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Research Paper

Solar Roof Top Electricity - A Sustainable Technique

Engineering

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ABSTRACT

India is geographically located at 28° 36.8' N and 77° 12.5' E in the hemisphere of the globe, that is an ideal location for solar energy utilization. India has a high solar insulation of about 5000 Trillion Kwhr/yr, which is far larger than current energy consumption. Growing demand for energy and increasing power value from utility companies compel industries to look for various choices. Captive solar roof power plant is cost effective and reliable solution which might achieve the payback in only 3-5 years, whereas the plant will last for more than twenty five years. The main reason behind choosing roof top is that there's no problem of land acquisition for fitting the power plant. The solar Roof top power plant produce clean and renewable energy. No sort of pollution is created, no greenhouse gases are emitted, no by-products are give out, and therefore the Solar Roof Panels are completely recyclable and reusable.

INTRODUCTION

Since ages, our energy desires are met by numerous fuel like coal, petrol, diesel, lamp oil & natural gases. But all of these energy sources are non-renewable & thus destined to finish in some unspecified time in the future.

Today, we've started feeling the crisis of non-renewable resources & it's time that we start using renewable natural resources, among that solar energy from sun is that the best choice for our country.

India is the fourth largest client of electricity in the world. As we have average three hundred sunny days during a year, our country is best suited to solar energy. With presently available technology, we can use solar power for any kind of applications.

Due to technological advances & economy of scale, the solar equipment has become economical particularly in comparison to DG sets or when grid electricity costs are more than Rs 10 per unit. With depreciation advantages, and a payback period of 3 to 5 years whereas the savings will be realized for twenty five years.

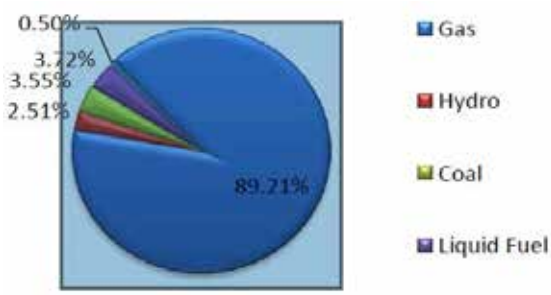
This system has not only reduced diesel consumptions, but also saved electricity cost, improved productivity & equipment life, and provided drinking water in no electricity zones.

This system can be installed on hospitals, banks, government buildings, institutional buildings, petrol pumps, etc.

Present power scenario

India depends greatly on fossil fuels for its energy. Here coal remains the most important fuel for power generation. about eighty nine of generated power comes from natural gas and the rest is from liquid fuel, coal and hydropower. the current share of renewable energy is barely 0.5%.

Following pie chart refers:
Chart: Sources of power generation



WHY ROOFTOP ?

The main reason behind choosing roof top is that there's no drawback of land acquisition for fitting the power plant

Roof top solar power plants are both green and economical. The customers will have access to power all the time and will not suffer from any regular or unexpected power cuts.

Customers does not have to rely on diesel generators throughout load shedding hours. The roof top plant is capable of running all the appliances, just like normal grid electricity. In fact, the quality of the power is much superior compared to grid power in most places.

Solar power plants assist you generate clean and green energy at affordable price. A extremely optimized solar power plant generates most of its power during 8:00 am to 6:00 pm.

ECONOMICAL

The roof top solar power plant is exclusive and is especially designed for metro cities. Metro cities got to pay higher charges for obtaining uninterrupted supply of electricity.

It is one of the simplest investments & life time answer against ever increasing fuel and grid power cost. This system is economical against grid tariff of Rs. 10/unit. It has the lowest maintenance value and has no recurring expenses.

FUNCTIONING

If the solar roof top is generating enough power, no power are drawn from the grid.

If the solar roof top is meeting only partial load, the remaining power will be drawn from the grid.

If there's no solar generation from the roof top, then grid will be the source of supply.

There is no power storage i.e no batteries are needed.

ADVANTAGES
A 10Kwp Roof top solar power plant will generate up to 45-50 units on a normal sunny day and might generate about 15000 units annually.

The area needed for the installation of roof top solar power plant system is about 120 Sq ft/KW.

It is a green product as a 10Kw roof top solar power plant can save up to 600 tons of CO2 emission in the plant's time period.

It has a very short payback period of about four to five years.

Plant lifetime is about twenty five years.

Lowest maintenance cost.

The customer is the owner himself & no billing charges occurs.

Electricity is generated for more than twenty years with none traditional fuels.

No fuel cost is involved.

Solar PV systems are durable.

The systems are appropriate for any a part of the country (e.g., underserviced areas)

No pollution is generated and The power generated using solar is environmentally friendly.

Solar Electricity generation and the Application of Solar PV

A solar panel consists of many cells produced from silicon. Every silicon cell will yield 0.5 volt DC. The sunlight impinging on panels, i.e. irradiance or insulation(incoming star radiation), is measured in units of watts per square meter (W/m2).

We can use only 25th of daylight radiation for PV module. The PV system power output (DC) has approximately a linear relationship to the insulation. Using the available solar radiation on the inclined surface the hourly energy output of the PV generator will be calculated solar radiation following equation:

P = A*x2 + B*x + C (in Watts)

Where, x= radiation, P=power generation, and A, B, C are constants, which might be derived from measured data. By using above formula, we will predict solar power generation at any solar radiation.

Solar panels are put in at a 22° alignment with the ground in India, though this alignment depends upon the installation's geographic location. In India the daylight falls directly in summer and transversally in winter. So, it's best to slant the panel at 45° in summer and between 15°and 20° in winter.

Since it's hard to regulate the panels at totally different angles with the change of seasons, the technical consultants decided to position the panels at 22° to optimize the sunshine received to avoid moving the panels to trace the sun.

CASE STUDY
The case study below gives you the idea of economic advantage from solar power plant.

Fig.1 Solar Panels at sugar factory near satara

System: 5MW alternative energy Plant

Area required: thirty acres

Units Generated: 80 lac units/year

Electricity savings/year: 4.8 crores/year

Diesel savings: fifty two lacs/year

Cost per unit: 3.89 (Including losses, charges & interest)

Payback: 5.5 years

Incentives: Accelerated depreciation (80% 1st year, 20% second year)

CONCLUSION
We can't wait any more to seek out a replacement for fossil fuel, that is speedily disappearing. Our dependency on fossil fuels has long been a matter of national security and that we don't desire to wait till it's gone to come to a decision what to try to do next. We have the technology to resolve this drawback during a comparatively short amount of your time, which can be all we've left.

In developing counties the most important a part of the geographical area is needed for construction. therefore rather than wasting helpful land we will develop solar roof top power plants the major might improve economy with infrastructure.

Generally the solar Roof top power plants will:-
1. Eliminate the necessity for coal-fired or atomic energy plants.
2. Finish our dependency on fossil fuels (coal and natural gas).
3. Cut our nation's greenhouse emission emissions by over five hundredth.
4. Usage of recycled material

"Let's go greener"

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