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FUTURE SCOPE OF SOLAR ENERGY

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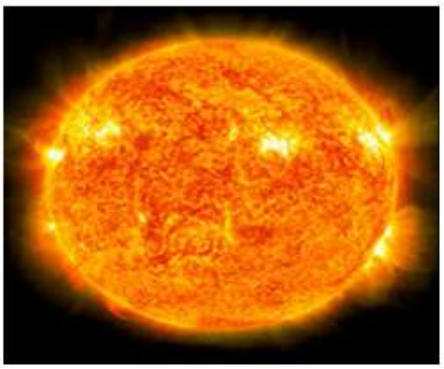
Introduction:



The solar energy is quite simply the energy produced directly by the sun and may be collected elsewhere, normally in the Earth. Solar energy is the ultimate energy source driving life as well as different human activities on Earth. The Sun is the only star of our solar system located at its center, the Earth and other planets orbit the Sun. The Sun creates its energy thermonuclear process (Nuclear Fusion) that converts about 650,000,000 Tons of hydrogen to helium every per second. This nuclear process creates heat and electromagnetic radiations. The heat remains in the Sun and is instrumental in maintaining the thermonuclear reaction. The electromagnetic radiation (including visible light, infra red light and ultra violet radiation) spreads out into the space in all direction heat and electromagnetic radiations. The heat remains in the Sun and is instrumental in maintaining the thermonuclear reaction. The electromagnetic radiation (including visible light, infra red light and ultra violet radiation) spreads out into the space in all direction.

Actually only one billionth part of energy that leaves the Sun reaches the Earth's surface in time. This is more than enough to meet the world's energy requirement. In Fact, all other sources of energy, renewable and non renewable are actually stored forms of solar energy. The exceptions are geothermal energy and nuclear fusion and fission. Even fossil fuels own their origins to the Sun. They were once living pants and animals whose life was dependent upon the Sun throughout e process of photosynthesis and followed by complex chemical reactions in which decaying vegetation was subjected to very high temperature and pressure over a long period of time.

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The difficulties lie in harnessing the energy, how to harness the energy from solar energy ? Due to the nature of solar energy, two components are required to have a functional solar collects the radiation that falls on it and converts a fraction of it to other forms of energy (either electricity and heat or heat alone). The storage unit is required because of the non constant nature of solar energy at certain times when only a very small amount of radiation will be received (at night or during heavy cloud cover). In modern day technology the photovoltaic cells has provided a way to produce electricity from solar energy.

In 2011, the International 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."

Solar energy Technologies

Solar energy technologies or collectors are characterized as either passive or active depending on the way they capture, convert and distribute sunlight and enable harnessed at different levels around the world.

(1) Passive solar energy technologies:- Passive solar energy uses heating and cooling strategies that have been used selecting materials with favorable thermal properties, designing spaces that naturally circulate air and referencing the position of a building to the sun. The solar energy heats the building by natural radiation and convection and the heat is trapped, absorbed and stored by materials with high thermal mass (usually bricks or concrete) inside the houses.

(2) Active solar techniques:- Active solar techniques include the use of photovoltaic systems, concentrated solar power, and solar water heating, solar pump and fans to harness the solar energy and convert into useful outputs.

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Solar collectors

Solar energy collectors are special kinds of heat exchangers that transform solar radiation energy to internal energy of the transport medium. The major component of any solar system is the solar collector. This is a device that absorbs the incoming solar radiation, converts it into heat, and transfers the heat to a fluid (usually air, water, or oil) flowing through the collector.

There are basically two types of solar collectors: non-concentrating or stationary and concentrating. A non-concentrating collector has the same area for intercepting and absorbing solar radiation example- Flat plate collectors. In concentrating collectors the surface area intercepting the solar radiation is greater, sometimes hundreds of time greater than the absorber area. The collector focuses or concentrates solar energy onto an absorber.

