

# Recent Analysis of Green Energy Technology (GET) for Telecom Applications

S.Sivarajan, S.Manikandan, T.Rajeshkumar, R.Ranadheer Reddy

**Abstract:** There is strong must be constrained to build up a practical independent power exchange that serves the open enthusiasm by giving productive power through the ecologically mindful and affordable improvement of the available vitality assets. To spot light the green energy technology (GET) with regard to need, sorts of GETs, highlights, planning boundaries, applications, disadvantages, challenges, and so on is the other target of this paper. GETs are helpful to continue setting as perfect and unpracticed and also they are treated as simple power hotspots for media transmission or elective applications. we can utilize the green media applications for telecommunication systems. The power exchange ought to be worried by change age sources to a property sources and managing clients to help them avail vitality a great deal of quickly. Green telecom technology has been utilizing greatly to advertise carbon flightiness inside the telecom exchange. Ecological issues of sustainable power source have been expanding rapidly. Although there are some issues and difficulties with the edge of boundaries in usage but the green energy technologies territory unit immediately available inside the market.

**Keywords:** Green Energy Technology (GET), Clean Energy Technology (CET), Renewable Energy Technology (RET), Green Energy choices (GEOs), green Telecommunication (GT), Green Power, Green House impact, Green House Gases CHG), dioxide (CO<sub>2</sub>), Fossil Fuels, Non – typical Energy.

## I. INTRODUCTION

The tremendous troubles with the relevant environmental emergency and enlargement regarding active consumptions can be realized by emissions regarding green house gases, go about disposition according to pray outdoors instant solutions yet modern technology for the assembly on most important power excellent desirable the rebuke or growing energetic needs. Exaggerated greenhouse flow or extensive green residence gases attention tiers in surroundings causes the world wide temperature alternate is performed into deliberation certain of each on the main essential world chance so much needs on the power regulations (IPCC, 2007). The greenhouse emissions would be measured greatly because of the fact on the delivery of utilization of fossil fuels. Hence the making use of fossil fuels must be dwindled. By using capacity on elevating energy efficiency and together with the aid of victimization huge scale renewable energy assets, green house emission can be obtained.

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This is concertedly authentic inside the telecommunication programs that has visible, within the ultimate years. An interesting make bigger between the kind on installations current on the entire territory usually settled in infrequently reachable regions. So therefore applicable growth of active consumptions will lead to concerning new and reliable services in quality calls with an upward thrust of the BTS operation hours and visitors control, on the way to make certain the same old of the carrier wherever and whenever[1].

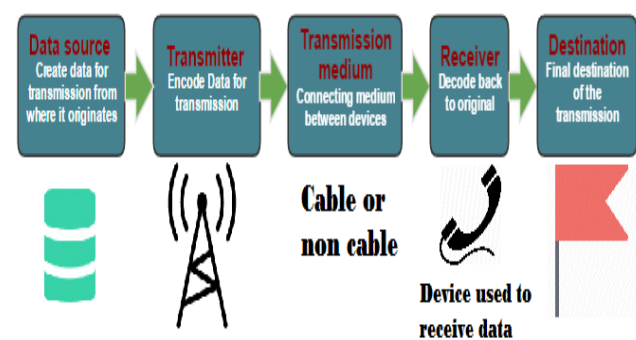


Fig. 1. Telecommunication system

The overall intension of the research mission is to look at a fixed of solutions which may additionally allows:

- An energy used to a telecommunication system can be obtained at an interval when the realization of the consumptions of a BTS.
- The energy from non-conventional sources to be manufactured and also there must be reduction in greenhouse emissions of polluting agents in the atmosphere.
- Monitoring systems for the energy consumptions and the applicable influences on the environment to be implemented.
- From the technical and cost effective point of view and the feasibility of some solutions, it has been evaluated.
- In various operational competitions, there will be an examination of energy to a radio-telecommunication for various kinds of purpose. (urban and rural areas, different periods in the year, different working load, etc...)
- Reduction of transmission components consumption, utilization of air conditioning consumptions are the methods to boost energy potential and energy saving are to be intervened in the temperature control system.

