



Assessment of Solar Rooftop Power Plant-a Case Study

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Assessment Of Solar Rooftop Power Plant- A Case Study

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Abstract:

In this project, We are doing the assessment of the rooftop solar power plant that is present in our college rooftop, that is KIET group of institutions has established 100 kWp capacity grid-connected solar photovoltaic power plant on the rooftop of the E-block, KIET Muradnagar campus, Ghaziabad . The plant was fully commissioned on 2 August 2016. With the motive of green campus, management of KIET group of institutions is looking forward for installation of Solar Power Plant with larger capacity to cater complete KIET campus. Hence, it is essential to document the performance of the first grid-connected solar power plant installed in KIET. In this report, the performance of the photovoltaic solar power plant in KIET during 1June 2017 to 16 June 2018 has been discussed.

Keywords: solar, rooftop, assessment, solar rooftop power plant

1.Introduction

The KIET 100kWp solar power plant is located at a latitude of 28.4507° and a longitude of 77.2953° . The overall area occupied by photovoltaic modules is 323 sq. meters. The plant has 2 inverters with a capacity of 30 kVA (35kVAp) and 50 kVA (55kVAp). There are 323 modules that contain poly-crystalline Silicon solar cells. The solar photovoltaic modules are connected such that a voltage of 415 volts is generated at the output of each inverter. This is connected to the existing 415V distribution box. The total electrical energy generated by the KIET 100kWp solar power plant during August 2016 till date (16 June 2018) is 204.07 MWh.

Although the performance of the photovoltaic modules was good, there were teething troubles associated with the inverters, which was the main reason for reduced energy generation. The impact of temperature variation of modules on their performance was studied. It is observed that the efficiency of the plant is sensitive to temperature

than the solar insolation. Daily datasets of five minute average data have been used for in-depth analysis. Since the regular cleaning mechanism has been established , there are negligible issues regarding the maintenance and technical problems faced by the plant operators have also been reduced

2. General Information of the plant

2.1 General Climatic conditions of the site

The weather and climatic conditions has great impact on the yield of Solar PV Power Plant.

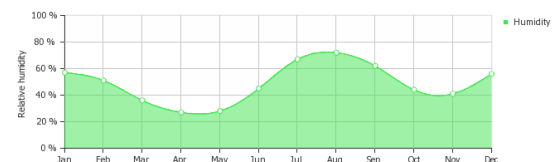


Figure 1: Average humidity of Ghaziabad over the year

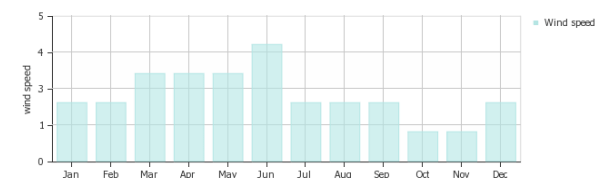


Figure 2: Average wind speed over the year (This is the mean monthly wind speed in meters per second)

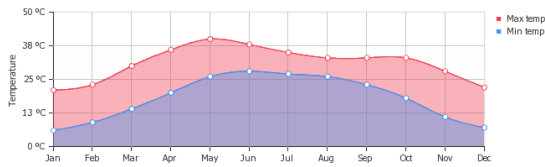


figure 3: Average minimum and maximum temperature over the year The monthly mean minimum and maximum daily temperature

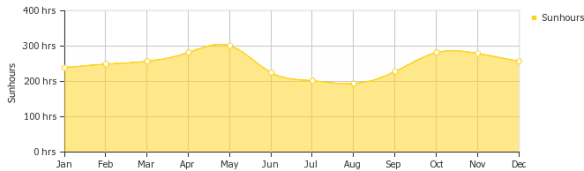
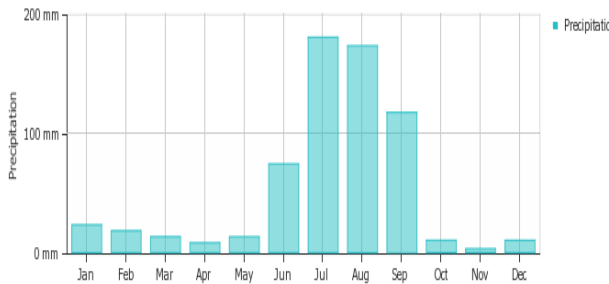


figure 4: Average monthly hours of sunshine over the year (This is the monthly tota



l of sun-hours)

figure 5: Average monthly precipitation over the year.(This is the mean monthly precipitation, including rain, snow, hail etc.)

