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Study of Solar Energy

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Abstract: ***Solar energy is the earth's most abundant and freely available resource. It is sustainable, renewable and an inexhaustible resource produced directly by the sun and collected on earth. In today's date, India is a large consumer of fossil fuel such as coal, crude oil etc. The rapid increase in use of Non-renewable energies such as fossil fuel, oil, natural gas has created problems of demand & supply. Because of which, the future of Non-renewable energies is becoming uncertain. Also India has had a negative Energy Balance for decades, which has resulted in the need to purchase energy from outside the country to fulfil the needs of the entire country. Solar energy is an alternative to non-renewable and polluting fossil fuels in today's world of growing energy needs. The sun produces vast amounts of renewable solar energy that can be collected and converted into heat and electricity. Solar power can directly supply much of the world's required energy.***
Keywords: Renewable, Clean energy , solar energy, Electricity, Non-polluting

I. INTRODUCTION

Current approaches to energy are non-sustainable and non-renewable. Today, the world's energy supply is largely based on fossil fuels and nuclear power. These sources of energy will not last forever and have proven to be contributors to our environmental problems. Renewable energy offers our planet a chance to reduce carbon emissions, clean the air, and put our civilization on a more sustainable footing. Renewable sources of energy are an essential part of an overall strategy of sustainable development. They help reduce dependence of energy imports, thereby ensuring a sustainable supply and climate protection. Furthermore renewable energy sources can help improve the competitiveness of industries over the long run and have a positive impact on regional development and employment. Renewable energies will provide a more diversified, balanced, and stable pool of energy sources. Some countries of the EU such as Denmark, Germany, Austria and Spain as well as China or India have already demonstrated the impressive pace of transition which can be achieved in renewable energy deployment, if the right policies and frameworks are in place. Also the new US policy has made clear its determination to massively increase renewable energy in the US, giving strong and clear signals to the world. With rapid and continued growth in the world it is no longer a question of when we will incorporate various renewable energy sources into the mix, but how fast the transition can be managed.

Solar energy offers our planet a chance to reduce carbon emissions, clean the air, and put our civilization on a more sustainable footing. Solar energy are an essential part of an overall strategy of sustainable development. They help reduce dependence of energy imports, thereby ensuring a sustainable supply and climate protection. Furthermore, Solar energy can help improve the competitiveness of industries over the long run and have a positive impact on regional development and employment. Solar energy will provide a more diversified, balanced, and stable pool of energy sources. With rapid growth in Brazil, China and India, and continued growth in the rest of the world.

The electricity requirements of the world including India are increasing at alarming rate and the power demand has been running ahead of supply. It is also now widely recognized that the fossil fuels (i.e., coal, petroleum and natural gas) and other conventional resources, presently being used for generation of electrical energy, may not be either sufficient or suitable to keep pace with ever increasing demand of the electrical energy of the world. Also generation of electrical power by cold based steam power plant or nuclear power plants causes pollution, which is likely to be more acute in future . With almost one third of the world's population living without electricity, solar energy offers great promise to improve living standards. Being clean energy, it reduces greenhouse gas emissions. There is a continuous improvement in advancements in the technology used to create solar energy so as to make it more cost effective.

II. IMPORTANCE OF SOLAR ENERGY

After establishing the dependence on external fuels and the trend in increasing dependence on fossil fuels, alternate energy sources are being explored. Solar energy appears to be a promising option. Solar energy is the earth's most abundant and freely available resource. It is sustainable, renewable and an inexhaustible resource produced directly by the sun and collected on earth. Solar energy is an important, clean, cheap and abundantly available renewable energy. It is received on Earth in cyclic, intermittent and dilute

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form with very low power density 0 to 1 kW/m2.Solar energy received on the ground level is affected by atmospheric clarity, degree of latitude, etc.

Solar energy is radiant light and heat from the Sun that is harnessed using a range of ever-evolving technologies such as Solar heating, photovoltaics, solar thermal energy, solar architecture, molten salt power plants and artificial photosynthesis.