The essential factors that drive the implementation of green energy technology are initiatives and strategies of green technology that will lead to the reduction of the environmental emphasis of technology. The implementation of green technology may reduce usage of energy and consumables which includes hardware, electricity, fuel and paper. Because of these reductions, green technology will stand to benefit from the cost savings in energy use, purchases, environmental management and support, in addition to their benefits. Beyond these benefits associated with the green technology, some initiatives may address stakeholder and their regulatory demands and also realizing credits or debates from local utilities or governments. Many simulation studies were established to predict the amount of power that could be stored by a software system which helps to access BTS-GSM transmission power.



Fig. 3. System of Green Energy

### III. GREEN TECHNOLOGY GETTING SMARTER BY ICT

ICT is in terms of information and communication technology and it can be defined as a “set of technological tools and resources which are mixed as a abundant used to transfer, and to produce, disposal, supply, store and decision making with the information. ICT denotes the technology which has electronic devices and linked with human interactive materials. The green technology is the method of study which teaches environmentally sustainable computer systems and telecommunications in a various ways to make maximum positive environmental benefit and minimum negative impact. By inaugurating green ICT, the reduction of impact of ICT on the environment could be achievable. The aim of green ICT is that reducing the greenhouse gas emissions, preventing the atmospheric pollutions, managing the chemical substances and biodiversity conservation. Saving of energy and cost are the economical benefits of the green ICT. When green ICT implemented, it ensures the consumer the lesser amount of power taken by its components and also the working progress with the substitute programs to predict the influences of the changes they initiate. It involves environmental sustainable technology and processes such as designing, manufacturing, utilizing and disposing.



Fig. 2. Benefits upon implementation of green energy technology

### II. THE NEED OF CLEAN OR GREEN ENERGY

In today’s life fossil fuels, coal, oil and natural gases are used to meet our energy demands and also we are using them much more enormously than being produced. At the same time, they will switch over to empty. The entire world’s energy demand is expected to be grown by 33% in the next 20 years. Only the green energy will tend to fulfill the customer’s demand. Although there is an enormous supply of fossil fuels, implementing the green energy is better for the environment. We often call green energy technologies “clean”& “conventional” as it produces few if any pollutants. Green energy is the renewable source has insignificant influence on greenhouse gas emissions which contains solar, hydro, wind, biomass & geothermal. The green energy sources can be an alternative for the primary sources used by the people. The green power trends are induced by the goal of replacing fossil fuels in the past forty years. Now the broader target includes minimizing the emission of CO2. The considerable issue to use fossil fuel is that the external cost for electricity from fossil fuel is much more than the cost of contributions from conventional energy with various sources. The renewable avoids the swift exhaustion of fossil fuels reserves and will emancipate future generations to tackle with the environmental impact of over-dependence on fossil fuels. In U.S. more than 190 electric utilities offers green power. Moreover half of the consumers surveyed are willing to pay an extra \$180 to receive green electricity per year[2].

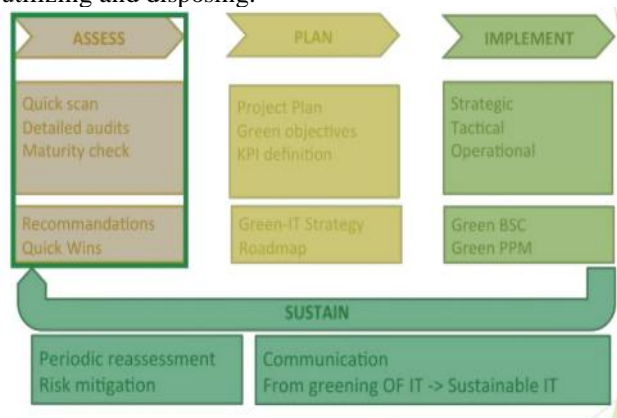


Fig. 4. Implementation of Green ICT

The information and Communication Technology (ICT) sector can be sub divided into 3 types of sub-sectors, specifically telecommunication and devices sector, PCs, printers and peripherals sector and also the knowledge centers.

For the past few decades, all 3 of those sectors have seen a continuous progress in usage and consequently in their energy consumption. This growth has been the results of range of things, such as, widespread use of computers in residential, offices and businesses, exponential growth in circuits and mobile connections, and higher amount of storage and high ultimate data . The combined carbon footprint of those subsectors was calculable at 0.83Gt of CO<sub>2</sub>e (carbon oxide equivalents) emissions in 2007 that is calculable to extend to one.43Gt of emissions by 2020[3].

