

Analysing Energy Storage Systems

For a long time, the world has been relying on energy from fossil carbon that has for many reasons dominated the energy market because it is easy to transport, among other reasons. As time passes by, the energy on earth is increasing. The earth itself from its mode of formation absorbs solar energy from the sun and stores it in its epicenter and it can not emit it back in the same rate. This adds to the many forms of energy that man is creating and using everyday. Therefore, the energy at man's disposal for use is enormous yet his rate of use is low. The increasing energy levels on earth have resulted in global warming with the melting of the ice in Polar Regions hence the rising sea levels. This article explains the available modes of energy storage and use that can match the rate of energy input on earth. This article will be important to those who want to learn more about the latest modes of energy current developments and the possible future developments regarding the green revolution.

Introduction

Recently world leaders had gathered in Copenhagen Denmark to discuss the way forward on carbon reduction to ease global warming. The theme was global warming which results from increased carbon emission that inhibits auto radiation from the earth back into the atmosphere which results in accumulated solar heat in the lower parts of the atmosphere hence global warming. The major issue that is surrounding the global warming topic today is increased heat in the world that has affected man by a far and wide in every aspect. Man is yet to discover better ways of using the much energy at his disposal that matches its rate of input. This article discusses the current modes of using solar energy (including solar cells), the new modes and the latest discoveries that include use of hydrogen as a form of energy. All these ways are aimed at reducing emission of carbon dioxide which is the core source of the problems. Not every part of the world gets equal amount of sunshine. Much of the sun is concentrated in the tropics with the Polar Regions experiencing little or no sunshine depending on the season.

Energy

As Watson (2010) puts it, energy is a characteristic of matter that makes things happen. It is a major agent of change. Without it, things would rather be constant. There are many forms of energy that are convertible from one form to the other. These include; chemical energy, kinetic energy, potential energy, electric energy and thermal energy. Many people often confuse heat as a form of energy. Work and heat are forms of energy transmissions. When we measure the heat by taking the temperature, we actually want to know the average energy of all the atoms and the molecules in a substance. If the temperature is up, then the average kinetic energy of the molecules in the matter has increased. The molecules are in motion banging onto each other thus

transferring energy one another. However, there are some scholars who refer to internal energy as heat or heat quantity (Watson, 2010).

There has been an increasing shortage of fossil fuels, increasing gasoline prices and global warming causing world leaders to have sleepless nights on how best to venture into renewable sources of energy which are also environmental friendly. Renewable sources of energy include solar energy, wind energy, hydrogen and geothermal power. According to Baldwin (2002), in forty minutes the sun gives out energy that the world population can use for a whole year. The use of solar energy as a source of energy dates back many years to 1970s, but the greatest advancement has been realized in nanotechnology (thin cell solar research) where tiny cells, through silicon are used to collect solar radiation. Solar radiation is used to generate electricity, heating or cooling spaces, etc. Thermal solar is the one that is used to heat or cool while the system used is either passive or active. For a system to be considered as active, moving parts must be involved, otherwise it is passive (Baldwin, 2002).

Solar power collector does not necessarily have to be on the roof top of a building. They just have to be placed in a place where they can collect maximum daylight. Most interesting is the solar technology that tracks the movement of the sun all day long. The panels tilt following the sun's movements just like a sunflower (Baldwin, 2002).

Solar power has diverse uses. It can be used for heating water and houses, pumping water, lighting among other industrial and urban tasks. Some solar calculators are already in use while other appliances like a solar driven cars, planes are still in development and we hope that one day they will be as many as gasoline or diesel powered engines. However, a disadvantage to solar powered devices is that they are still expensive that they cannot be afforded by everybody. But as technology improves, with increased demand for renewable sources of energy that are eco friendly, it will be easier for an average person to grasp (Baldwin, 2002).

Solar energy storage devices

With time, many companies have a tried to improve the energy storage technologies. There have been several storage devices in use as we see below.

