions

If anything is more aggravating than exploding energy costs, it's your tax bill. New and established government programs let you attack both by going solar. The first method is by simply saving money on taxes. If you install a solar energy system on your home, the federal government is going to give you a tax credit of up to $2,000. Tax credits reduce your tax liability dollar for dollar unlike deductions which are subtracted from your gross income. A majority of states now also offer tax credits you can use when paying state taxes. Each state handles the matter differently, but you can expect to get a credit for a percentage of your installation cost or a fixed figure.

Net Metering

Net metering is a concept that has resulted in exploding sales in the solar energy industry. Net metering refers to state laws that require utilities to purchase power generated from your residential solar system at the same price the utilities would otherwise charge you for electricity. In effect, net metering lets you use the utility company as a battery. While you are at work during the day, your solar system sends energy to the utility and your power meter actually runs backwards. When you come home at night and use power, the power meter runs forward. All and all, net

metering will either slash or completely eliminate your utility bill. With solar panel systems having a life of 40 years, think how much money you'll save! While a majority of states have net metering laws, not all do. Make sure to check if yours does.

Property Tax Incentives

Property taxes. How we all hate paying property taxes. Well, many states now provide exemptions, exclusions or credits for homes with solar power. Each state handles this issue differently, so look into the potential savings in yours.

Rebate Programs

To promote solar energy, rebate programs are offered to homeowners by states and utilities. Again, the characteristics of such programs vary wildly, but typically come in the form of rebates ranging from a couple hundred bucks to $4,000 or more.

With your utility bills going through the roof, it is time to consider steps you can take to save money. The economic benefits of going solar have never been better, which makes now the time to convert.

21. HEATING YOUR HOME WITH SOLAR, BUT WITHOUT PANELS

With rising energy costs and massive stress on our electrical grids, solar is rising in popularity. Not everyone realizes you can heat your home without buying big panel systems.

Heating Your Home With Solar, But Without Panels – Gain

You can use solar energy to heat your home through a concept known as gain. While you may associate panel systems with any mention of solar power, they are not a component of this approach. Of course, this makes the installation a heck of a lot cheaper than going with traditional panel systems.

Solar gain is a concept that has been with us for much of the history of mankind. Earlier civilizations obviously didn't have electricity. To keep structures warmed, they learned to use the heat produced by sunlight. It is fairly humorous when archaeologists marvel at the fact ancient structures are always oriented to the sun. If they knew anything about solar gain, they would realize the structures were being used to produce thermal heating through masonry, openings and so on. Regardless, these early civilizations were the first to develop and implement solar gain heating.

The simplest way to explain solar gain is with a practical example. Assume it is summer time and your car is parked in the driveway with the windows rolled up. What happens when you open the door to get in? A massive blast of heat comes out. If you have black seats like I do, you also hop around like a fool when you sit down on the black surface. Your car is hot because it has acted as a platform for solar gain. The sun came in the windows, heated up surfaces in the car and raised the temperature. Since most vehicles are poorly ventilated, the heat reached unbearable levels because it couldn't escape quickly enough. This is solar gain in a nutshell, a methodology that can be applied to your home.

With solar gain heating, the idea is to maximize sun penetration into the home, convert the sunlight into heat, and circulate it through the home. To accomplish this, one typically puts windows on the south side of the home to capture as much sunlight as possible. Thermal storage materials, such as masonry, are placed below the windows to capture and store heat for after the sun goes down. The heat from the sun is circulated throughout the house throughout the day and evening until the stored amount is exhausted. Yes, it works in winter.

Solar gain is an ancient and highly effective method for heating your home. If it sounds interesting to you, visit a solar site to find out the specifics.

22. HOME IMPROVING WITH SOLAR – THE IMPORTANT CONCEPT OF GAIN

You've decided to pursue a solar home improvement, but aren't so keen on the idea of putting panels on your roof. No worries, you just need to understand the concept of gain.

I Gotta Gain Some Heat

I'll cut to the chase – gain refers to how you generate heat for your home without solar panels. You can think of it as gaining heat by manipulating the power of the sun. There are three categories of gain: direct gain, indirect gain and isolated gain. So much for the mumbo jumbo, what are we really talking about here?

Direct gain refers to improving your house in a manner that allows the sun to… [drum roll]…directly provide power in the

form of heat to your home. For instance, if you install large windows in the south facing side of your home and put down heat storing flooring such as masonry, you are pursuing direct gain. The sun will directly heat the home through the windows during the day and will also heat up the flooring. As the sun goes down, the flooring will continue to radiate heat. The advantage of direct gain is it is fairly easy to implement. The disadvantage is it only works during the day and for a few hours afterwards if you've put in a heat storing flooring material.

Indirect gain is a bit more complicated. It refers to the idea of using a structure between the exterior and interior of the house to store heat produced by exposure to sunlight. The basic idea is to get more heat production for a longer period of time. Indirect gain is typically accomplished by building a thermal wall out of masonry, known as a Trombe Wall, as the south facing wall of your home or a part of it. The wall is built out of a material that absorbs heat such as concrete or brick and then has glass placed over it. Put another way, the south wall is a window with a brick wall behind it. The wall materials suck up the power of the sun and store heat. This heat is then radiated when you need it by opening vents in the wall. The advantage of indirect gain is you get longer, more controlled heating. The disadvantage is you have the world's weirdest looking window on the south side of your home.

Isolated gain is a simple concept. Have you ever used a greenhouse to grow flowers or tomatoes or…well, something? Isolated gain works just like a greenhouse, except you are providing heat to yourself instead of plants. Essentially, you build a self-contained glass structure on the south side of your home which is also well insulated. The structure heats

up in the sun during the day to very high temperatures. When you need heat, you just turn on a fan, which moves it into the house through venting you've installed.