#### IV. GREEN TECHNOLOGY IN TELECOM SECTOR

The need for growing green within the telecommunication Sector was felt as a result of the value of operation related to the energy resources for telecom sector is incredibly high because the typical energy resources that we are exploitation exert harmful gases within the atmosphere. Because of that varied environmental problems like heating and different arises. Conjointly the usage of green technology can facilitate in fulfilling the energy demand of rural areas wherever in current state of affairs power availableness is incredibly poor. The usage of renewable energy resources can facilitate in meeting the energy demand of these areas still because the value related to renewable energy resources is incredibly less compared to traditional resources. owing to the influence of the social and political trends towards environmental responsibility against heating and different problems that are occurring because of the emission of these harmful gases and making property in business going towards green technology appears to be an economical various[4]



Fig. 5. Movement towards green telecom

#### Steps towards green telecom

1. The use of renewable energy resources for compensating carbon emission due to telecom Industry.
2. Adoption of innovative technology and energy efficient equipment to reduce the energy requirement for telecom sector.
3. Passive Infrastructure Sharing.
4. World Bank has rolled clean Development Mechanism (CDM) carbon trading.
5. Main emphasis on reuse and recycling of network equipment.
6. Improvement of grid supply.

7. Superior matrix planning like slighter air conditioning requirement to cool sites, more outdoor BTS and less BTS.
8. Upgrade of grid reserve.
9. Government support-subsidies, taxes and levies.
10. Improving efficiency of Backup power sources.
11. Optimized cooling by free cooling unit and green protectors.
12. Battery refinement.

#### V. TELECOM INDUSTRY AND GREEN ENERGY

During the 20<sup>th</sup> century, the exigency in energy of an individual taken as a global average will be increased by four factors. Because of the growth in expectancies of life, populations, material and wealth, all of these four things let to a high ultimatum on the ecosystem of the earth. Telecommunications systems in the demand of enlarging amount of electricity to initiate the process by their growth. The various power stations such as thermal, wind and hydro and also burning of fossil fuels like coal, oil, gas and diesel are the major sources of electric power to the telecommunication system. These two sources of electricity will lead to the emission of greenhouse gases (GHG) with the gloomy effects of atmosphere. A green medium consumes small quantity of power, less amount of water, spreads natural resources, creates less wastage and initiates space for healthy and comfortable living to maintain the occupants agreeable. The aspects of green medium are,

- Innovation
- Design
- Production
- Installation
- Indoor environmental equality
- Maintenance
- Quality assurance
- Recovery
- Recycling

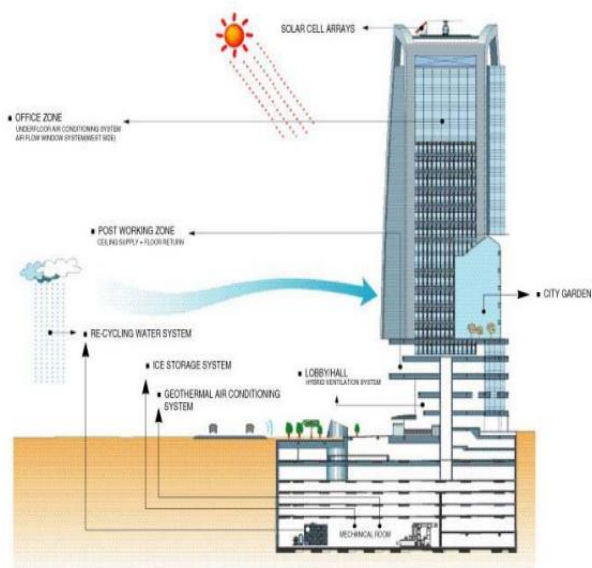


Fig. 6. Green Building



**VI. DIVERSE METHODS OF GREEN ENERGY TECHNOLOGIES & INNOVATIONS**

In today’s trends of technology, only some selections accessible are there to provide our power demands. Coal, natural gas, nuclear, fuel and renewable sources like solar, wind, biomass, and hydro and geothermal are greater selections for whole new production. The conclusive target is energy potency, which contains conservation, reduction in demand, and codes improvement, standards and connected technology. An every individual has our favorite risk and may be slanted against some of the rest. However if consumer tend to truly be the option of that warming is happening, that consumers are inducing it, that they tend to face quickly approaching a tipping point on the another side, then we must think that the recovery of this technique whether it is possible or impractical about all choices[6].