Fuel cells: these are electrochemical cells that generate electricity through a chain of reactions. A fuel cell can have many combinations of reactants, for example; we can have a hydrogen and oxygen as reactants forming a hydrogen fuel cell. Thus there are many other types of fuel cells depending on the reactants. When an electrolyte like hydrogen is added to an oxidant like oxygen, a reaction occurs leading to generation of electricity. The difference between fuel cells and electrochemical batteries is that a fuel cell consumes reactants from an external source which has to be replenished. Research is underway for hydrogen to be used jointly with electricity as an energy store, energy carrier as well as moving and delivering energy in usable forms. The advantage of hydrogen over renewable energy sources like the solar power is that it is there all the

time even during winter when the sun isn't shining; but it can store as well as transport this energy it (Zenz, 2009).

Electric double-layer capacitors (super capacitors): They have a high density of energy as compared to normal capacitors though both are electrochemical capacitors. It is also better than the high electrolytic capacitor. Super capacitors can have a capacity of up to 5000 farads. These capacitors have applications such as energy storage devices in vehicles, energy smoothing in homes, electronic devices in homes (Zenz, 2009).

Batteries: The lead acid batteries we have today can less power than crude oil i.e. about 500 times less. These batteries have limited room for improvement because they are based on low thermodynamics of less than 0.7 mega joules.

Lithium-ion batteries: according to Zenz (2009), these batteries involve reduction of carbon and oxidation. They have an energy capacity of 2 mega-joules per kilogram.

Solar energy is concentrated within the tropics. Much of the energy is wasted away since people have not fully tapped into it and in areas tapped; there are few people with storage devices. Tapping the solar energy can be done by using a solar cell. Many investors have invested in the renewable sources of energy just because they have many advantages including environmental friendly to geopolitics. A solar cell directly converts the solar energy into electricity using the photo voltaic effect. A number of solar cells form a solar panel which can be used to tap much of the solar energy. This tapped power is usually stored up in the batteries. These batteries are not of high quality thus not cost effective. According to Csiro website, (2010), a storage device that is of high performance and cost effective is what has been the missing link. The original solar cell dates back many years ago but currently, there are a number of high efficiency cells developed using a cost efficient technology (nanotechnology) (Csiro website, 2010).

Hydrogen cell

In the modern world, hydrogen is mainly used to manufacture ammonia, refine petroleum, and synthesize methanol. It is also used by NASA's space shuttles, and in hydrogen fuel cells. Since research is underway, in future we could use hydrogen to fuel vehicles, fly planes as well as providing power for our homes and offices (California energy commission website, 2006).

Hydrogen can be obtained through electrolysis (splitting water), reforming hydrogen, and using some algae and bacteria which give off hydrogen using sunlight. According to California commission website (2006), a machine that uses hydrogen as energy is eco-friendly since its pollution is negligible. And in fact some experts think that the future economies will be hydrogen driven unlike the current economies which are fossil fuel drive (California commission website, 2006).

One of the major challenges that come with the consumption of fossil form of energy is the emission of carbon which pollutes the environment. Cars are a big contributor to environmental pollution due to their carbon emission that is in form of carbon monoxide, nitrogen oxides, carbon dioxide and hydrocarbons. All these add to environmental pollution. To conserve the environment, people must use eco-friendly sources of energy (green energy). These include cars powered by the battery and solar-powered cars as well as hydrogen-powered cars. These do not harm the environment as they have almost zero emission (California commission website, 2006).

Hydrogen started being used as fuel by the manufacture of hydrogen fuel cell. All along, technology has been improving meaning that we have new discoveries in the market. The latest technological breakthrough is the unveiling of the hydrogen car which is an alternative to the battery cars. These vehicles use hydrogen fuel cells with clean electric motors. Hydrogen is not consumed but is chemically reacted in a hydrogen fuel cell. The chemical reaction produces electricity, water and heat only. According to MacKenzie (1994), hydrogen is one of the most abundant elements (is found in water, fossil fuels, atmosphere plants and animals), and it is therefore the best alternative for the non-renewable sources of energy like gasoline. It is a safely combustible fuel though safety precautions that accompany any fuel should also be applied. It is not such a dangerous fuel since its leaks evaporates faster than gasoline thus minimizing the hazard of explosion. Many manufacturers are now realizing a breakthrough with manufacture of hydrogen vehicles (Nadis&MacKenzie, 1986).

The best use of solar energy

Solar energy is a renewable source of energy because of its abundant. Solar energy can be best used through heat. Heating water for households has been the most common use of solar heat. Solar energy can also be used to provide heat for your home. This can be achieved through passive and active heating as described below:

Passive heating: this is where the best design elements are used to make the best use of solar heat during the day during winter. It is the most cost effective way of heating up your home with solar power. This method is best implemented during the building phase of a house (ehow, 2010).