The beauty of any of these systems is they are fairly simple concepts to understand. If solar panels don't appeal to you, just go for some gain.

23. HOW SOLAR THERMAL WORKS IN YOUR HOME

Given energy concerns these days, most homes are now designed to take advantage of passive solar heating concepts. Solar thermal is a big part of this process.

How Thermal Mass Works In Your Home

Getting a little free heating can go a long way on your utility bill, particularly over the life of a structure. Passive solar heating is the methodology used to achieve this goal. It is a process wherein a home is built or upgraded in such a way as to catch and contain as much of the sunlight in the form of heat as possible. To effectively use solar for heating, thermal mass is a subject you need to understand.

Thermal mass simply refers to any material that absorbs and stores heat. In this case, we are obviously talking about material that stores the heat inherent in sunlight and disperses it at a later time once the sunlight is no longer hitting it. You may not realize it, but your home already has thermal mass producing heat. Any material exposed to the

sun, furniture, floors and such, acts as thermal mass. Unfortunately, it is usually on a pretty small scale.

Often called intentional thermal mass, a passive solar home will have strategically placed materials that are very efficient at absorbing and radiating heat. While this may sound complex, it really is not. The materials include items such as bricks, tile and masonry. Adobe and clay materials also function well in certain situations.

In a passive solar home, you need the thermal mass in the interior of the home. Strategically placing tile and brick in areas below windows that receive significant sun during the day will often do the trick. Depending on your heating needs, the amount of thermal mass you use will vary. In colder climates, it should be used in bulk while homes in Arizona need only nominal amounts.

One common misunderstanding regarding thermal materials refers to their color. Logically, it would seem to make sense that the materials need to be dark since dark colors absorb more heat. This is not particularly true in passive solar. It is the material, not the color that makes the difference. Bricks can be just about any light color, but not white. This may sound insignificant, but it can be a major benefit if you want to avoid a dark, gloomy interior in your home.

If you are trying to harness the power of the sun for heating purposes, you need to get a good grasp of the thermal products you will use. This should give you a head start.

24. HOW TO SELECT AN INSTALLER FOR YOUR SOLAR PANELS

So, how do you pick an installer for your system?

Install My System

As with any major part of your home, installation of a solar platform should be done by a professional. Many of the tax credit and rebate programs require professional installation and failure to do so can lead to the loss of the benefits. In short, there are practical and economic reasons to get it done right.

While a solar platform is necessarily a form of electrical generation, you shouldn't assume every electrician knows how to install one. In truth, most do not. Instead, you can visit a site like solarcompanies.com to find businesses in your state, search on the web or simply pull out the phone book. In states such as California, installers are plentiful while other locations may require a bit of hunting.

Once you've located potential installers, make sure to ask some questions. Do not pick the lowest price or first one you find. Use your common sense and ask the same questions you would to any contractor installing something on your home.

The first question to ask is whether the installer has, in fact, installed systems before, how often and for how many years? You do not want a neophyte handling your installation. Installation experience is vital because certain elements of solar systems are very unique, particularly if you are tying

into a grid system for a utility company. If you are tying in, make sure the installer has experience doing such installations, not just putting up solar panels.

The second question to ask is whether the installing company is licensed. Most solar installers will be required to have an electrician's license. Contacting the state electrical board to ask about the installer is a wise move. For some state rebates, you may also have to use an installer that has a solar contractor specialty license. Again, the state electrical board should be able to help you out with this.

This may all sound a bit confusing, so let's turn to the easiest method for finding installers. When in doubt, contact the manufacturer of your system. Many manufacturers have a list of approved installers. If not, they typically can make recommendations regarding various entities that handle the job for you.

4 FURTHER READING

25. FUTURE ENERGY CONCEPTS – THE FUEL CELL

26. FUEL CELL POWER: THE ENERGY OF THE FUTURE

27. ALTERNATIVE ENERGY FROM THE OCEAN

25. FUTURE ENERGY CONCEPTS – THE FUEL CELL

With global warming, general pollution and rising fuel prices, our future energy needs are a hot topic. Fuel cells may represent a solution, one coming sooner than later.

A fuel cell is a fairly vague phrase thrown around by those in the know and those that know relatively little. Regardless of the particular design, a fuel cell is essentially a cell similar to a battery in which a chemical process occurs to produce electricity. In this case, however, the fuel is hydrogen. The basic idea is to combine hydrogen with oxygen in a process that produces electricity. This electricity is then used as we would normally use it in our lives.

If you read the paper or watch the news, one would think the concept of hydrogen fuels in a new one. In fact, it is not. The first one was created in 1839. The problem, of course, was it was inefficient and there wasn't much interest since fossil fuels were plentiful and our energy needs were tiny compared to today. It wasn't until the 1960s that much interest was shown in the energy platform. As with many advances, NASA decided to use fuel cells to power the Gemini and Apollo space crafts. Unfortunately, the trick has been translating this limited use to wide spread applications in daily life.

A common misconception is a fuel cell represents renewable energy. Very clearly, it does not. It is a device, not an energy platform. It is like saying a hydroelectric dam is a renewable

energy. The dam is a machine to harness a renewable energy resource, but not an energy source in and of itself. The fuel cell works much the same way. It is a methodology for harnessing energy from hydrogen. The particular method can be clean or dirty, to wit, one can use water or coal for the base material. Obviously, coal is not much help.

Fuel cells can be run, in theory, on any material containing hydrogen. This means renewable energy sources such as hydrogen, biogas, and so on. The primary goal is to focus on water and other renewable sources because of their inherent clean advantages. When hydrogen is used, for instance, it produces no tangible pollution or greenhouse gases. The byproduct, instead, is simply water.

