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Photovoltaic system- A case Study

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Abstract: *Globally, buildings are responsible for approximately 40% of the total world annual energy consumption. Most of this energy is for the provision of lighting, heating, cooling, and air conditioning. Increasing awareness of the environmental impact of CO2 and NOx emissions and chlorofluorocarbons triggered a renewed interest in environmentally friendly cooling and heating technologies. This paper outline solution for energy efficient building, by introducing the photovoltaic system, solar panels are designed for particular considered case study as it is renewable energy. Its advantages, disadvantages are discussed.*

Keywords: *Energy consumption, energy efficient, photovoltaic system, solar panels, renewable energy.*

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I. Introduction

Energy consumption is the consumption of energy or power. it is covered in the following categories:

- World energy consumption
- Domestic energy consumption
- Electric energy consumption

World energy consumption: World energy consumption refers to the total energy used by all of human civilization. Typically measured per year, it involves all energy harnessed from every energy source applied towards humanity's endeavors across every single industrial and technological sector, across every country.

Domestic consumption of energy: Domestic consumption of energy is the amount of energy that is spent on the various appliances used within housing. The amount of energy used per household varies widely depending on the standard of living of the country, climate, and the age and type of residence.

Electric energy consumption: Electric is the form of energy consumption that uses electric energy. Electric energy consumption is the actual energy demand made on existing electricity supply. Consumption of electric energy is measured in watt-hours.

Need

- It reduces fossil fuels burning adverse impact on environment.
- It reduces requirement of fossil fuel consumption.
- The economic development of a country is often closely linked to its consumption of energy.

What is renewable energy?

- Renewable energy is classified as energy that comes from resources like sun light (known as solar), wind, and geothermal heat and rain that is constantly replenished.
- Renewable energy can serve as a replacement to electricity, motor fuels, rural energy and heating. Many people might discount renewable energy sources right off the bat just by looking at the definition. They wouldn't hesitate to question why it is necessary to switch to sources like sunlight, wind, or rain. The way they see it, these are not very reliable sources of energy.

Advantages renewable energy

- Renewable energy is, well, renewable.
- Environmental Benefits
- Reliable Energy Source
- Economic Benefits
- Stabilize Energy Prices

Disadvantages of renewable energy

- Reliability of Supply
- Difficult to Generate in Large Quantity
- Large Capital Cost
- Large Tracts of Land Required

II. CASE STUDY

To apply the concept of Solar Photovoltaic System to existing building, we have selected the campus of SHIVAJIRAO S. JONDHALE COLLEGE OF ENGINEERING AND TECHNOLOGY, Asangaon, Dist. Thane.

In this campus there are total 4 buildings, in which two buildings having two wings and rest of are single wings. For these buildings Energy Consumption is calculated by considering working days, holidays and According to that Solar photovoltaic System is designed.

As per the previous last three months' electricity bills of college campus, highest Electric bill of Month October, i.e. **TWO LAKH NINETY FIVE THOUSEND EIGHT HUNDRED ONLY.**

And consumed units of Electricity are 18264.00

So, we have to design Solar Photovoltaic System for highest consumption.

By considering Maximum units =18264.00 and approximate working days for college are 22 days.

So, 18264.00/22=830.1818 =831 units per day consumption for whole college campus.

Design of solar photovoltaic system for per day energy consumption of whole campus.

Total Energy Consumption per day= 831000Wh/day

Input Energy of the inverter = 831000/0.90= 923333.34Wh

Sizing the solar array:

Actual operating conditions of the solar panels are =35v, 8.57Amp

Battery efficiency = 0.85

Efficiency of the controller circuit (of the battery) =0.90

The solar array has to generate = 923333.34/(0.85×0.90) =1206971.6Wh/day

It needs to generated (array voltage is 35v) = 1206971.61Wh/35 =34484.90Ah

Assuming good sunshine of 6 hrs. Most of the days.

The solar array has to generated =344890/6 =5747.48 Amp

No. of panels required =5747.48/8.57 =670.65 = 671 panel.

Sizing the batteries:

Depth of Discharge = 0.70

Required charge capacity =923333.34/12 =76944.44 Ah

No. of batteries required =76944.44/ (150×0.7) =732.80 =733 batteries

For 3 days autonomy =38×3=114

Sizing of inverter:

Inverter Efficiency =0.90

Input energy of inverter =831000/0.90 =923333.34Wh

No. of inverter =923333.34 /8000 =115.4 = 115 inverter

For 3 days autonomy =6×34=18 inverter

III. Conclusion

We can use solar energy as renewable enegy by introducing solar system. And make building energy efficient.

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Examples follow:

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