USE OF RENEWABLE RESOURCES IN WIRELESS COMMUNICATION NETWORKS

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ABSTRACT

Energy consumption has always a noticeable impact on the environment. Fast growing world population, increasing prosperity and the hunger for fuel that has developed a consequence, have led to a rapid rise in the need for energy, so to fulfill that need we require renewable resources. The non-conventional or alternative energy resources are not amenable to depletion even with irrational levels of consumption. Using alternative energy resources will not only reduce environmental impact, it will also cut costs and help to make technology more affordable for everyone. This paper provides an overview of various alternative energy resources like solar power, fuel cells, wind power which serve as the efficient energy resources for the future generations of wireless mobile communication networks.

Keywords: *Renewable Energy Sources (RES), Solar mobile charger, Fuel Cell, Wind Power, Wireless Communication Networks.*

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I. INTRODUCTION

Conventional sources of energy are diminishing, and some researchers have already hinted at a time horizon for their depletion. It certainly means that the oil and carbon reserves that remain for future generations will not suffice for their needs. It is possible that those people might find better uses for these energy sources as raw materials rather than contaminating the atmosphere by burning them, as humankind now does. The technology already exists and naturally, it can be improved for the sustainable use of non-conventional energy or renewable energy sources (RES), with the aim of slowing down our extraction and consumption rate of fossil fuels, while at the same time doing a favour to the planet's bettered environment. Two main reasons urge replacing non-renewable energy sources with renewable ones. One is that the world will eventually run out of coal, oil and gas, since of course reserves are limited. But even if new and richer oil and gas fields and carbon deposits were found, or if new techniques can improve extraction and combustion, the main problem is atmospheric pollution, especially with the production of CO_2 as a flue gas release, since it makes for climate change by increasing the greenhouse effect [1]. Fig. 1 shows various renewable energy resources.

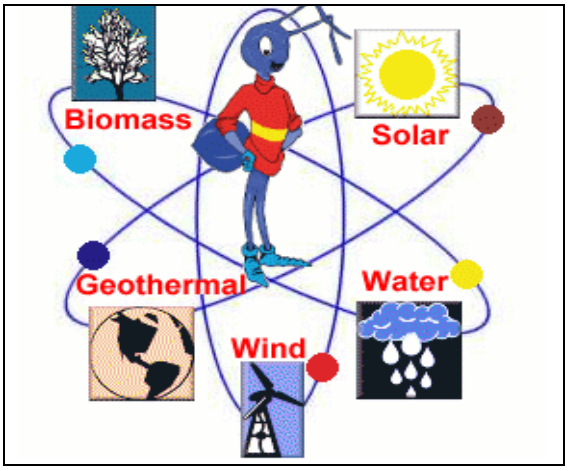

Fig.1: Various renewable energy resources

Whereas traditional renewable energies covered most of the energy needs of mankind until the end of the 19th century, the 20th century can be seen as the century of fossil energy. By the middle of the century fossil fuels in internal combustion engines had almost completely replaced the classic systems for using renewable energies, such as windmills, water wheels and vehicles and machines driven by muscle power. Modern hydropower for the generation of electricity and

biomass, which was mainly used as fuel, was the only renewable energies of any significance. In 2007 fossil energies covered around 80% of the world ' s primary energy needs (from figure).Hydropower and nuclear energy had a share of around 6% and 5%, respectively, and biomass close to 10%. The other renewable energies amounted to less than 1% with geothermal energy – use of the earth's heat – having the largest share. At the beginning of the 21st century renewable energies such as wind power and solar energy, which until then had been used relatively little, started to record double - digit growth rates. It is expected that their share of worldwide energy supply will increase considerably in coming years.

When we compare different forms of energy, a distinction is therefore made between primary energy, secondary energy and useful energy.

Primary energy is energy in its natural and technically unconverted form, such as coal, crude oil, natural gas, uranium, sunlight, wind, wood and cow dung (biomass).

Secondary energy is energy in the form in which it is channeled to users. This includes natural gas, petrol, heating oil, electricity and district heating (the use of a centralized boiler installation to provide heat for several buildings).

Useful energy is energy in its eventual form, such as light for illumination, warmth for heating and power for machines and vehicles.

The different forms of energy are most frequently compared on a primary energy basis. More than 90% of the original energy content is lost during the conversion of primary energy to usable energy [1]. Primary, Secondary and Useful energies, collectively responsible for the implementation of renewable energy resources in wireless communication, as they can be used up for the solar mobile charger, fuel cells and wind mills. Figure 2 shows the implementation of Primary, Secondary and Useful Energies.