If there is anything we are good at as a species, it is making technological breakthroughs. If we can build a hydrogen nuclear weapon, surely we can build a hydrogen fuel cell.

26. FUEL CELL POWER: THE ENERGY OF THE FUTURE

Many scientific and engineering thought leaders consider fuel cell power stacks as the primary technology in the evolution of electronic or alternative fuel automobiles within the next decade.

According to Makino, a global provider of advanced machining technology, technologically advanced vertical machining centers are proven to be the ideal method for machining and manufacturing molds for the production of

fuel cell power stack separator plate membranes. These membranes are the key to producing affordable fuel cell power stacks.

Certain rigid and thermally stable vertical machining centers can produce depth accuracy within 2 microns, and a superior surface finish quality of 0.4 microns in 40 Rockwell C steel molds, both of which are essential in making such plastic and rubber membranes.

These membranes have to be of high quality and specification to establish the proper electrochemical conversion process to convert hydrogen and oxygen from the air into water. The process flow then produces electricity and heat, especially when configured in a fuel cell stack via a reformer, which controls and regulates the hydrogen for safety.

Such an electrolyte or proton-exchange membrane separates and buffers the negatively charged anodes, repelling electrons, and the positively charged cathodes, attracting electrons. The membrane allows the electrons to flow through it to the cathode side of the fuel cell stack, generating electricity. Combustible fuels burn in an engine, this turns an alternator which produces electrical energy. Standard batteries store this electrical energy as chemical energy and convert it back again. But a fuel cell stack provides direct current power and needs no storage. It is on demand. Think of it as an open cycle battery, with the reaction components flowing through it.

Unlimited supplies of fuel cell stack energy can be created via the mass production of low-cost membranes, which can be a growing market for most machine shops equipped with

technologically advanced verticals. This energy source can not only be used as power for automobiles but also as power for utility companies and home generation units, offering the world low-cost, safe, quiet, efficient, environmentally friendly and readily available power solutions.

27. ALTERNATIVE ENERGY FROM THE OCEAN

Ocean Thermal Energy Conversion (OTEC) was conceived of by the French engineer Jacques D'Arsonval in 1881. However, at the time of this writing the Natural Energy Laboratory of Hawaii is home to the only operating experimental OTEC plant on the face of the earth. OTEC is a potential alternative energy source that needs to be funded and explored much more than it presently is. The great hurdle to get over with OTEC implementation on a wide and practically useful level is cost. It is difficult to get the costs down to a reasonable level because of the processes presently utilized to drive OTEC. Ocean thermal energy would be very clean and not add pollutants into the air. However, as it presently would need to be set up with our current technologies, OTEC plants would have the capacity for disrupting and perhaps damaging the local environment.

There are three kinds of OTEC.

"**Closed Cycle OTEC**" uses a low-boiling point liquid such as, for example, propane to act as an intermediate fluid. The OTEC plant pumps the warm sea water into the reaction chamber and boils the intermediate fluid. This results in the intermediate fluid's vapor pushing the turbine of the engine, which thus generates electricity. The vapor is then cooled down by a heat exchanger that has sea water acting as a coolant from the deep ocean, where it is a few degrees above freezing.

"**Open Cycle OTEC**" is not that different from closed cycling, except in the Open Cycle there is no intermediate fluid. The sea water itself is the driver of the turbine engine in this OTEC format. Warm sea water found on the surface of the ocean is turned into a low-pressure vapor under the constraint of a vacuum. The low-pressure vapor is released in a focused area and it has the power to drive the turbine. To cool down the vapor and create desalinated water for human consumption, the deeper ocean's cold waters are added to the vapor after it has generated sufficient electricity.

"**Hybrid Cycle OTEC**" is really just a theory for the time being. It seeks to describe the way that we could make maximum usage of the thermal energy of the ocean's waters. There are actually two sub-theories to the theory of Hybrid Cycling. The first involves using a closed cycling to generate electricity. This electricity is in turn used to create the vacuum environment needed for open cycling. The second component is the integration of two open cyclings such that twice the amount of desalinated, potable water is created that with just one open cycle.

In addition to being used for producing electricity, a closed cycle OTEC plant can be utilized for treating chemicals. OTEC plants-- both open cycling and close cycling kinds-- are also able to be utilized for pumping up cold deep sea water which can then be used for refrigeration and air conditioning. Furthermore, during the moderation period when the sea water is surrounding the plant, the water can be used for mariculture and aquaculture projects such as fish farming. There is clearly quite an array of products and services that we could derive from this alternative energy source.

5 COUNTRIES IN ACTION

28. ALTERNATIVE ENERGY DEVELOPMENT IN JAPAN

“Japan is a densely populated country, and that makes the Japanese market more difficult compared with other markets. If we utilize the possibilities of near-shore installations or even offshore installations in the future, that will give us the possibility of continued use of wind energy. If we go offshore, it's more expensive because the construction of foundations is expensive. But often the wind is stronger offshore, and that can offset the higher costs. The price—if you measure it per kilowatt-hour produced—is going lower, due to the fact that turbines are getting more efficient. So we're creating increased interest in wind energy. If you compare it to other renewable energy sources, wind is by far the most competitive today. If we're able to utilize sites close to the sea or at sea with good wind machines, then the price per kilowatt-hour is competitive against other sources of energy,” go the words of Svend Sigaard, who happens to be president and CEO of the world's largest wind turbine maker, Vestas wind systems out of Denmark. Vestas is heavily involved in investments of capital into helping Japan expand its wind turbine power generating capacity. It is seeking to get offshore installations put into place in a nation that it says is ready for the fruits of investment into alternative energy research and development.