**VII. EXPLORING THE VARIOUS TYPES OF GREEN TECHNOLOGY**

Here are some of the most sought-after green technologies that can help you sustain your environment as well as our budget.

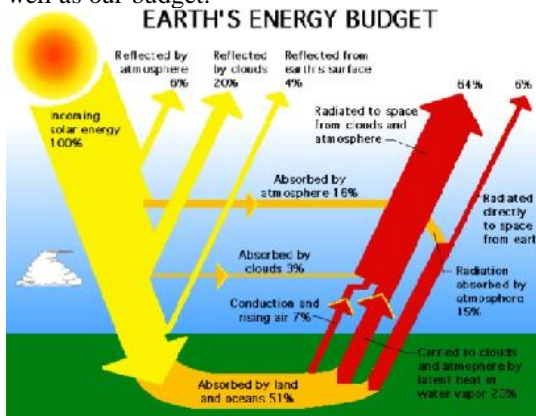


Fig. 7. Energy budget of Earth

**A. Solar Power**

There are two kinds of solar energy:

1. Solar energy or Thermal energy:

From the sun, the solar or thermal energy can be derived straightly. This energy plays a vital role throughout the world.

2. Electric energy:

This energy can be occurred when converting the sunrays or sunlight into an electric power by using solar cells, also known as photovoltaic cells (PV). This process is described as photoelectric effect.

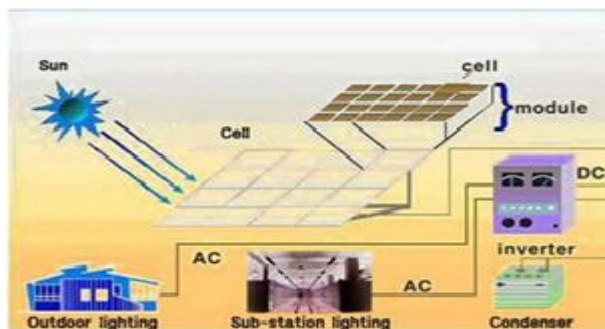


Fig. 8. Solar Power System

The enormous source of renewable is solar power. In today’s green technology the major amount of energy can be derived only from the solar power. The predicted potential of solar energy in our country is 5000 trillion units per year. The solar power always fulfils the consumer’s demand in enormous ways that is starting from the earth heating to lighting up our days. The solar power can be distributed widely over a geographical area, and also it ensures that developing countries such as India have access to electricity production makes technology advancements extremely cost effective for the long- term, while the consumption of fossil fuels causing greater damage to the environment in enlarging forms. The economic factor of conventional sources is considerable because the electric power source from the sun is ultimately free of cost. The solar power system does not require any commissioning during their lifespan, and also produces no pollution[5].

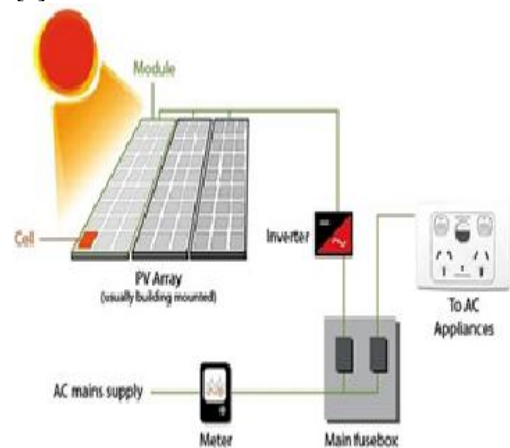


Fig. 9. SPV Panel

The photovoltaic solar panel is a fine example of major power source or energy revolution predicted by the green technology. The solar panel is converting the sunlight into electricity power. It is the long lasting sources of green technology that could be used almost anywhere. Many countries lie on this type of power source. Moreover, the solar panels are available on the market in a very style of sizes, massive enough to power large industrial circuits. Although this SPV panel produces continuous power, environmentally friendly and it is cheap in cost but more panels may required to produce the electric power in the areas which almost remains cloudy and foggy. Unlike other renewable sources which can be operated during night, solar panels are proven to be useless in the night which leads consumers to depend on the local utility grid to utilize the power.