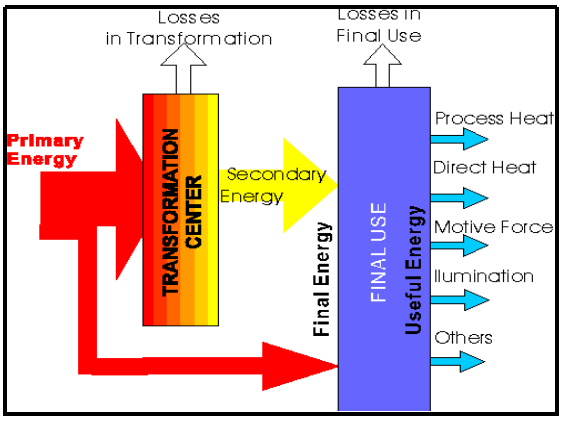

Fig.2: Implementation of Primary, Secondary and Useful Energies

II. SOLAR MOBILE CHARGER

Solar Battery Charger for Phones, Cameras, and USB Devices (Pink) lets you charge all your electronic gadgets anywhere, anytime.

This charger may be little, but it can charge any device that charges through mini USB, such as cell phones and PDAs, cameras and camcorders, MP3 and MP4 players, GPS devices, and even portable gaming systems like the PSP. Figure 3 shows the Solar Mobile Charger.

Fig.3*:* Solar Mobile Charger

Before you go out, charge the battery in one of three ways: connect to your PC via the USB cable, plug the AC adapter into an electrical outlet, or place the charger in direct sunlight. Charge it with your computer_while you're at work, or stick it in your dashboard while you're driving [2]. Solar cell phone chargers are getting more popular but many are still often a little pricey. You can shave a few dollars off the price tag and create your very own solar gadget charger in just a few easy steps. Intractable has step-by-step instructions on how to turn a small box, a solar cell, car power outlet socket and a few other easy-to-find materials into a solar charger for your

cell phone or other hand held gadgets. If you pair up charging via the sun along with tricks for making your battery last as long as possible, you'll be well on your way to taking your gadgets off grid. You might be interested in other ways besides solar to charge up your gadgets. There are also wind power, kinetic energy, fuel cells and more options—with more affordable and practical solutions appearing all the time [3].

How does the solar cell phone charger work?

A solar cell phone charger works by harnessing the power of the sun, and storing it for use later by the mobile phone.

How much energy could I save in KW each year using a solar cell phone charger? The energy savings of using a solar charger for cell phones could range from tens of dollars to hundreds of dollars.

III. FUEL CELLS

A fuel cell is a device that generates electricity by a chemical reaction. Every fuel cell has two electrodes, one positive and one negative, called, respectively, the anode and cathode. The reactions that produce electricity take place at the electrodes it appears that the future for fuel cells is brilliant. These devices can operate many appliances, from laptops and cellular phones to large generating plants. Many different sources such as methanol, natural gas, methane, etc., are used to feed fuel cells, while oxygen is taken from the atmosphere. They produce electricity, heat, and most of them issue pure hot water, so their contribution to pollution is nearly nil. In a fuel cell, the system consumes hydrogen and oxygen and produces electricity, plus hot water [1]. The fuel cell in automobiles Nicolas Otto invented the combustion engine in 1875, and applied it to a motor bike; later. Gottlieb Daimler and Wilhelm Maybach developed an advanced gas engine. Then, in 1885, Karl Benz built the first practical automobile in history [1]. Figure 4 shows the Diagram of Fuel Cell.

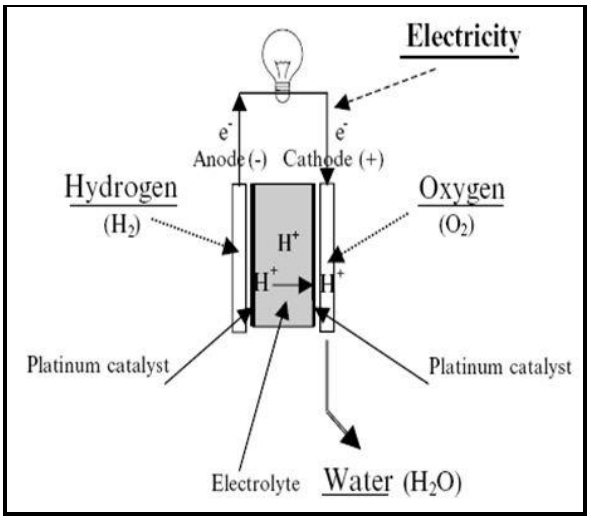

Fig.4: Diagram of Fuel Cell

Latest concern about fuel cellsin automobiles is that if we compare the environment impact of the different typas of fuel and engines reqires considering their full cycles: that is, from the source , whatever it might be , to the wheels of a car, bus or truck.this is why it is sometimes called ‘ wheel to wheels cycle’ , which can be divided into two: the process to put fuel in the tank(the source -to -tank -cycle),the process to make the wheel rotate and the vehicle move (tank-to-wheels cycle) [1].

