

POWER PRODUCING IN PARKING LOT THROUGH SOLAR PANEL

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Abstract: Provision of parking lot in educational campus is very necessary as it improve the discipline and educational environment. With its provision, concept of adding solar panels to parking lots to produce electrical energy and shade the parking space at the same time we take a case study of vidhyabharti campus, umrakh. The need of electricity in vidhyabharti campus is 300 unit per day. Then we calculated the energy produced by solar panel by providing solar panel of 250 watt with 94kw plant on 671 m² area. We calculated total number of solar panel required and the total estimated cost of solar panel. Than we collected data about electricity bill paid by vidhyabharti campus. After all calculation, we found that total electricity bill of 25 year of vidhyabharti campus is much more than the estimated cost of the solar panel provision on parking lot.

Keyword: Economic, Environment friendly, Parking lot, Solar panel

I. INTRODUCTION

The purpose of the field study was to elaborate a cost benefit analysis of installing solar panel structures on the parking lot at the vidhyabharti campus. Solar photovoltaic is considered 'clean energy' because it harnesses energy from a renewable resource: the sun. Our planet is constantly receiving energy from the sun, so why not utilize it? Overall solar is very environmentally friendly solution in a society that uses huge amounts of energy. Solar panels offer both an environmental and economic benefit, especially at colleges where energy consumption is high. Solar PV will help reduce college's electricity bills, protect against energy rising energy costs, and increase sustainability initiatives. Our primary objective is to create a realistic plan for the first implementation of solar panels on campus with the hope that the vidhyabharti administration will accept the idea.

II. STUDY AREA

This selected study area is vidhyabharti campus, Umrakh, was established in 2008. This campus has like BBA,BCA,BE,B-PHARM,M-PHARM,DIPLoma ENGINEERING. The institute is recognized by AICTE, New Delhi and affiliated to Gujarat Technology University, Ahmedabad and higher secondary school also and research center and civil

material testing consultancy canteen, hostel stationary ,etc are also there. This campus is located in Umrakh village and it is 3km away from Bardoli town. Bus station and Railway station is 2 km away from campus. It is also nearby sugar factory and Avadh lake city. The campus is in rural area .The campus is approximately 62712 m² sq.meters and total built up area is 1995 sq.meters. The campus has seen great expansion over the past several years with the introduction of new facilities, an increase in students ,faculty and staff member and an increase in the number of people referred to the civil material testing and consultancy and research centre. Future development planned or committed for the campus includes new research facilities, new college building, sport complex, a new boy’s hostel,etc. The latitude longitude is (21.1461817,73.08959340000001). There is farm surrounding the campus and also Vasishtha School near the campus. The population of campus is more on Monday and less on Saturday. Monday and Wednesday are peak day. In which peak hours are 9:30 am to 5:10 pm , in which electricity use is more.

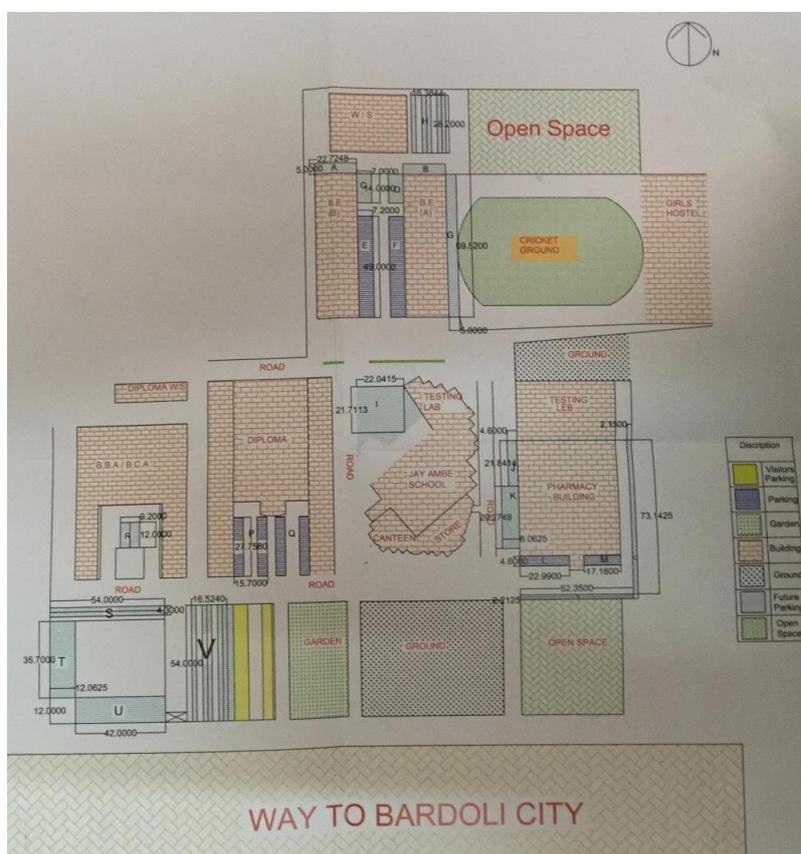


Fig 1.AutoCAD map of vidhyabharti campus

III. METHODOLOGY

1. Picking the location:

We pick the location for solar panel provision is parking lot, because solar panel is alternatively used as a roof on parking lot and it also eliminates the roof expenses on that particular parking lot on which we are going to provide solar panel.

