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GREEN TECHNOLOGY-AN EMERGING TREND

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Abstract - *Technology means application of knowledge for practical requirements. The present technology is running towards the highest peak of advancement that brings the irreversible damage to our earth. We know that every invention has its pros and cons but we merely ignore its disadvantages which are indeed disturbing human life as well as animal habitats. Thus Green Technology aims to save our planet by utilizing renewable resources which never depletes. It is also used to minimize the effect of environmental pollution by replacing waste products by renewed products so that the greenery is increased and we can go green. It has various branches like Green Electricity, Green Nanotechnology, Green Buildings, and Green Chemistry etc. Each of them has no negative effects, thus the future generation can be benefited from them. As we pollute this planet, we are sole responsible to save it from its destruction. This paper mainly focuses on the need, importance and advantages of Green Technology for the better tomorrow.*

Key Words: renewable resource, pollution, green building, green energy, green chemistry, green technology.

I.INTRODUCTION

Green Technology is application of environmental science by conserving the planet and using its natural resources. It is also useful to curb the bad impacts of human involvement on the nature. It is also called as Clean Technology. Sustainable development is the key concept in this. This technology comprises of set of methods and techniques for generating energy from renewable resources. Energy generating techniques involve photo voltaic, turbines of wind, hydro-electricity generators etc. Green Technology acts to reduce the toxicity present in the nature by counteracting them or alter the conditions which produce them. This can lead to economic and biological balance to the environment. It helps to reduce the greenhouse gases effect and depletion of ozone layer which rises the global warming. Green energy and Green chemistry are core part in advancements in research and development field. The processes which lead to sustainable approaches are important for safe, clean and healthy environment. Denmark Government has decided to switch 100% renewable energy by 2050[1].

II. RENEWABLE ENERGY AND RESOURCES

The renewable resources are the sources which never vanish from the environment such as wind energy, solar energy and tidal energy. It is found abundant and unlimited in the nature though we repeatedly use them. These are available cheaply or almost free. It helps in reducing pollution in air and improving health of all living beings on earth. From the law of conservation of energy, energy is neither be created nor be destroyed but can be changed from one form to another form [2]. Hence, generation of energy for required purposes can also be done. Let us go in detail about each renewable resource.

II. a. SOLAR ENERGY

Solar energy is bright and immense radiant energy emitting from the Sun which is located several miles away from the earth. Solar batteries are used to store excess energy. During the day, energy is captured for production of electricity, home appliances like solar cooker, solar water heaters, solar calculator, and solar panels is widely used now-a-days. Solar cookers use sunlight for cooking, drying and pasteurization purposes. Concentrated Solar Panel systems use lenses or mirrors to focus a large area of sunlight into a small beam. Photo Voltaic converts light into electric current using the photoelectric effect. This solar energy is also called as solar power. The United Nations Development Program in 2000 World Energy Assessment found that the annual potential of solar energy was around 1,575–49,837 exajoules (EJ). This is several times larger than the total world energy consumption, which was estimated as 559.8 EJ in 2012[3][4]. The Earth receives 174 petawatts (PW) of incoming solar radiation at the

upper layer of atmosphere [5]. Nearly 30% is reflected back to space while the rest is absorbed by clouds, oceans and land masses. Sunlight absorbed by the oceans and land masses keeps the earth surface at an average temperature of 14°C [8]. By photosynthesis, green plants convert solar energy into chemically stored energy which produces food, wood and the biomass from which fossil fuels can be derived.[9][10]. According to International Energy Agency, the solar power can produce most of the world's electricity by reducing the emissions of greenhouse gases.

II.b. BIOGAS AND BIOFUEL

A mixture of gases produced by breaking down of organic waste matter in non-oxygen condition is called biofuel. These organic waste are agricultural waste, manure, food waste etc. This generates no net CO2 (carbon dioxide). If we don't consider the CO2 emissions in the next few decades the earth's climate will change irreversibly leading to catastrophes. As of 2011, over 44 million households use biogas for cooking purposes. Ecofriendly biofuels like CNG (compressed natural gas) are used in motor vehicles instead of petrol or diesel. Ethanol is the most common biofuel worldwide. Alcohol fuels are produced by fermentation of sugars derived from corn, sugar cane, molasses and any sugar or starch (such as potato and fruit waste, etc.). Biomass can be converted to convenient energy-containing substances in three different methods: thermal conversion, chemical conversion and biochemical conversion. This biomass conversion can result in fuel in solid, liquid, or gas form. "First-generation" or conventional biofuels are biofuels made from food crops grown on cordial land. Second generation biofuels are fuels manufactured from various types of biomasses. Biomass is a wide-ranging term which means any source of organic carbon that is renewed rapidly as part of the carbon cycle. Third generation biofuel introduces with alga culture and algae fuel. The fourth generation biofuel is electro fuels and photo biological solar fuels. Green diesel can be produced by hydrocracking biological oil feed stocks, such as vegetable oils and animal fats.