It is an important source of renewable energy and its technologies are broadly characterized as either passive solar or active solar depending on how they capture and distribute solar energy or convert it into solar power. Active solar techniques include the use of photovoltaics system, concentrated solar power and solar water heating to harness the energy. Passive solar techniques include orienting a building to the Sun, selecting materials with favorable thermal mass or light-dispersing properties, and designing spaces that naturally circulate air.

The large magnitude of solar energy available makes it a highly appealing source of electricity. The United Nation Development Programme in its 2000 World Energy Assessment found that the annual potential of solar energy was 1,575–49,837 exajoules (EJ). This is several times larger than the total world energy consumption, which was 559.8 EJ in 2012.

In 2011, the Intenational energy Agency said that "the development of affordable, inexhaustible and clean solar energy technologies will have huge longer-term benefits. It will increase countries' energy security through reliance on an indigenous, inexhaustible and mostly import-independent resource, enhance sustainability, reduce pollution, lower the costs of mitigating global warming and keep fossil fuel prices lower than otherwise. These advantages are global. Hence the additional costs of the incentives for early deployment should be considered learning investments; they must be wisely spent and need to be widely shared".The total cumulative solar power capacity for the entire world was 177,003 Megawatts— enough to power over 29 million homes.

Here are the top 10 countries leading the way in solar energy:

A. Germany: 38,250 Megawatts
B. China: 28,330 Megawatts
C. Japan: 23,409 Megawatts
D. Italy: 18,622 Megawatts
E. United States: 18,317 Megawatts
F. France: 5,678 Megawatts
G. Spain: 5,376 Megawatts
H. Australia: 4,130 Megawatts
I. Belgium: 3,156 Megawatts
J. South Korea: 2,398 Megawatts

III. TYPES OF SOLAR SYSTEMS

Two types of solar systems are examined in this report: solar electric that converts solar energy to electric power and solar thermal which uses solar energy to heat water . Both convert sunlight into usable energy and both have many applications in agricultural settings to aid farmers and ranchers in satisfying the energy requirements of their operations. Solar energy can be used either to provide heat (passive solar) or to generate electricity (active solar); so the energy generated can be termed solar thermal or solar power, depending on the way it is captured, converted and distributed.

A. Solar Thermal

The sun's heat energy can actively be converted to generate water heating, space heating, cooking, disinfecting, etc. Flat collection plates are placed on homes and buildings to face the sun's rays (directed south in the northern hemisphere). The collection plates have a transparent covering with dark metal plates beneath, which absorb heat.

1) Solar Water Heater
2) Solar Water Disinfection (SODIS)
3) Solar Cooker

B. Solar Power Technology Devices

Advanced technologies have made solar energy more competitive with conventional energy fuels for generating electricity.

1) Photovoltaic
2) Concentrated Solar Power (CSP) Systems
3) Solar Chimney Power Plant

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IV. SOLAR ENERGY APPLICATIONS

Solar Energy if harnessed in its right earnest can lead to local as well as global sustainable development, by being applied in most of the sectors such as domestic, power, industrial, agricultural, etc

A. Domestic

1) Cooking
2) Water-heating
3) Refrigeration and Air conditioning
4) Space-heating

B. Power

1) Thermal
2) Hydro-thermal
3) Ocean Thermal Energy Conversion (OTEC)
4) Solar Ponds
5) Hydrogen
6) Tidal

C. Industrial/Agricultural

1) Dryers
2) Process Steam
3) Water Pumping
4) Chilling
5) Green-houses
6) Desalinization
7) Furnaces

D. Factor affecting Solar Performance

1) Solar radiation
2) Direction
3) Angle with horizontal (summer / winter)
4) Temperature
5) Wind velocity
6) Shadow

V. ADVANTAGES

Most prominent attributes of solar energy are as follows:

A. It is a tested, dependable and easily available form of energy
B. It is green and clean energy without any harmful environmental impacts
C. The raw material i.e. the sunlight is free of cost and virtually limitless
D. Its installation is fast and easy
E. Does not require complex infrastructure
F. Provides a great deal of energy independence to organizations
G. Peak hours of energy utilization and consumption in most of the business setups coincide with the maximum availability of sunlight

VI. CONCLUSION

The world still continues to seek energy to satisfy its needs and giving due consideration to the social, environmental, and economic and security impacts. It is now clear that current approaches to energy are unsustainable. It is the responsibility of political institutions to ensure that technologies which enable sustainable development should be transferred to the end users. Scientists and