The Japanese know that they cannot become subservient to the energy supply dictates of foreign nations—World War II taught them that, as the US decimated their oil supply lines and crippled their military machine. They need to produce energy of their own, and they being an isolated island nation with few natural resources that are conducive to energy

production as it is defined now are very open to foreign investment and foreign development as well as the prospect of technological innovation that can make them independent. Allowing corporations such as Vestas to get the nation running on more wind-produced energy is a step in the right direction for the Japanese people.

The production of energy through what is known as microhydoelectric power plants has also been catching on in Japan. Japan has myriad rivers and mountain streams, and these are ideally suited places for the putting up of micro hydroelectric power plants, which are defined by the New Energy and Industrial Technology Development Organization as power plants run by water which has a maximum output of 100 kilowatts or less. By comparison, “minihydroelectric” power plants can put out up to 1000 kilowatts of electrical energy.

In Japan, the small-scaled mini- and micro-hydroelectric power plants have been regarded for a considerable time as being suitable for creating electricity in mountainous regions, but they have through refinement come to be regarded as excellent for Japanese cities as well. Kawasaki City Waterworks, Japan Natural Energy Company, and Tokyo Electric Power Company have all been involved in the development of small-scale hydroelectric power plants within Japanese cities.

29. ALTERNATIVE ENERGY IN IRELAND

The Irish are currently pursuing energy independence and the further development of their robust economy through the implementation of research and development into alternative energy sources. At the time of this writing, nearly 90% of Ireland's energy needs are met through importation—the highest level of foreign product dependence in the nation's entire history. This is a very precarious situation to be in, and the need for developing alternative energy sources in Ireland is sharply perceived. Ireland also seeks to conserve and rejuvenate its naturally beautiful environment and to clean up its atmosphere through the implementation of alternative energy supplies. The European Union has mandated a reduction in sulphuric and nitric oxide emissions for all member nations. Green energy is needed to meet these objectives. Hydroelectric power has been utilized in Ireland in some areas since the 1930s and has been very effective; however, more of it needs to be installed. Ireland also needs to harness the wave power of the Atlantic Ocean, which on its west coast is a potential energy supply that the nation has in great store.

Ireland actually has the potential to become an energy exporter, rather than a nation so heavily dependent on energy importation. This energy potential resides in Ireland's substantial wind, ocean wave, and biomass-producing alternative energy potentials. Ireland could become a supplier of ocean wave-produced electricity and biomass-fueled energy to continental Europe and, as they say, “make a killing”. At the present time, Ireland is most closely focused on reaching the point where it can produce 15% of the nation's electricity through wind farms, which the

government has set as a national objective to be reached by 2010. But universities, research institutes, and government personnel in Ireland have been saying that the development of ocean wave energy technology would be a true driving force for the nation's economy and one which would greatly help to make Ireland energy independent. A test site for developing wave ocean energy has been established in Ireland, less than two miles off the coast of An Spideal in County Galway Bay. This experimental ocean wave harnessing site is known as “Wavebob”. The most energetic waves in the world are located off the West coast of Ireland, says Ireland's Marine Institute CEO Dr. Peter Heffernan. The technology to harness the power of the ocean is only just emerging and Ireland has the chance to become a market leader in this sector. David Taylor, CEO of the Sustainable Energy Initiative, or SEI, tells us that SEI is committed to innovation in the renewable energy sector. Wave energy is a promising new renewable energy resource which could one day make a significant contribution to Ireland's electricity generation mix thereby further reducing our reliance on fossil fuels.

Padraig Walshe, the president of the Irish Farmers Association, tells us that with the closure of the sugar beet industry, an increasing amount of Irish land resources will become available for alternative uses, including bioenergy production. Today, renewable energy sources meet only 2% of Ireland’s total energy consumption. From a farming perspective, growing energy crops will only have a viable future if they provide an economic return on investment and labor, and if the prospect of this return is secure into the future. Currently the return from energy crops is marginal and is hampering the development of the industry. Biomass energies need to be further researched by Ireland.

30. CHINA'S ENERGY PLAN TO REDUCE ITS DEPENDENCE UPON COAL

According to a U.S. Congressional – Executive Commission on China, which held a series of Issues Roundtables in late 2004, it was estimated that 12 Chinese mine workers die for every million tons of coal produced. Most are killed by methane gas explosions while inside the coal mines. China Business Weekly reported in July 2000, "To prevent gas explosions, China emits 6 billion cubic meters of methane from mines annually, seriously polluting the environment..." Last year, instruments on the world's largest environment-monitoring satellite, the European Space Agency's Envisat, revealed the world's largest amount of nitrogen dioxide was hanging over Beijing and northeastern China. Because the country emits more methane from its coal mining than any other coal producing country, China pollutes the earth's atmosphere with about one-third of the total annual emissions of methane. According to the US Environmental Protection Agency, methane traps heat twenty times more than carbon dioxide, which impacts global warming.

On March 6th, People's Daily reported, "Shanxi, China's largest coal-producing province, plans to put the brakes on the further expansion of coal mining in the next five years." Shanxi Governor Yu Youjun at a recent press conference announced, "We cannot continue the rough way of development anymore and must limit coal production strictly with the guidance of scientific concept of development." While only slightly reducing the country's aggressive GDP growth, China has instituted reforms to maximize its energy efficiency and minimize the environmental damage and loss

of human life. Not only is the country stamping down on the causes of these problems, it wants western technology to help become more efficient.

Since September 2005, Shanxi shut down nearly 5,000 illegal mines and fined or imprisoned more than 1,200 operators, including 60 local officials. Coal produced about 70 percent of China's energy supply in 2005. The Chinese government worries China's dependence upon coal could rise above 80 percent over the next five years. The country is second only to the U.S. as a net importer of petroleum. Nontraditional sources are being encouraged to clean up the environment and reduce China's dependence upon foreign oil. StockInterview.com has widely discussed China's scramble for uranium as the country has embarked upon the most aggressive nuclear power program since the United States in the 1970s. Along with nuclear energy, China hopes to exponentially expand its natural gas program as a means of lowering its astronomical levels of air pollution.