**B. Wind Power**

Every renewable energy sources other than geothermal and tidal can be obtained from the sun. The wind power is generated by the sunlight with the medium of windmill that captures wind energy and converting into an electrical energy using generator. Generally, the wind can be described as the formation of solar energy. Wind is caused by the heating of the earth’s surface which occurred uneventfully and rotation of the earth. The earth receives approximately  $1.74 \times 10^{17}$  watts from the sun. From this energy, about one or 2% will be converted to observe wind energy. The sunlight, air and as well as the design of a

wind mill are the deciding factors of the potential or efficiency of wind power. Even though the wind currently produces nearly 1% of the nation's power but it could generate 6% of nation's demand by 2020. The earth surface heats and cools unevenly, creating atmospheric pressure zones which makes air flow from high to low pressure areas. The wind turbines and the generator plays major role in wind mill. The wind turbines converting the kinetic energy in the wind to mechanical power when the generator converts mechanical power into electric power. When designing a windmill, consumer must decide the factor of the size of both turbine and as well as generator [8].

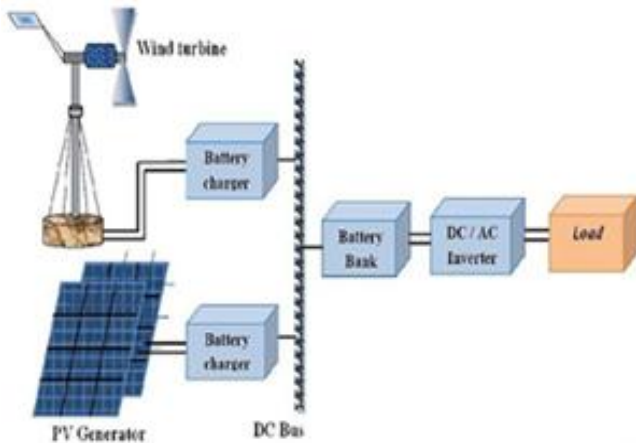


Fig. 10. Stand alone Wind Power plant

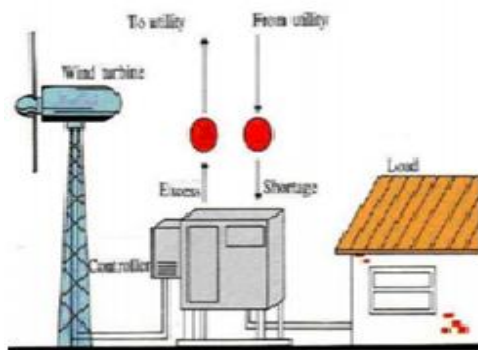


Fig. 11. Grid- tied Wind Power plant

The amount of a power that can be generated by wind turbine is expressed as:

$$\text{Density of Wind Power} = \frac{1}{2} \rho V^3$$

Where,  $\rho$  = Density of wind

$V$  = Speed of wind

The wind is economically free and also with modern technology it can be captured efficiently. However, with business wind farms being started across the United States it's attainable to shop for renewable energy from them instead, while not having to line up your own farm. However, householders will have all their energy desires with only one turbine started on premises. Although wind turbines are very tall but each takes up only a small plot of land to install. This means that the land below can still be used. The strength range of the wind is unstable and it varies from zero to storm force. Because of this issue, the wind turbines do not produce the same amount of electricity all the time. A wind turbine causes noise pollution to the environment.

### C. Biomass Power

Biomass power is a non-conventional energy source that can be generated from both living and non living organisms. It is formed by metabolic activities of biological systems and products of their decomposition. Forest, plants, animal's waste, sugar cane, wood and many other byproducts from a variety of agricultural processes are the major sources of the biomass energy. Biomass would be treated as chemically or biochemically to turn it to an energy-rich fuel. To produce electric power and heat energy, the biomass energy is used greatly. The technology of biomass energy conversion which including combustion, gasification, anaerobic digestion and liquid bio-fuels [7].

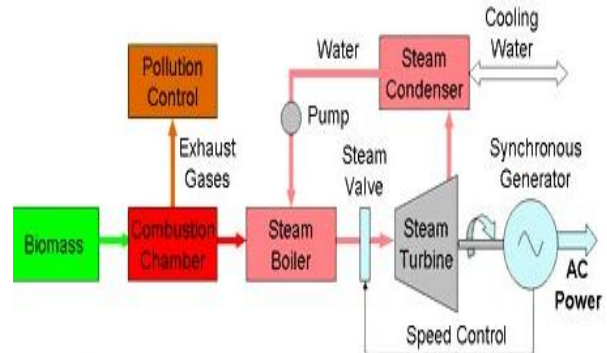


Fig. 12. Biomass Power Plant

In our country 3500 mega wattage of power generated by using biogases based co-generation in sugar mills. The biomass energy is an indigenous source. The pollution emitted from combustion of biomass usually than those from fossil fuels. It reduces acid rain, greenhouse gases such as carbon dioxide and methane. Although it fulfills the consumer's demand, it is labor intensive and the cost of collecting large quantities for commercial application is significant.