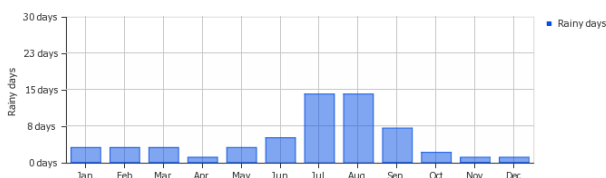


figure 6: Average monthly rainy days over the year.(This is the number of days each month with rain, snow, hail etc.)

Table 1: General Climatic conditions of the site

Height above sea level	215 metres (705 ft).
Ambient Air Temperature	At an average temperature of 34.1 °C, June is the hottest month of the year. January is the coldest month, with temperatures averaging 14.3 °C.
Relative Humidity	Average 49 % throughout the year
Rainfall	Precipitation is the lowest in April, with an average of 4 mm. Most of the precipitation here falls in August, averaging 268 mm.

2.2 Technical Details

Table 2 : General information of the plant

Place of Installation	13 KM Stone on Ghaziabad – Meerut Road. Murad nagar, Ghaziabad
Latitude & Longitude of the place	28.4507° and 77.2953° .
Allotted Land Area	323 sq. meter
Nominal Capacity of the PV Plant	100 kWp
Date of Commission	2 August 2016
Owner	KIET Group of Institutions
Installed by (Contractor)	Enertia Solar, Meerut
Modules	Wari make, 310 Wp

SCADA for diagnosing and monitoring	Yes
Grid Tie Inverters	2 No. Delta make

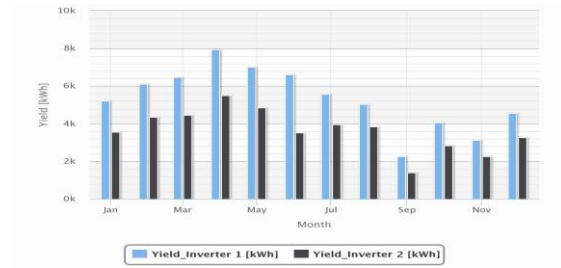


Table 3: Technical data of Solar PV

Panel Type	Multi-crystalline (Poly crystalline silicon)
Panel Wattage	310 W
No. of PV Panels	323
Panel Tilt	15

FIGURE 7: Yield of 100 kW SPV Power Plant for Year 2017



2.3 Plant Maintenance & Operation

Four cooler motors with extendible pipes are employed for pumping the water from 4 tanks for panel cleaning. 4 Maintenance staff members under the supervision of Chief Electrician are designated to work for this plant.

FIGURE 8: Yield of 100 kW SPV Power Plant for year 2018 Figure 8 shows the yield of 100 kW Solar photo voltaic (SPV) Power Plant for year 2018. Maximum yield has been achieved in the month of March 2018.

Cleaning of PV Modules:

Generally, the modules are cleaned twice in a week. Occasionally, wipers are used to remove the accumulated dirt and bird droppings, once in a month. On an average, each module is cleaned once in a week.

4. Conclusion

3. Performance analysis

Yield of 100 kW SPV Power Plant for Year 2017

Figure 6 shows effect of rainy season on the yield of 100 kW SPV Power Plant in the month of July, August and September 2017. In addition to this due to smog and fog October, November and December 2017 show less yield. In the month of September 2017 there was communication failure due to which the yield was not recorded by server but the plant was fully operational.

1. The total revenue generated from the plant/saved for the period 1 August 2016 to 16 June 2018 Rs.16,34,960 /-

2. The total CO₂ (carbon di-oxide) avoided due to the plant for the period 1 August 2016 to 16 June 2018 is 163.49 Ton.

5. References

1. <https://en.climate-data.org/location/967663/>