II.c. WIND POWER

Wind power is the air flow through wind turbines to mechanically power generators for electricity. Wind power is plentiful, renewable, clean, produces no greenhouse gas emissions during operation, consumes no water, and uses little land. Wind turbines are the devices which convert the wind's kinetic energy into electrical power. As of 2015, Denmark generates 40% of its electric power from wind. A wind farm is a group of wind turbines where the land between the turbines can be used for agricultural or other purposes. Until 2015, there are over 200,000 wind turbines worldwide operating, with a total capacity of 432 GW. Wind power has no fuel costs.

II.d. TIDAL/WAVE ENERGY

Waves are generated by wind passing over the surface of the sea. Wave Energy also known as Ocean Wave Energy, Wave power converts the periodic up-and-down movement of the oceans waves into electricity by placing equipment on the surface of the oceans that captures the energy produced by the wave movement and converts this mechanical energy into electrical power. A machine that exploits wave power is a wave energy converter (WEC). The worldwide resource of coastal wave energy has been estimated to be greater than 2 TW [14]. It is pollution free as wave energy generates little or no pollution to the environment compared to other green energies. This method dissipates the waves to the shoreline protecting from coastal erosion. It gives no difficulty to migrating fish and aquatic animals. The wave power available at deep ocean sites is about three to eight times the wave power available at shoreline sites.

.III GOALS OF GREEN TECHNOLOGY

Every technology has a goal to achieve in order to fulfill the needs of the present generation. But the sophistication shouldn't be only one sided, we should also consider its drawbacks. The main goals of Green technology are meeting the needs without actually damaging the resources or environment. It implies using the ecofriendly products. If we go on producing a new product each time, there will be a huge loss of resource. Then here comes an approach of re-using the used material. In detail, we call it 3R concept which includes

a. Reduce
b. Reuse
c. Recycle.

'Reducing' means minimizing the excess production or lowering the wastage. By being wastage conscious, we can obtain sustainable living for the present and the generations to come. For example, instead of using paper for every purpose we can switch to online document. The other way for reducing the wastage is reusing the products with the help of recycling process.

Recycle means the process of taking the used material, process it and make it as new. By this, levels of pollution can be limited. Materials such as glass, paper and metal can be easily recycled. On an average every US citizen produces 730kg of wastage every year for US alone. Some materials like Aluminum coke tins take up to 50 years to degrade into earth. So these needs to be recycled than dumped. Recycling these tins saves energy equal to run TV for three hours. Recycling a pound of steel saves energy which can be used to light a 60-watt bulb for a day. Each newspaper should be recycled for re-use instead of cutting down trees for fresh papers.

IV. BRANCHES OF GREEN TECHNOLOGY:

There are 5 branches of Green Technology. There are:

a. Green Electricity
b. Green IT
c. Green Nanotechnology
d. Green Buildings
e. Green Chemistry

GREEN ELECTICITY:

Green electricity can be described as electricity generation from the green energy resources like solar, wind, biomass etc. As we know that the conventional electricity generation, based on combustion fossil fuels or burning of coal, causes CO2 emission into air which creates most of the pollution. It contains pollutants which worsen the planet and this is believed to be main reason for global warming. It is reported by the IEA (International Energy Agency) that a global switch to efficient lighting systems would trim the world's electricity bill by nearly one-tenth. Eco friendly bulbs offer a positive alternative and the ability to combine energy saving with money saving. Motion sensors can be a good way to keep lights turned off when they're not needed, and dimmers can give you just the right amount of light, and timers can be set to turn things on and off when needed. A green vehicle is a road motor vehicle that produces less harmful impacts to the environment. Vehicle emissions contribute to the increasing concentration of harmful gases leading to climate change [12]. Of the total greenhouse gas emissions from transport, over 85% are due to CO2 emissions from road vehicles. The transport sector is the fastest growing source of greenhouse gases.[13]

GREEN IT:

Green computing, green ICT as per International Federation of Global & Green ICT "IFGICT", green IT, or ICT sustainability, is the study and practice of environmentally sustainable computing or IT sector. This aims to reduce the carbon footprint generated by the Information System. Green Information technology and communication designs use products which can reduce the negative effects of human activity on the environment. Many corporate IT departments have green computing mechanisms to reduce the environmental effect of their IT operations. [14]. Modern IT systems totally rely upon a combination of people, networks, and hardware; as such, a green computing mechanism must cover all of these areas as well. The U.S. Department of Energy specifies five primary areas on which to focus energy efficient data center design best practices:[15]

a. Information technology (IT) systems
b. Environmental conditions
c. Air management
d. Cooling systems
e. Electrical systems