Active heating: this where solar panels are used to convert the solar rays into electricity which is the used to heat up your home. The best way to do this is through radiant floor heating. In this system, the air, liquid or electricity heats the floor which then transmits heat to the whole home through radiation (ehow website, 2010).

The amount of heat that the sun emits to our planet earth is too much (about 35000 times that we produce). Some of it is radiated back into the lower parts of the atmosphere while much of it is absorbed. This solar energy can be easily harnessed and be used to serve several purposes like heating up homes, lighting, running up homes, lighting, running automobiles etc. the funny thing is that this source of energy is inexhaustible i.e. it is

renewable. Generation of solar energy is in two ways; through electricity and heat (Renewable energy website, 2010). Electricity can be generated from solar energy by using a solar cell. This type of cell contains photovoltaic cells which are used to convert solar radiation into electricity. A collection of solar cells form a solar panel (Renewable energy website, 2010). The initial solar panels were very large, but of late, nano-technology has been used and their size has reduced drastically (Renewable energy website, 2010).

On the other hand, solar radiation can also be tapped using heat. The heat is used to heat up water into steam. The steam turns the turbines which can in turn run steam generators to produce electricity. These photovoltaic systems are so environmental friendly as they do not produce any green house gases. Also they do not require direct sunlight; thus they work even during cloudy winter conditions. The current technological advances are headed towards eco-friendly energy production (Renewable energy website, 2010).

New ways of using solar energy

The world is continuing with its search for alternative sources of energy other than fossil fuel. Enormous researches are going on in various parts of the world in this regard as far as green energy is concerned. This has led to various discoveries in the best use of solar power. Below are some of the breakthrough researches or those that are underway:

Solar cells from tobacco plant: Research is still going on as regards the ability to get solar cells from tobacco plant which can be used to cure cancer cells. According to alternate energy website (2010), tobacco solar cells can be programmed to cure cancer cells according to the research that is underway from the University of California (alternate energy website, 2010).

Solar-powered UAV: This is also still under development from Queensland university of technology. When finished, it will be possible to fly an unmanned solar powered flight for surveillance. This will save lots of fossil fuel and reduce green house gas emissions (Alternate energy website, 2010).

New solar pond distillation system: The University of Nevada, Reno researcher is developing a solar technique for ecosystems of terminus lakes. From the new solar distillation system, salinity of the lake water will be removed improving the water ecosystem. Its source of energy will be renewable solar energy (Alternate energy website, 2010).

Photovoltaic could have new options provided by fiber optics: Very soon, the large heavy solar panels on roof tops will be done away with. This is because of the new development from Georgia institute of technology. They are developing a new three

dimensional photovoltaic system which will be light and small and can be hidden from view but still taps solar radiation (Alternate energy website, 2010).

The world is going green with many companies venturing into research for green energy. Green energy is still on the increase. For the example, lately Toyota embraced the opportunity by opening up a solar charging station. This solar car charging station is abuzz in anticipation since those other car charging stations available are for electric cars. The station works by collecting sun's radiation through solar panels, storing up the power in batteries which are later on used to charge and power vehicles. This is a major booster towards green energy revolution (Alternate energy website, 2010).

One of the drawbacks of the solar energy devices is that they are still going very expensively in the market. Compared to fossil fuels which are all over and cheap, green energy products are expensive and therefore, not available the average man. This has slowed down the efforts to reduce green house gas emission hence increased incidences of global warming.

Conclusion

Despite the many advances towards harnessing solar energy we are still far from replacing fossil energy with green energy. However, technological advances and design plans make use of this resource a reality. Fossil energy is still cheap as compared to green energy sources like solar panels and hydrogen fuel cells which are expensive and therefore not affordable by the average man. The greatest indisputable fact is that the sun is still the greatest source of renewable energy that we can easily harness. Solar energy can be very significant to the globe. All those People endowed with sun sports can light their houses in future by use of photovoltaic roofs and even supplying the surplus to the national or municipality grid. Only if man can put into use all the sun's solar emission, the problem of global warming will be solved once and for all.