Solar energy collectors are basically distinguished by their motion .These collectors are

Motion	Collector type	Absorber type	Indicative temperature range (° C)
Stationary	Flat-plate collector (FPC)	Flat	30 – 80
	Evacuated tube collector (ETC)	Flat	50 – 200
Single-axis tracking	Compound parabolic collector (CPC)	Tubular	60 – 300
	Linear Fresnel Reflector (LFR)	Tubular	60 – 250
	Cylindrical trough collector (CTC)	Tubular	60 – 300
	Parabolic trough collector (PTC)	Tubular	60 – 400
Two-axis tracking	Parabolic dish reflector (PDR)	Point	100 – 1500
	Heliostat field collector (HFC)	Point	150 – 2000

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Advantage of solar energy in India

Some of the advantages of solar energy which makes it all the more suitable for India are as follows:

(1) This is an inexhaustible source of energy and the best replacement to other nonrenewable energies in India.
(2) Solar energy is environment friendly. When in use, it does not release CO_2 and other gases which pollute the air and also cause global warming. Hence, it is very suitable for India, India being one of the most polluted countries of the world and reduced global warming.
(3) You don't need a power or gas grid to get solar energy. A solar energy system can be installed anywhere. Solar panels can be easily placed in houses. Hence, it is quite inexpensive compared to other sources of energy.
(4) Solar power is abundant and inexhaustible. In energy deficient country like India, where power generation is costly, solar energy is the best alternate means of power generation.
(5) Solar energy is free. Sure, there is an initial capital cost to install a system that will convert the electromagnetic energy and photons sent out by the sun into electricity, but once you have made the investment as long as the sun keeps shining you will be producing electricity. No one will be sending you a bill for sunshine.
(6) Solar energy can be used for variety of purposes like as heating, drying, cooking or electricity, which is suitable for the rural areas in India. So you can make money and save money by using the solar energy.

Disadvantage/Limitation of solar energy in India

Some of the disadvantages of solar energy which needs further researches are as follows:

(1) One major limitation currently associated with the most forms of renewable energy is that the energy is not concentrated and not easily portable.
(2) The cost of installation of solar energy system is initially is fairly high. Never the less, solar technologies are constantly developing, so it is safe to assume that prices will go down in the future.

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(3) Solar panels also require inverters and storage batteries to convert direct electricity to alternating electricity so as to generate electricity. While installing a solar panel is quite cheap, installing other equipments becomes expensive.

(4) The land space required to install a solar plant with solar panel is quite large and that land space remains occupied for many years altogether and cannot be used for other purposes

(5) We cannot generate energy during the night time with solar energy. And, also during day time, the weather may be cloudy or rainy, with little or no sun radiation. Hence, this makes solar energy panels less reliable as a solution.

(6) Only those areas that receive good amount of sunlight are suitable for producing solar energy and energy production is quite low compared to other forms of energy.

(7) Solar panels require considerable maintenance as they are fragile and can be easily damaged. So extra expenses are incurred as additional insurance costs.

Government schemes

In order to achieved the target proposed by the national solar mission. Government of India have launched various schemes which is generally divided in two category:- (i) Grid Connected, (ii) Off Grid Connect

(1) Grid Connected Solar Power :- A target of installing 100GW of grid connected solar power by 2022 has been kept. In order to achieved the above target Government launched Schemes like – Solar Park Scheme, VGF Schemes, CPSU Scheme, Defence Scheme, Canal bank and canal top Scheme etc. India has Cumulative capacity of 34600 MW up to march 31, 2020 in area of grid connected solar power

(2) Off Grid Solar PV Program:- Off grid solar PV applications program is one of the oldest programs of the ministry aimed at providing solar PV based applications in areas where grid power is either not available or unreliable. Application such as Solar home lighting systems, solar street lighting systems, solar power plants, solar pumps, solar lanterns and solar study lamps are covered under program like- PM-KUSUM, AJAY etc.