2. Tilting angle of solar panel

In order to get the most from solar panels, we must point in the direction that captures more sunshine. In India, as anywhere in the northern hemisphere, solar panels should point towards

north. For fixed tilt angle throughout the year, the angle of latitude is generally preferred. This is one fixed orientation where the panel almost always intercepts the greatest amount of solar radiation during the year.

3. Collect data about electricity used

To analyse the total electricity bill of vidhyabharti campus in 1 month, we collect average number of kw electricity used in one day. We increase it by 25% as we are producing energy by solar panel and there is some loss in energy in DC to AC converter. From that , we estimate the total electricity bill will be paid by 25 year.

4. Estimated cost of solar panel.

As solar panel has more initial cost, we calculate the approximately cost of solar panel which are needed for energy production for vidhyabharti campus. As for production of 1 watt energy by solar panel, approximately cost of 1watt is Rs.60 including cost of panel, inverter, D/C and A/C Cabling and other accessories. By adopting this cost, we calculate overall cost of solar implementation in vidhyabharti campus to overcome need of electricity every day.

5. Number of solar panel

If we use 250watt solar Panel with size 1641mm * 991mm*42mm. So, total number of solar panel can be derived by dividing hourly needed energy by the solar panel’s wattage to calculate the total number of panel we need.



Fig 2. Size of Solar Panel

IV. RESULTS & ANALYSIS

1. Location

We take location of vidhyabharti campus where bus parking is placed. This area is large enough to provide all solar panel .It is shown in figure by T and U.

2. Tilting angle

As Vidhyabharti campus is north facing in northern hemisphere, its latitude is around 21°. We are going to provide fixed solar panel; its tilt angle should be same as latitude. Direction should be facing towards south, as our region is in northern hemisphere.

3. Electricity used everyday

In our campus, average 300 units electricity used per day between 9:30 am to 5:10 pm. Solar panel does not work 100% effectively. There are losses in converting the energy from the sun into DC power, and turning the DC power into AC power. So, 25% should be added to average units. This 25% of 300 units is 75 units. Total energy used is 375 units per day between 9:30 am to 5:10 pm. So, for 1 hour energy divide total energy by number of working hour. In summer , 1kw plant of solar panel produced 1 kw per hr and it called 1 unit. As in

summer, we get sun energy approximately 7 to 8 hr. We get energy of 7 to 8 units. In winter and monsoon season, we get sun energy for approximately for 4 hr. So, solar panel it will produce 4 units per day. We have to use solar energy effectively in winter also, take 4 hr for getting sun energy should be produced in 1 hr.

TABLE 1.

Total energy used in working hour 9:30 am to 5:10pm(8.66hr)	Add 25% ,as solar panel is not 100% effectively work	Energy should be produce for 1 hour
300 unit	$300+(300*0.25)=375\text{unit}$	$375/4=93.75=94\text{kwh}$

4. Number of solar panel needed.

If we are going to 250watt solar panel, we need following number of solar panel. We have energy used 44kwh, we have to place $(94000/250=376)$ panels).

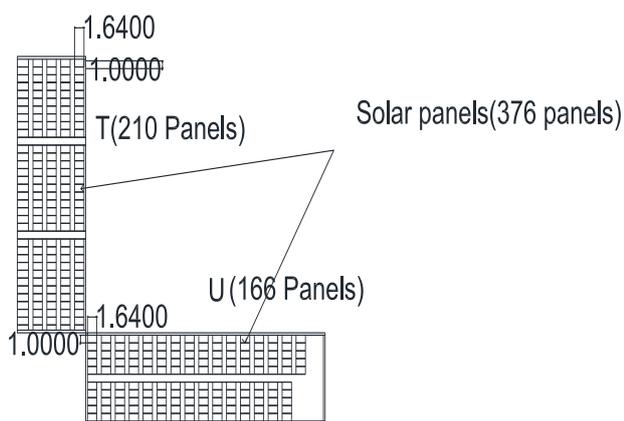


Fig.2.Solar panels arrangements

5. Total area needed

For placing 1 solar panel of size $1.64\text{m} * 0.991\text{m} * 0.044\text{m}$ and keeping space of 0.01m between two solar panel ,total area needed for 1 solar panel is 1.65 m^2 . So, Total area needed is as per following. $(1.64*376=617\text{m}^2)$

6. Total cost of solar panel plant.

If we assume Rs.60 per watt, than we have to expense for 94000watt is $(60*94000=5640000)$. As solar panel has generally 25 year life, we invested 56,40,000 for 25 years, not only for 1 year.

Total cost of whole plant(approximately)	56,40,000 Rs.
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7. Electricity bill will be paid by 25 years(approximately)

In Gujarat, cost of 1 unit energy is approximately is Rs.8. For 300 units, electricity charge as per follow:

TABLE 2.

Monthly charge	72000Rs.
Yearly charge	8,64,000Rs.
For 25 year	2,16,00,000 Rs.

V. CONCLUSION

From above result, we concluded that solar panel is ultimately cheaper than other source of power. It is look costlier at initial level, but it is more beneficial as solar panel's life is 25 year. It is Economic as well as environment friendly. It helps administration financially. Solar panel is the perfect way to improve sustainability while saving quite a bit of money. Solar panels are used as roof as well as energy producer and energy gain by it is from renewable source sun. It may call clean energy. So, power generation through solar panel is make parking lot sustainable.

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