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Solar Energy for Rural Areas

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Abstract:-- **Solar energy is the renewable energy which is one of the never - ending resource. The present scenario in India is that in rural areas there is still scarcity in electricity .and the electricity is only available for few hours and few days. Due to simple lifestyle of living they face difficulties in completing their daily day to day tasks. But with the proper technologies to utilise solar energy we can surely reduce their efforts. By using new technologies we can use100% sun energy efficiently.**

I. INTRODUCTION

Solar energy is the renewable energy which is one of the never - ending resource. The present scenario in India is that in rural areas there is still scarcity in electricity .and the electricity is only available for few hours and few days. Due to simple lifestyle of living they face difficulties in completing their daily day to day tasks. But with the proper technologies to utilise solar energy we can surely reduce their efforts. By using new technologies we can use100% sun energy efficiently

Advantages of using solar energy

1. There is no production of noise when solar cells extract solar energy from the sun. On the other hand, machines, such as generators, produce a lot of noise when producing power.

2. There is absolutely no pollution created by solar energy. However, when oil is burnt to produce energy, harmful greenhouse gases, carbon dioxide and carcinogens are produced.

3. It is cheaper to use solar energy in the long run because the maintenance cost of solar panels is very low compared to the other types of energy production equipment that have moving parts that lead to high maintenance costs.

Disadvantages of solar energy

1. Solar energy entirely depends on the amount of sunlight available. Therefore, it cannot be harnessed on a cloudy day, at night or during a storm.

2. The solar panels and cells required to harness this renewable energy are very expensive to purchase unlike the equipment needed to generate non-renewable energy, such as a generator.

There are many methods or products which help us to make 100% use of solar energy :- By using these methods or products we can reduce the difficulties of the people living in rural areas and can make their lifestyle easy and convenient.

Various solar energy utilization products are as follows along with uses of solar energy :-

They are

1) water heaters
2) solar electricity
3) solar lamps
4) solar cooker
5) solar water distiller
6) solar water pumping
7) street and outdoor lights
8) solar pool heating
9) solar inverters
10) solar panels (portable)

Solar energy is considered the most abundant of all renewable resources in India. The inception of the Jawaharlal Nehru National Solar Mission (JNNSM), also known as the National Solar Mission, has resulted in very rapid development of solar technologies in the country. The mission, launched by the Indian prime minister in January 2010,hasan ambitious target of installing 20 GW of grid-connected solar power by 2020, in order to give solar

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technologies an impetus. Besides installing grid-connected solar power (based on solar thermal power generating systems and SPV technologies), the JNNSM has a target of promoting 2,000 MW of offgrid applications, including 20 million solar lighting systems and 20 million sq. metres of solar thermal collector area by 2022. The mission is to be implemented in three phases—the fi rst phase will continue till March 2013, the second phase till March 2017 and the third one till March 2022. The target for Phase-I is to set up 1,100 MW of gridconnected solar plants, including 100 MW capacity of rooftop and small solar plants, 200 MW capacity equivalent of off-grid solar applications and seven million sq. Metres of solar thermal collector area.The main objective of this mission is to help reach grid parity by 2022 and set up indigenous manufacturing capacity.

Potential

The total theoretical potential for solar power in terms of direct normal irradiance is very large.India has a vast potential for solar power generation, since about 58 per cent of its total land area (1.89 million sq. km) receives an annual average global insolation above 5 kWh/m2/day. Regions that receive global insolation of 5 kWh/m2/day and above can generate at least 77 W/m2 (actual on-site output), at 16 per cent efficiency. Hence, even 1 per cent of the land area, with global insolation of more than 5 kWh/m2/day, could deliver nearly 1,460 GW of SPV-based electricity (379 billion units (kWh) considering 2,600 sunshine hours annually). This power generation capacity would enhance considerably with the improvement in the efficiency of SPV technology. Concentrated solar thermal (CST) technology could deliver the same potential with around 1.2 per cent of the land. However, CST requires direct insolation and can only be installed in specifi c locations.Being a densely populated country with residential, agricultural and industrial priorities, availability of land for solar programmes is likely to be a constraint. Rooftop PV could, therefore, play a role in supplementing the land requirement for solar Solar technologies can be divided into two broad categories.

Solar photovoltaic: Converts sunlight into electricity, based on photovoltaiceffects

Solar thermal: Uses solar radiation for heating directly and generating electricitySolar Photovoltaic (SPV)

Technology

Solar photovoltaic (SPV), or simply photovoltaic (PV), refers to the technology of using solar cells to convert solar insolation to electricity. It works on the photoelectric effect. The process works even during cloudy or rainy days, though with reduced production and conversion efficiency. The global cumulative installed PV capacity has increased from 1.4 GW in 2000 to about 70 GW in 2011, with a global annual investment of some USD 147 billion in 2011 (REN 21 2012). Germany, Japan, USA, Italy, Spain and China are leading countries in terms of cumulative capacity, annual installed capacity, and/ or production of PV modules and systems. In India, most of the existing manufacturing capacity is based on crystalline silicon manufactured as wafers. Solar PV applications include solar home systems, solar power plants, solar lighting (street lighting, home lighting systems and lanterns), solar pumping and PV modules for telecommunications and data logging. However, the high capital cost is a barrier.