### D. Hydro Power

The hydro power is the most significant renewable energy source which can be obtained by utilization of water in motion. Total hydro potential of the world is 5000 GW and it fulfills more than 20% of the ultimate energy demand of the world. Turbine and generator is the consequential part of this plant as these plays salient role in any power plant.

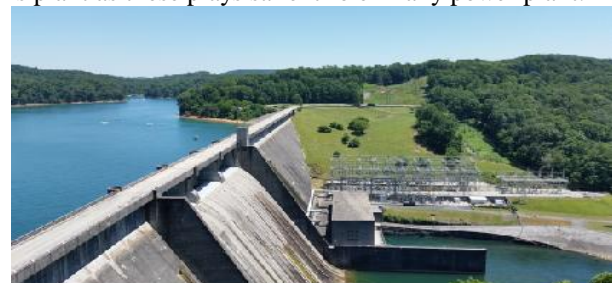


Fig. 13. Hydropower Plant site

Water flows through a dam rotates a turbines, which operates a generator to produce electric power. Hydroelectric power contains both large type of hydroelectric dams and small run-of-the-river plants. It takes few minutes of time to initiate the process and synchronize the plant. Efficiency of the plant does not change with age.



The life span of hydro power plant is considerably great when comparing with the thermal and nuclear power plant. This type of power plants requires long transmission lines and transmission line to transmit the power to substation as they usually situated at hilly areas away from load center. Due to this issue, the line losses will be produced. Moreover, the production of the power plant lies on the natural phenomenon of rain. The methods to produce the hydro power is,

- Impoundment
- Diversion
- Pumped storage

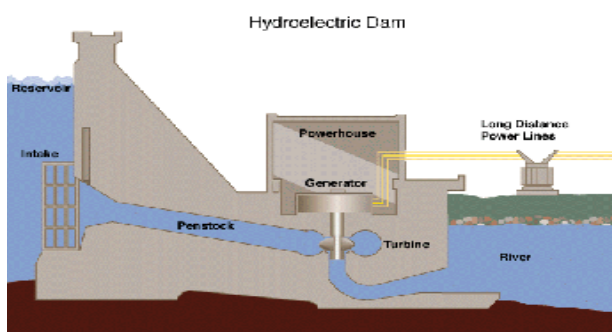


Fig. 14. Hydro Electric Power Plant

### E. Geothermal Power

The geothermal power is the renewable energy source that can be obtained from the earth's internal heat. For particular applications like heating the geothermal power is used in some countries over a few decades. The geothermal energy could be found in the form of ultimately hot molten rock called magma in the ground to uncountable distance below the earth's surface. These reservoirs of steam and hot water can be exploited to induce electricity or to heat and cool buildings directly[9].

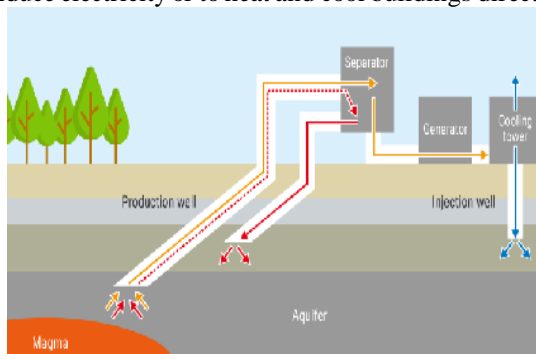


Fig. 15. Geothermal Power Generation

The geothermal power plant that captures hot water from steam to rotate the turbine. For geothermal power plants, specially designed steam turbines are used. Types of geothermal power plants are,

- Dry Steam Power Plants
- Flash/Steam Plants
- Binary cycle Power Plants

The fluids used in geothermal has less harmful greenhouse gases. Creating noise pollution, water contamination and seismicity are the impacts of environment.