Chinese Premier Wen Jiabao told the National People's Congress earlier this month that the country's growth rate would be reduced to 7.5 percent over the country's next five year plan. Economic growth reached nearly 10 percent in 2005. The strain imposed on China's natural resources and labor has been taking its toll. According to the next five-year plan, China's government policy will concentrate on building a resource-efficient and environment-friendly society. Their idea is to sustain the high output while reducing waste.

That may not be so simple. On February 20th, China Daily reported, "The bulk of China's gas-fired power plants are on the verge of closure due to a shortage of natural gas." Wang Yonggan, secretary general of China Electricity Council, said

nearly 40 percent of China's power plant capacity remained unused because of the lack of gas supplies. Wang warned a plan drafted the National Development and Reform Commission to increase China's gas power capacity to 30 gigawatts by 2010 (up from 10.7 now) would make "such targets impossible to reach," because of the gas shortfalls.

China's Ambitious Coal Bed Methane Gas Development

One of the more serious reforms being addressed is the energy crisis within the context of the environmental stigma now attached to China. Coal is a problem because, as toxic as it is known to be, it helps fuel China's growth, literally. But the dark rock has its bright side. Following the examples of the U.S. coal industry, predominantly in New Mexico's San Juan Basin, Wyoming's Powder River Basin, and Alabama's Black Warrior Basin, and the more recent rise of Alberta's Horseshoe Canyon, China has aggressively moved into the development of its coal bed methane gas industry. The degasification of coal can not only increase mining safety, but it can be an economic method of natural gas production.

In a 2005 report issued by the Federal Reserve Bank of Dallas, coal bed methane is being taken very seriously as an alternative energy source with strong growth potential in the U.S. energy mix.

"Geologists call it continuous gas, but it is also called unconventional gas or even weird gas. Whatever you choose to call it, you must give it due respect for its growing importance. The Department of Energy reports the share of unconventional gas doubled from 17 percent of Lower 48 natural gas supplies in 1990 to 35 percent in 2003. By 2025 it is projected to be 44 percent— matching the role of

conventional gas—with the remaining 12 percent of domestic supplies imported."

In the future, China hopes to increase its dependence upon cleaner burning fuels, such as nuclear and natural gas. However, the greatest immediate growth, for instance over the next five years, is likely to come from natural gas. Recent statistics show natural gas to be about 3 percent of China's energy mix. Numerous announcements over the past two years have been made that the country wants gas in its energy mix to reach 8 percent or more. For those who have traveled to China, it is no secret the country is in dire need of cleaner burning fuels.

Official statistics show that China uses 2.45 tons of water to produce a ton of coal. Coal bed methane, a byproduct, is often wasted. In 1996, China established China United Coal bed Methane (CUCBM) to harness that byproduct and to help reduce the toxic pollution and alarming fatalities, generated by coal mining. CUCBM is a sole professional company with the exclusive right to explore and develop coal bed methane resources in joint ventures with foreign companies. It is controlled jointly by Petro China Energy Company and the China Coal Energy Group Corporation.

CUCBM has been actively developing China's coal bed methane industry by drawing upon the expertise, technology and capital of its foreign partners. "More high level technologies need to be deployed to ensure reliable power supplies," Ma Songde, China's vice minister of science and technology told Associated Press in late February. "By developing these technologies, we can resolve issues restricting growth and enhance growth." China is actively

seeking foreign investment and cooperation in power generation, particularly in clean energy.

As a light hydrocarbon, coal bed methane is among the cleanest sources of energy. Published reports show that China's coal bed methane (CBM) resources, buried within a recoverable depth of 2000 meters, are estimated at approximately 36.81 trillion cubic meters. China has the world's third largest CBM resource. Following behind the United States, it is the second country to have conducted large-scale field exploration of coal bed methane.

According to a March 9th article in People's Daily, "China's coal bed methane industry made important headway in 2005." About 340 CBM wells were drilled across the country. That may not sound astonishing compared to the number of wells drilled in Canada, during the same year, which surpassed the 3,000 level for the first time. In that context, China remains nearly a virgin territory for CBM. CUCBM has been actively partnering with the world's giant oil companies and others to explore their vast CMB reserves. In 1998, Texaco (now Chevron-Texaco) was the first to partner with CUCBM and resulted in geological studies, exploratory wells and development contracts.

Since then, CUCBM has been extremely selective in choosing its joint venture partners to develop the ultra-valuable Production Sharing Contracts (PSCs). After attracting oil majors such as Texaco and Conoco-Phillips, only a total of 26 Production Sharing Contracts have been awarded to foreign-owned companies. Total coverage of those contracts now extends about 34,000 square kilometers of China's below surface coal basins. Foreign companies have invested more than $150 million in the contracted blocks. CUCBM

hopes to ramp up coal bed methane output by 2010 to help meet the national gas growth target of 10 billion cubic meters.

Pacific Asia Energy Corporation's CBM Contracts in China

The first Canadian publicly traded company awarded a Production Sharing Contract was Pacific Asia China Energy Inc. (PACE), which holds the PSC through its wholly owned subsidiary, Asia Canada Energy Corp. Pacific Asia China Energy, which trades on Toronto's Venture Exchange under the ticker symbol of PCE, also holds a second PSC through another wholly owned subsidiary China Canada Energy Corporation. It was the former which interested us, the company's Guizhou Project in southern China.