The concept of green IT has emerged in 1992 when the U.S. Environmental Protection Agency launched Energy Star, a program that helps organizations save money and reduce greenhouse gas emissions by identifying products that offer superior energy efficiency. The main benefits of green computing are reduced environmental impact (less GHG emissions, less e-waste, fewer virgin resources needed for manufacturing new devices) lower energy costs longer lasting computing devices reduced health risk for computer workers.

GREEN NANOTECHNOLOGY:

Green Nano-technology producing Nano-materials and products without harming the environment or human health. These are used to make micro and nano products using non-toxic ingredients at low temperatures using less energy and Renewable inputs. Green nanotechnology has two goals: producing nano materials and products without harming the environment or human health, and products that

provide solutions to environmental problems. One innovation of green nanotechnology that is currently under development are nanomachines modeled after a bacteria bioengineered to consume plastics, *Ideonella sakaiensis.* These nano-machines can decompose plastics dozens of times faster than the bioengineered bacteria. LED screens are also good examples.

GREEN BUILDINGS:

Green building (also known as green construction or sustainable building) refers to both a structure and the implementation of processes that are environmentally responsible and resource-efficient throughout a building's life-cycle, construction, operation, maintenance, renovation, and demolition. Most green buildings cost a premium of <2%, but yield 10 times as much over the entire life of the building [16]. EPA studies reports that indoor levels of pollutants may be up to ten times higher than outdoor levels. LEED-certified buildings are designed to have healthier, cleaner indoor environmental quality, which means health benefits for occupants [17]. Tropical Green Building refers to a style of construction that focuses on reduced use of chemicals, and supporting local labor and community. Materials used in green building construction are:

a. Low volatile organic compounds paints
b. Bamboo flooring
c. Cotton batt insulation
d. Ecological concrete
e. Paper insulation panels
f. And good ventilation

GREEN CHEMISTRY:

Green chemistry, also called as sustainable chemistry, is an approach of chemical research and engineering that encourages the design of products and processes that minimize the use of chemicals and the generation of hazardous substances. Chemical products should be designed to achieve their desired function while being as non-toxic as possible. Moreover, certain herbs are used in cosmetic products. The idea of green chemistry comes from the Pakistani National Centre of Physics and it was introduced by Dr Syed Hussain. Their research team found a nano-catalyst that can be used to produce biodiesel from used tea. If this reaches the commercial market, it could be a great way to produce alternative energy. On the other hand, if the methane produced by farm animals from their manure is collected, it could represent 100 billion kWh of electricity per year. The use of green technology can reduce the amount of waste and pollution and provide early warming messages which are created during production, consumption, impact of natural disaster. This technology helps us to reduce pollution and save our planet from natural calamities. It can be used in different fields like automobiles such as CNG vehicles and biogas in domestic purposes. It provides an international forum for scientists, engineers, researchers, technocrats for consolidating research. Activities and practical aspects of green science and technology. It is better to prevent waste than to clean up the dirt after it has been created.

V. ADVANTAGES OF GREEN TECHNOLOGY:

The main advantages of green technologies are as follows:

- ENERGY SAVING.
- ENVIRONMENT FRIENDLY
- COST EFFECTIVE
- SAVE POWER
- REUSE OF NATURAL RESOURCES

CONCLUSION

Thus, from the natural resources it is easy to generate electricity, power which is less harmful to the environment. This green technology makes the living easy and reliable. Mainly the air pollution has to be controlled as it is rapidly increasing and causing exponential number of deaths per year. As per the WHO report 2014, Delhi stands first in crossing the pollution levels beyond the safe limits. The observed levels at Anand Vihar (in Delhi) in 2013 was nine times than the acceptable levels. The dirt particles and smoke from increased transport density has caused respiratory illness and deaths. The Central Pollution Control Board has stated that if the pollution levels(particles per cubic centimeter) crossed 90-120 in PM 2.5 and 250-350 in PM10 then it can cause serious health issues and lung infections whereas Delhi and some other parts of the country has crossed 153 in PM 2.5. Therefore, it is very important to control the pollution and save our planet from destruction. If proper prevention or care is not taken it not only

effects human beings but also animals and birds. It is very important for us to learn about our environment and promote ecofriendly products rather than growing with the harmful chemicals or toxic substances.

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