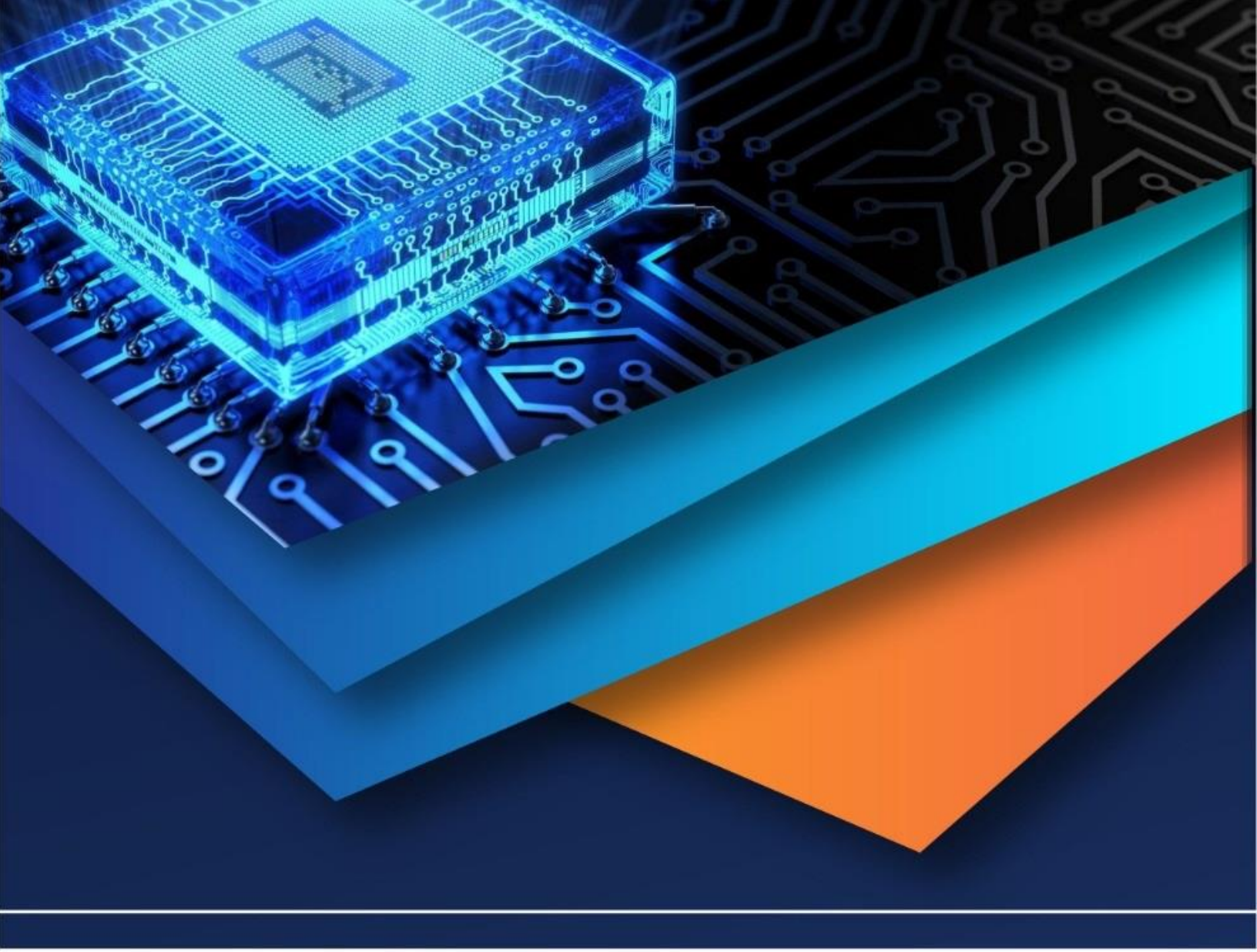
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individuals bear the responsibility of understanding the earth as an integrated whole and must recognise the impact of our actions on the global environment, in order to ensure sustainability and avoid disorder in the natural life cycle.

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