In talking with Dr. David Marchioni, one of Canada's leading CBM geologists, he said of CUCBM, "The Chinese government doesn't want to hand out resources to people who don't do anything with them. They want them developed. They want to have gas. They want to have energy." Dr. Marchioni helped co-author "An Assessment of Coaled Methane Exploration Projects in Canada," published by the Geological Survey of Canada. He is also president of Petro-Logic Services in Calgary, whose clients have included the Canadian divisions of Apache, BP, BHP, Burlington, Devon, El Paso Energy, and Phillips Petroleum, among others. He is also a director of Pacific Asia China Energy and is overseeing the company's CBM exploration program in China.

But what is the strategy here? If Alberta is now turning the corner and putting itself on the map as a serious CBM

contender, why would one of Canada's top CBM geologists get excited and pursue a property in southern China? "We got access to a huge resource for little money," said Dr. Marchioni. "Instead of paying hundreds of millions for a concession this size, we paid a small fraction of that. Comparably, the project at Guizhou would have cost up to $200 million to acquire in Alberta."

China needs to attract foreign capital, and may be generous up front, but did PACE buy a pig in the poke? We questioned him about the potential size of the resource. Marchioni responded, "The layman may think those are really big numbers, but you only have to look at the official reports. These are the numbers those guys think." He was referring to the Sproule assessment of the resource, which offered a three-case scenario, starting at nearly 1 billion cubic feet and reaching the upper limit of more than 11 trillion cubic feet. Still, their assessment for a "most likely scenario" was a hefty 5.2 trillion cubic feet. Marchioni added, "They were numbers we originally thought we had, and they've been confirmed."

How big is big in this case? "I think we could fully support some large plant of some sort," Marchioni explained. "This is more of a long-term thing where you would be looking at a major industrial development. You'd be looking to either have enough money yourself or you bring in partners to do things like liquefied natural gas or major gas-fired power station, liquefaction of coal."

Marchioni was quite excited about the CBM project in Guizhou, "These are all big projects, but the resource is there to support such a project. Because the resource is so huge, you could support a project like that. There also are a

lot of potential industrial users for gas in the region." China Daily reported South China, where the Guizhou province is located, is facing gas shortage problems because of the high energy demands of Guangdong province.

And what does PACE bring to the Chinese? "Hopefully, they'll have an operating CBM project or two contributing clean burning fuel to their energy mix, which is really what they want," answered Marchioni. "We also bring access to outside technology from places that are producing CBM."

31. SOLAR REVOLUTION IN BANGLADESH

Grameen Shakti is a renewable energy resources company based out of Bangladesh. They are a part of the Grameen family of companies, which has been working for decades to alleviate the burdens of poverty in developing countries. The Grameen Bank, one of their founding companies, has become world-renowned for their charitable work and for helping to establish groundbreaking programs focused on the needs of people.

In recent years, the Grameen Bank has financed and supported a number of projects aimed at removing social and financial barriers and creating opportunities for those less fortunate. Grameen Telecom is one such example. The central aim of this company is to provide collateral-free loans to rural villagers for use in establishing local communications networks. This model has become known as the Village Phone.

They have now committed significant resources to sustainable energy development. The cornerstone of this

effort is the Photovoltaic Program. In Bangladesh, only 30% of the population is receiving energy from the electrical power grid. In this developing nation, the infrastructure to provide energy to every household simply doesn't exist. In an effort to address this problem, Grameen Shakti has financed the installation of thousands of solar energy systems in rural communities.

This has created immense opportunities for people in rural villages. Children now have the ability to pursue their studies long after the sun has gone down. Businesses now have the ability to operate beyond their traditional work hours, thus increasing productivity and sales. A world of opportunity has opened up for an entire generation of rural villagers. As a consequence, they are no longer rural villagers. They are now members of our global village.

One of the most amazing consequences of this program has been the level of technological engagement that has occurred among the youth in Bangladesh. For young people in rural communities, the future is bright. Due to the advancement in technological knowledge and understanding, the demand for skilled workers has increased at a phenomenal pace. To address this concern, Grameen Shakti has also established training programs that educate young people in the principles of electronics and engineering.

It is both exciting and encouraging to witness the immediate and tangible effects of an enlightened business model that measures its true profitability by its social impact. It is an idea that is completely foreign to the western capitalist mindset and one that serves as a shining example of the power of an idea. Western corporations take heed; there are lessons to be learned in rural Bangladesh.

32. RENEWABLE FUELS FOR ALTERNATIVE ENERGY - GERMANY

The Germans have really taken off when it comes to renewable fuel sources, and have become one of the major players in the alternative energy game. Under the aegis of the nation's electricity feed laws, the German people set a world record in 2006 by investing over $10 billion (US) in research, development, and implementation of wind turbines, biogas power plants, and solar collection cells. Germany's “feed laws” permit the German homeowners to connect to an electrical grid through some source of renewable energy and then sell back to the power company any excess energy produced at retail prices. This economic incentive has catapulted Germany into the number-one position among all nations with regards to the number of operational solar arrays, biogas plants, and wind turbines. The 50-terawatt hours of electricity produced by these renewable energy sources account for 10% of all of Germany's energy production per year. In 2006 alone, Germany installed 100,000 solar energy collection systems.

Over in the US, the BP Corporation has established an Energy Biosciences Institute (EBI) to spearhead extensive new research and development efforts into clean burning renewable energy sources, most prominently biofuels for ground vehicles. BP's investment comes to $50 million (US) per year over the course of the next decade. This EBI will be physically located at the University of Illinois Urbana-Champaign. The University is in partnership with BP, and it will be responsible for research and development of new biofuel crops, biofuel-delivering agricultural systems, and machines to produce renewable fuels in liquid form for automobile consumption. The University will especially

spearhead efforts in the field of genetic engineering with regard to creating the more advanced biofuel crops. The EBI will additionally have as major focal point technological innovations for converting heavy hydrocarbons into pollution-free and highly efficient fuels.

