



Techno-economic Analysis of Solar Photovoltaic Power Plant for Hotel in Maharashtra

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Abstract: In this paper, the potential and the cost-effectiveness of a solar photovoltaic power plant for meeting the energy demand of Hotel in Nashik (India) is analyzed. Also, the energy demand of Hotel for year 2016 was been estimated (68 KW) and the design of the solar PV power plant of 20 KW capacity was proposed and installed Simple payback period is 2.41 years which is quite attractive.

Keywords: Photovoltaic, Solar power plant, Techno-economic analysis, Payback period.

I. INTRODUCTION

Solar photovoltaic power system is the most promising non conventional energy technology. photovoltaic systems range from small, rooftop-mounted or building-integrated systems with capacities from a few to several tens of kilowatts, to large utility-scale power stations of hundreds of megawatts. Nowadays, most photovoltaic systems are grid-connected, while off-grid or stand-alone systems only account for a small portion of the market.

The diagram below shows the basic building blocks of a small stand-alone off-grid photovoltaic power generating system. A grid connected system would not need the battery. They do however need alternative capacity to come on stream to carry the load during the hours of darkness.

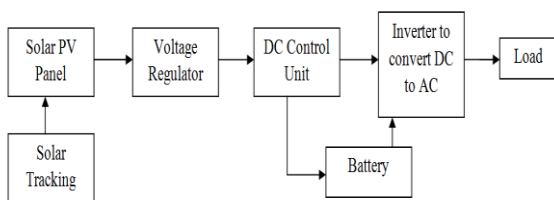


Fig. 1 Photovoltaic Electrical Power Generation

II. DESIGN OF SOLAR PV PLANT

A solar photovoltaic system was installed at Hotel Prestige Pride, Nashik in Maharashtra State. The load study conducted for Hotel is given in Table I. The consumer is a commercial consumer with an average monthly bill of Rs 68,000 per month. The higher tariff of Rs 12 per kWh was because of the differential tariff system levied by MSEDCL. This tariff system provides incentive to consumers to reduce higher energy consumption. To shave off the higher energy consumption the solar PV of 20 kW capacity was designed. The technical specifications of the photovoltaic system installed are included in Table II.

III. TECHNO-ECONOMICS

Component wise cost of PV system was considered for calculating the capital cost. This is included in Table III. The annual energy output after installation of PV system was monitored for four months and the energy bill for the period was noted. Table IV summarizes the average monthly savings.

TABLE I CONNECTED LOAD OF HOTEL

Sr. No.	Connected Load	Power Consumption (Kw)
1.	Lighting	18
2.	Lift	3.7
3.	Air Conditioning	33

TABLE II TECHNICAL SPECIFICATIONS

1.	Present Connected Load	55 Kw
2.	Installed PV System	20 Kw
3.	No. of Panels	64
4.	Peak Power Capacity per panel	315 Watt
5.	Total Capacity	64 * 315= 20160 W

TABLE III BREAK UP OF CAPITAL COST

Sr. No.	Component	Cost (Rs.)
1.	Solar PV Panel	740000
2.	Switch gear (4 pole)	18000
3.	Inverter	240000
4.	L & T Netmeter	22000
5.	Structure of GI	75 (per kg)
	Total Cost	1450000

$$\begin{aligned} \text{Cost/kW} &= 1450000/20 \\ &= 72500 \text{ Rs./kW} \end{aligned}$$



TABLE IV MONTHLY SAVINGS AFTER PV
INSTALLATION

Sr. No.	Parameter	Amount (Rs./ month)
1.	Electricity Bill before Pv	68000
2.	Electricity bill after PV	18000
	Net Savings	68000-18000= 50000

$$\text{Annual Savings} = 50000 \times 12 \\ = 600000 \text{ Rs.}$$

$$\text{Simple Payback Period} = \\ 1450000/600000 = 2.41 \text{ years}$$

IV. CONCLUSION

Study has been carried out to assess the technical feasibility and economic viability of Solar PV plant. The feasibility of solar PV system can be attributed to differential tariff and saving in battery cost with net metering. Installation of solar PV systems with net metering are therefore recommended.

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