## VIII. OTHER GREEN TECHNOLOGY INNOVATIVE SOLUTIONS

### A. Wooden Computer Chips

Generally, the computer chips are made up of semiconducting materials such as silicon, germanium, silver and copper due to their high mobility. The properties of these materials have both conductor and an insulator. The wooden chip may also known as biochip like a computer chip that can perform millions of mathematical operation in a second when a wooden chip can perform thousands of biological operations in a few seconds. The wooden chip utilizes technologies of modern biology and electronics in a micro scale. Tracing of person or animal, anywhere in the world is possible by using wooden chip. It can accumulate and store persons' data about medical, financial and demographic data. These are available in market at various contemporary colors, eye catching visual and top quality design.

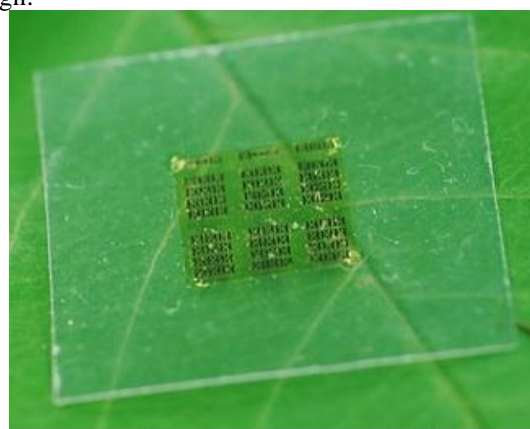


Fig. 16. Wooden Computer Chip

### Sugar-based Bio-plastics

The bio-based plastics can be produced from enormous range of non-conventional bio-based feedstock such as agro-based feedstock, lingo-cellulosic feedstock and organic waste feedstock. These are obtained from fermented plant starch, bacteria which produce it through the fermentation of sugar or lipids. Although the usage of bio-plastics increasing, but they still account for less than 1% of the world's plastic market. The plastic that can be obtained from fossil fuels is less expensive than the sugar-based biodegradable plastics. Some of the bio-plastics decompose in a quick period of time, and the life cycle of bio-plastic given below,

- Raw materials
- Removal or Extraction
- Filtering
- Production
- Ejection
- Compost and Renewal

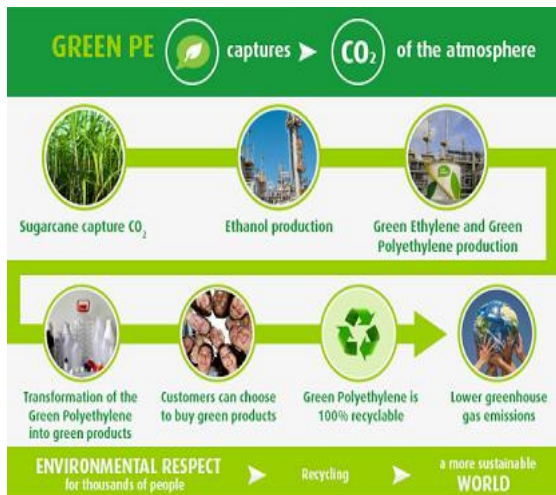


Fig. 17. Sugar-based Bioplastic Production

### IX. CHALLENGES AND BARRIERS IN GREEN TECHNOLOGY ADOPTION

- The products of green technology are highly expensive when the market demand of the particular product is low.
- Generally the selection of building materials will be decided by cost rather than environmental issues.
- The organization experiences hard to get the theme of green technology due to lack of understanding.
- Lack of training to implement technology is also the major barrier.
- Among the green technology products, there is no valuable connectivity.
- The consumer does not live close enough to a facility of recycling to renew their used components of anything. Therefore, it ends up in the trash.
- The source and quality of raw materials to implement green technology are not constant.
- The lack of ultimate information on technology innovation and implementation.
- The identification and selection of both constructive activities and relevant environmental aspects.
- Green technology has proven to work with certain conditions[10].



Fig. 18. Barriers to Green Tech

### X. CONCLUSION

Everything in the world has both positive and negative influences. Although there are some defects in green technology, but it definitely will be the solution to gain a potential to serve consumer to solve those issues and to develop our environment. To make our nation eco friendly, the awareness to be created to utilize renewable energy sources and to avoid using disposable items. In the telecommunication industry, all the resource companies are needed to lower their carbon foot print with the issues from the carbon credits. As the concerns about the availability and environmental influences of greenhouse gases become more extensive spread, the interest on environmentally set about renewable energy technologies will definitely take center stage among engineers and policy makers.

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