Also in the US, the battle rages on between Congress and the Geothermal Energy Association (GEA). The GEA's Executive Director Karl Gawell has recently written to the Congress and the Department of Energy, the only way to ensure that DOE and OMB do not simply revert to their irrational insistence on terminating the geothermal research program is to schedule a congressional hearing specifically on geothermal energy, its potential, and the role of federal research. Furthermore, Gawell goes on to say that recent studies by the National Research Council, the Western Governors' Association Clean Energy Task Force and the Massachusetts Institute of Technology all support expanding geothermal research funding to develop the technology necessary to utilize this vast, untapped domestic renewable energy resource. Supporters of geothermal energy, such as this writer, are amazed at the minuscule amount of awareness that the public has about the huge benefits that research and development of the renewable alternative energy source would provide the US, both practically and economically. Geothermal energy is already less expensive to produce in terms of kilowatt-hours than the coal that the US keeps mining. Geothermal energy is readily available, sitting just a few miles below our feet and easily accessible through drilling. One company, Ormat, which is the third largest geothermal energy producer in the US and has plants in several different nations, is already a billion-dollar-per-year business—geothermal energy is certainly economically viable.

6 ALTERNATIVE ENERGY THROUGH THE AGES

33. NIKOLA TESLA

34. THE POWER OF THE PYRAMIDS

35. FREE EBOOK: PRACTICAL GUIDE TO 'FREE-ENERGY' DEVICES

33. NIKOLA TESLA

The first remote controlled boat, wireless lighting, and rotating magnetic fields. Sounds like a few modern-day inventions and discoveries, does it not?

Well, you might be surprised to find that these are 100-year-old concepts and inventions created and discovered by the brilliant mind of Nikola Tesla, an inventor, mechanical engineer and electrical engineer. There are so many fascinating concepts and inventions created by Tesla that are still in use today that heavily influenced a lot of modern day living more than you might think.

Unfortunately, not a lot of people know about Nikola Tesla and his impact and legacy have gone somewhat unnoticed, but here at Phoenix Voyage we have compiled and produced dozens of articles, videos and links to various informative sites and foundations that pay a wonderful tribute to Nikola Tesla and attempt to help bridge the gap in using his innovations and influence to expand on the modern-day sciences that are paving the way to the future!

From information on the Tesla Collection, The Tesla Science Foundation and “Tesla's Force,” a stunning animated graphic novel currently in production by Phoenix Voyage, we have all the information you need and more on one of the most brilliant, mystifying and impactful scientists and engineers that ever lived!

34. THE POWER OF THE PYRAMIDS

When you think of pyramids you may think of Egypt, the pharaohs and perhaps even The Mummy film franchise. But your perception of what the pyramids are and the scope and impact of their timeless designs and deep-rotted architectural influences go way beyond mere Egyptian influence and recordings and the simplistic postcards and imagery that we all recall well from elementary school history.

The trivia facts alone for pyramids make it hard to not bat an eye or read on with slack-jawed amazement. Pyramids have their claim in many different cultures, the Japanese included! The shape itself and the blueprints for pyramid design involve much more than just a simple building. Turns out, in a lot of ways, the pyramids were designed with the intention of harnessing energy!

Just recently it was discovered the very shape of a pyramid was designed with the intention to send and receive electromagnetic signals. Apparently, Tesla himself had stumbled upon this back in his heyday, conducting several tests in which he discovered the potential for energy inputs and outputs related to the pyramid shape. This is known as Pyramid power. It involves seemingly supernatural and paranormal properties that can allegedly preserve food, improve health and cause other dramatic effects.

The shape of a pyramid itself acts much the same as the cone/funnel shape that is considered to be energetically equivalent to the shape of pyramid. The shape of a pyramid serves as an amplified-receiver of various kinds of electro-magnetic and gravitational waves, electrical discharges and

cosmic rays that surround our planet. This is science, people! And it's been around for quite some time!

Knowing what we know now, the possibilities and the potential for the pyramid shape have just begun to scratch the surface. It isn't inconceivable to think that we are slowly and surely paving the way for energy and resource alternatives that have, ironically enough, been right in front of us for the past hundreds and thousands of years.

WANT TO KNOW MORE? VISIT OUR PAGE/RESOURCES AT www.phoenixvoyage.org

TO LEARN MORE!

35. Special Offer: Free Ebook

Patrick J. Kelly has put together a 3,000 page FREE eBook called "Practical Guide to Free-Energy Devices" that is available on the Phoenix Voyage website.

"I am just an ordinary person who became interested in "free-energy" as a result of a television programme entitled 'It Runs on Water' shown in the 1980s by a UK television company called 'Channel 4'. From my point of view, the content of this documentary seemed to be rather unsatisfactory as it suggested quite a number of very interesting things but gave no real hard and fast specifics for the viewer to follow up on to investigate the subject further. However, it had the enormous benefit of making me aware that there was such a thing as "free-energy".

After a long period of searching and investigating I was beginning to gather enough information to be fairly confident of what was being done, what had already been achieved, and some of the possible background reasons for the effects which were being observed. Early in 2005 I decided that as I had encountered so much difficulty and had to put in so much effort to find out the basics of "free-energy" that it could be helpful to others if I shared what I had found out. So I wrote the first edition of this presentation and created a simple web site to make it available to others. Of course, this body of information is not static – on the contrary, it is very fast moving.

Consequently, this information digest is updated and refined typically many times each year. The present form of presentation is the third style of layout which has been used as the volume of material has increased.