A. 2010 hydrogen and fuel cells Global Commercialization & Development Update

Hydrogen and fuel cell technologies offer a pathway to enable the use of clean energy systems to reduce emissions, enhance energy security, and stimulate the global economy. As part of a portfolio of clean energy technologies, including energy efficiency, renewable energy and fuels, and battery-electric vehicles, employing hydrogen and fuel cells in the economy will help us to achieve these goals. A decade of sustained global research, development and

Demonstration (RD&D) is now producing the necessary technological breakthroughs for hydrogen and fuel cells to compete in the market. This report offers examples of real-world applications around the world and technical progress of hydrogen and fuel cell technologies, including policies adopted by countries to increase technology development and commercialization. Hydrogen and fuel cell technologies can use diverse domestic renewable and low-carbon resources and address multiple applications across stationary, transportation, and portable power sectors. The challenges facing full commercialization of hydrogen and fuel cell technologies can be addressed through both, policy mechanisms and technology improvements,

which require consistent and focused international collaboration to increase the incorporation of these technologies in the global energy portfolio.

B. Power Generation & Electric Grid Support

The demand for multi-megawatt (MW) fuel cell systems for power generation and utility grid support applications is on the rise. In the United States, the State of Ohio utility, First Energy, purchased a 1 MW, polymer electrolyte membrane (PEM) utility-scale distributed generation fuel cell system from Ballard Power Systems Inc. The installation provides feeder peak management, defers distribution system asset upgrades, delivers zero local CO2 emissions, and provides power conditioning for high quality power [5].

C. Back-up and Remote Power Generation, Back-up and remote power applications provide an important early market for fuel cell systems

Wireless TT Info Services Ltd, an arm of a major telecom operator in India**,** contracted with Plug Power for the purchase of 200 GenSys fuel cell systems to provide continuous power for off-grid cell towers. IdaTech and Ballard are also providing fuel cell systems to Acme Telepower in India.

Motorola announced that it will use Ballard fuel cells in back-up power systems for 123 base stations in Denmark's public safety communication network.

In the United States, companies such as Sprint and AT&T are deploying fuel cells for backup power at their cell phone towers.

Department of Energy's (DOE) Recovery Act project deployed 24 fuel cells at cell phone tower sites as of September 2010 [5].

IV. TELECOM BACKUP POWER WIRELESS

With wireless communications systems, rapidly expanding worldwide, the need for dependable and economical backup power is critical. Cell towers are often cited in remote locations making

regular maintenance costly and emergency servicing extremely difficult. Grid loss throughout the year, whether from severe weather or natural disasters, challenges the network's ability to stay up and running, adversely affecting revenue streams, customer retention and emergency communications. IdaTech fuel cell systems provide the reliable backup power that enables wireless networks to remain operational for extended periods of time. IdaTech fuel cells overcome the performance limitations, costly maintenance and environmental issues of battery and generator systems, while greatly increasing network robustness.

A. Applications

- Wireless Base Stations
- Telecom Rooftop [4]

V. WINDMILL

A windmill is any device which takes energy from the wind and uses it mechanically. Classical windmills were used to cut wood, pump water or grind grain for use in baking. Modern equivalents are used to generate electricity. This renewable energy source provides electricity to homes in rural areas in the absence of a method to connect to the utility grid or as backup systems when the grid goes down. Windmill towers come in three types: freestanding, fixed guyed or tilt-up [6].

A. Sustainable Systems: Designing a Windmill for the 21st Century

The first known wind machines were vertical axis windmills used for grinding grain in Persia around 500-900 A.D. Sustainable Systems is developing a modern-day version, similar to the vertical designs above, but greatly improved. The company is currently working with a patent attorney to secure the intellectual capital behind the design prior to manufacturing. Sustainable System's turbine design can function in a wide variety of sizes and environments. According to Sankar, they can be made at the 1-3 megawatt public utility scale-or so small they can go into mine shafts to provide electricity to communications equipment for miners. Sustainable Systems is in the process of installing a 60-foot prototype at Seven Springs Resort in southwestern Pennsylvania, expected to be capable of generating 100kw of electricity. The ski resort-with its high energy consumption and ample supply of wind-is an ideal testing ground [6].

VI. CONCLUSION

Fast growing world population, increasing prosperity and the hunger for fuel that has developed a consequence, have led to a rapid rise in the need for energy, so to fulfill that need we require renewable resources. Overconsumption of energy is the main trigger for the global warming that is now threatening to cause devastation in many areas of the world. Use of renewable energy sources is the only way to end our dependence on energy sources like oil and uranium, which are so costly both in financial terms and in the havoc they wreak on our environment, and satisfy our hunger for energy in a way, that is sustainable and compatible with the climate. . This paper provides an overview of various alternative energy resources like solar power, fuel cells, wind power which serve as the efficient energy resources for the future generations of wireless mobile communication networks.

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