Barriers and Shortcomings

PV power has huge, virtually unlimited and untapped energy potential and no environmental constraints to market expansion. The main issues that remain are the relatively high cost and the modest capacity factor (the intermittent operation), which translate to high electricity generation costs and the need for appropriate grid management and energy storage or back-up power in off-grid installations. To drive cost reductions through deployment, the government of India and different state governments offer fi nancial incentives (feed-in tariffs) for PV electricity generation, while grid authorities prepare for accommodating increasing amounts of renewable intermittent capacity (storage). Energy storage and development of smart grids are vital for a large deployment of PV power. Cost-effective energy storage is not yet available, but it is currently the focus of considerable R&D efforts. Concentrating solar power.

Technology

Concentrating solar power (CSP) systems use mirrors to concentrate sunrays and produce heat and steam and generate electricity by a conventional thermodynamic cycle. The parabolic trough (PT) and the solar power tower (ST) plant are examples of this type of technology. CSP can also be used for water desalination and synthetic fuel production. Line-focusing parabolic trough technology can also be used for direct heating purposes in industries or for

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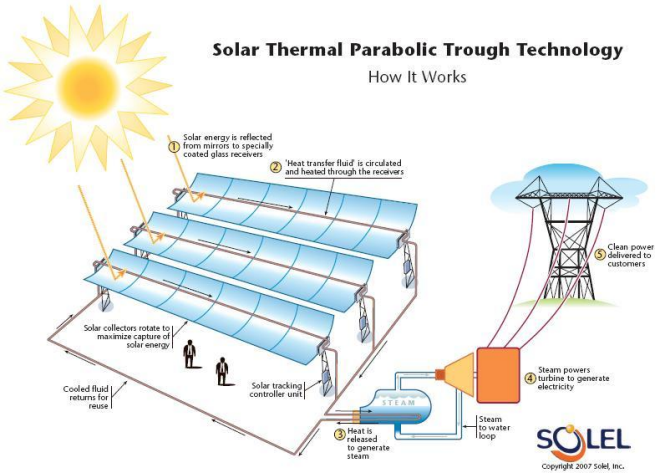
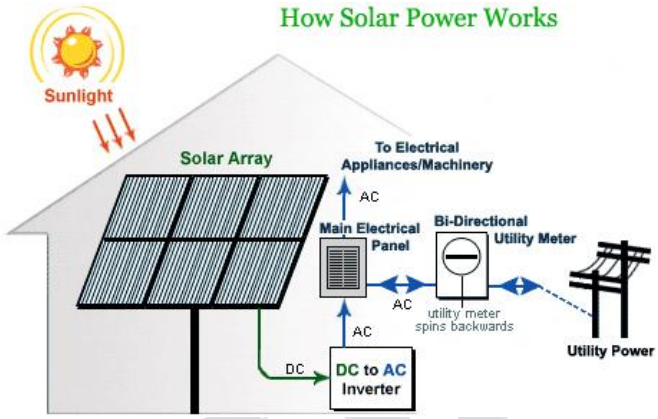
other thermal applications.CSP plants can be equipped with heat storage systems to generate electricity even when the sky is cloudy or after sunset. Thermal storage can significantly increase the CSP dispatchability compared with solar PV and wind power and can facilitate grid integration and competitiveness. It can, thus, be used at base load plants.

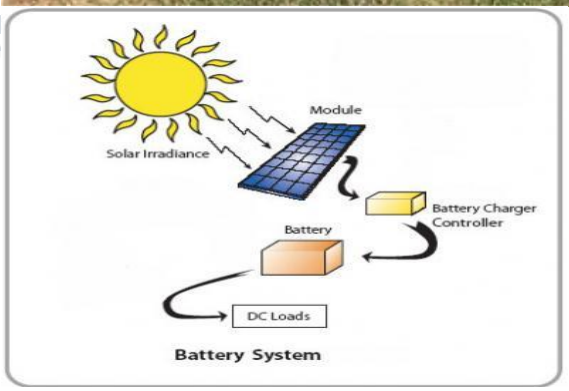
Barriers and Shortcomings

CSP is an expensive technology in comparison to fossil fuel-based technologies with levelized cost of electricity (LCOE) of around INR 18 per unit. Availability of land is another important factor. Also, grid management and costs to be entailed for balance of power are important since these are variable, like in the case of most other renewable technologies. However, as storage technologies (such as molten salt technologies) are made commercially viable, this will change drastically.





Applications of solar energy



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