It should be stressed that this information is what I have discovered as part of my interest in the subject and is mainly a reporting on what is being said by other people. I have not built and proved every device described – to do that would take many lifetimes, so please understand that this is just an attempt to aid your own investigation.

While it can be proved that some device works as described, through independent replication and verification, the reverse is not true. If someone were to build a device and fail to get it to work as described, then the most that can honestly be said is that an unsuccessful attempt was made to replicate it. It does not, of course, show that the original device did not operate exactly as described, just that the (possibly inept) attempt at replication, was not successful. In some instances, you will see that I have expressed the opinion that

the device is not viable, or as in the case of the 'Nitro Cell' that I do think that it does work, but as many people have tried to build it and failed to get the results described, that it can't be recommended as an investigation project. However, as soon as I said that, a local man announced that he had made two Nitro Cells and attached them to his two Ford Transit trucks which resulted in saving him an estimated £500 over the course of two years.

I do not suggest that this set of information covers every possible device or, that my description is by any means the complete and definitive statement of everything to be known on the subject. The old saying applies here: "If you think you know all the answers, then you just haven't heard all the questions!" So, this material is just an introduction to the subject and not an encyclopedia of every known device."

https://www.phoenixvoyage.org/store/p206/Practical_Guide_to_%27Free-Energy%27_Devices.html

7 ALTERNATIVE ENERGY WEBSITES ON THE PV WEBSITE

SOLAR POWER

https://www.phoenixvoyage.org/solar-power.html

GEOTHERMAL

https://www.phoenixvoyage.org/geothermal.html

HYDRO POWER

https://www.phoenixvoyage.org/hydropower.html

TIDAL ENERGY

https://www.phoenixvoyage.org/tidal-energy.html

BIOMASS

https://www.phoenixvoyage.org/biomass.html

COLD FUSION

https://www.phoenixvoyage.org/cold-fusion.html

WIND POWER

https://www.phoenixvoyage.org/wind-energy.html

RENEWABLE & FREE ENERGY

https://www.phoenixvoyage.org/renewable-energy-free-energy.html

NIKOLA TESLA

https://www.phoenixvoyage.org/ nikola-tesla-tribute.html

THE POWER OF THE PYRAMIDS

https://www.phoenixvoyage.org/pyramid-energy.html

CUTTING-EDGE TECH

https://www.phoenixvoyage.org/cutting-edge-tech.html

FREE EBOOK: PRACTICAL GUIDE TO 'FREE-ENERGY' DEVICES

https://www.phoenixvoyage.org/store/p206/Practical_Guide_to_%27Free-Energy%27_Devices.html

Addendum: What is Energy, Really? (For the Deep Thinkers)

We use energy as a loose term. Because it has been used incorrectly, and so often, the true meaning has been lost. Most of the time we really mean "power" instead of energy.

The old definition of power was the ability to do work. Energy is transformed into power through a specific application. However, with that being said, energy is meaningless if one does not have a use for it. For example, solar energy becomes solar power by heating water or generating electricity with it. Nuclear energy is the same, or wind or pretty much anything that moves or can be channeled to do something useful.

So when we make use of energy, it becomes power. Pretty simple, isn't it? That seems to clear up the confusion. The irony of it all is that we are surrounded by myriad forms of energy, and that remains energy because it is never harnessed. A man by the name of Henry Moray actually wrote a book called, "The Sea of Energy in Which The Earth Floats." He had what could be called a working free energy device the size of a small microwave oven that put out 50,000 watts. WOW!

Ahhh...but here we go again! "Free energy?" That term has been bandied about for about as long as I can remember. Calling it that means it is not channeled to do anything useful. Unless it is using that free energy and changing it to power—and that is what the Moray, and other devices do. In fact, it has been estimated that the actual power in the vac-

uum around us in which the matter of our bodies exist is 10 to the 93rd power ergs per cubic centimeter. For a refresher, an erg is a watt-second, about the same effort that a beetle exerts going up a wall at 1 centimeter per second. That's a lot of beetles. In fact, it is so much that if you added up all the energy emitted by every star in the Milky Way galaxy, or any galaxy for that matter, you would not come close to this number. And that is in the space of a sugar cube.

So the problem, semantics aside, is in harnessing this. The problem is analogous to weighing a glass of water at the bottom of the ocean. It's not an easy thing to do, and at first seems insurmountable. However, some inventors have found a way. Some of them have died with the secret, and others use their own terminology to explain it, not having any formal science education, and are dismissed by mainstream science. But the ones who have the answer also have the working devices, whether they can explain it or not.

So we need to look at those.

There are people who have studied and compiled books about these, Patrick Kelly being one of them. Also, there have been symposia and meetings to connect the inventors with those in industry to get these into the mainstream. There is a tremedous pressure to keep things the way they are, and not rock the boat, and as a result of this not much has happened. Why is this?

In my experience, it is the "Let's let the experts handle it" mentality. We think that each of us do not have enough knowledge to understand what is going on, so we shrug our shoulders and let somebody else do it. We abdicate respon-

sibility, because we do not know enough to even have an opinion.

THAT IS THE PROBLEM!

So what's the solution? Over the past 20 years or so, I have been educating myself. It has not been easy, and at some times unpleasant. But there have been bright points, and I had a chance to dialog with a lot of really deep thinkers that are no longer with us in this earthly existence. It has been an honor and a privilege to know them and hear what they had to say, and the one thing I heard over and over again was that if you want to know the truth, you have to go out and find it for yourself. There is no "truth" pill you can take and be done with it. In fact, we are dealing with knowledge that is deliberately kept out of the mainstream so it never becomes implemented. So the only way out of this is for as many people out there as possible digging for the truth and sharing what they find. Then we can find the real science, philosophy, history, medicine, and the reasons why things are the way they are without the sugar coating.

Let us all learn *together*!