Recommendation for solar energy in India

Government of India release Jawaharlal Nehru National solar mission (JNNSM) to install 100GW of solar power installation across the country by 2022. In order to successfully attain the target there are some recommendation as follows-

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1. The government has to extend support to the solar industry in the form of formulating common policy at the federal level proper implementation of the policies at the ground root level single window clearance system easy and long term financing and proper infrastructure.
2. The government has to improve R and D facilities, manufacturing facilities and infrastructure for the growth of the solar power sector in India.
3. To enhance conversion efficiency ,use of concentrated solar Photovoltaic should be employ technologies to counter the dust problem for example –anti soiling technology like dust free glass with self cleaning hydrophobic nano –coating.

4. Develop and offer training programs for citizen to get ski labour and establish connection between training institutes and solar power companies.
5. The government should regularly organize awareness programs throughout the country especially villagers and remote locations such as island.
6. To overcome transmission requirements is to develop numerous substations and transmission lines.
7. The government should provide enough budget for the solar energy sector. The solar energy sector budget doubled every year but it very low to other countries like China (118th times).
8. The country should move to domestic manufacturing. We imports 90%of its solar equipment from China, Taiwan and Malaysia.
9. Encourage the transfer of ideas/innovation between industry academia and policy makers from around the world to accelerated adoption of solar power like international solar alliance (ISA) which vision to enable one world, one Sun, one grid.
10. Easy finance availability for residential roof top, commercial and industrial establishment especially in MSME sector & support & encouragement should be provided for Indian manufacturing.

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11. Large development of micro and min gird must be under taken and adoption of new solar storage technologies must be prioritized. Solar must be moved from 'class' to 'Mass'.

12. India should follows this 5-point plan to maximize India's renewable energy potential:-

    1. Promote hybridization of solar and wind energy and build ancillary markets
    2. Build enhanced evacuation infrastructure
    3. Invest in digitalization
    4. Develop battery storage solutions
    5. Turnaround the distribution companies.

13).The issue of land is overcome with rooftop generation but another way to deal with land issue is utilizing building integrated Photovoltaic (BIPV) and floating PV plants in water bodies are an ultimate to land power plants.

Conclusion

Solar Power is an immense Source of directly useable energy and ultimately creates other energy resources: biomass, wind, hydropower and wave energy. The Photovoltaic effect is capable of large- Scale electricity generation But the present low efficiency of Solar PV Cells demands very large areas to supply Because of concerns such as Climate Change and environmental protection, energy Saving and reduction of carbon emission have been emphasized worldwide and India also started its journey towards a Sustainable future by harness Solar power at a very large scale because it is abundantly available and produces zero green house gas emission. As per the geographical location the country, India has tremendous Scope of generating solar energy. Solar Power Generation alone can cater mar than 60-65% of our entire need of power thus we have to focus on following future plans of installing large projects and Roof top solar energy generation that may cut down our need to more than 50% need every house hold.

Government of India is leading by example through launch various Schemes like PM-KUSUM, AJAY, JNNSM & Saubhagya etc. and also do lots of works on grid connected Solar power through installation of Solar rooftops widely on government building, airports, railway network, residential Sector and Commercial complex. Government of India also approved 41 Solar Parks with cumulative capacity of 25826Mw

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have been approved in 20 states for development of solar parks and ultra mega solar Project is very beneficial for country Also Government focus on Skill development schemes like Suryamitra Skill Development Program for growth of Solar energy.

An outlook for linking of solar energy targets with the current missions on 'Make in India', 'Smart city mission' and 'Digital India' as a promise for developing capabilities and transformation of entire power system in the country is recommended.

The suggestions discussed in previous section may help overcome that hurdle and provide an alternative for large scale installation issues like Land availability, long range transmission, large auxiliaries etc. Many educational programs initiated by the Government have increased the research. Technological advances also are required to help meet the targets of Solar PV installations with correct policy implementation & aggressive R&D and proper financial Schemes.

A Culmination Several Schemes around the Country has enabled its Success to achieve require target and leads India to being a green energy nation and become the world largest solar energy producer - After all we knew that The Energy of the Future is Solar Power.

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