

## EFFICACY OF NET METER IN ACE SOLAR POWER PLANT

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**Abstract** - This paper confers efficacy of net meter in Ace solar power plant. Electrical meter is a device which measures the aggregated energy devoured by electric equipment's. Renewable energies are replenished by time, those are solar, wind, tidal energies etc., Ace college has solar power plant of 20kW. The energy meters utilized to measure the amount of energy consumed is Net Meter. This Net meter is a bi-directional meter. This meter monitors the flow of power exported from solar plant to power grid and solar power consumed by the building. For this power flow (i.e., exported, and consumed power) an average load curve for an annum has been implemented by using MATLAB software. MATLAB is a programming and arithmetic computing platform where we algorithms can be developed, and models can be created. From this load curve generated, the max power and number of units that are generated in that particular annum can be scrutinized and acknowledged by consumers. So that, utilization of power by electrical appliances in their household or commercial places.

**Key Words:** Load curve, types of load curves, Annual load curve, Net meters, advantages of net meter.

### 1. INTRODUCTION

In today's era, humans are contingent on renewable energy. The energy that has been generated by the natural sources like sun, water, tides etc., by which global warming can be alleviated. One of the renewable energies is solar energy. Net meter is an electronic meter which helps processor of this solar plant to keep an eye on the power devoured and exported to grid. From those net meter readings, annual loads factor has been appraised. From this annual load curve, number of units generated, and max power devoured and exported has been appraised. Annual load curve is engendered for ACE solar plant of 20Kw for year 2020 by MATLAB programming.

### 1.2 LOAD CURVE

Load curve is a graphical representation that shows diversity in demand for energy devoured from source of supply with respect to time. The load has been represented in terms of KW or MW. Power systems load curve is incongruous throughout the day and distinguishable from day to day and season to season.

### 1.3 TYPES OF LOAD CURVE

Load curves are classified into three types:

- Daily load curve
- Monthly load curve
- Annual /yearly load curve

#### a) Daily load curve

Daily load curve is defined as number of units generated in a day with respect to time (number of hours in a day).

**Daily load curve = no. of units generated in a day / 24 hrs**

#### b) Monthly load curve

Monthly load curve is defined as number of units generated in a month with respect to time (number of hours in a month).

**Monthly load curve = no. of units generated in a day / 720 hrs**

#### c) Annual load curve

Annual load curve is defined as number of units generated in a year with respect to time (number of hours in a year).

**Annual load curve = no. of units generated in a day / 8760 hrs**

### 1.3 SIGNIFICANCE OF LOAD CURVE

The area under the load curve gives the number of units generated. The highest point on that curve indicates the maximum demand on the power station. Assists in selecting the power rating and number of units generated required.

## 2. NET METER

Net metering is a device which allows domestic or commercial users who engender their own electricity using solar panels or photovoltaic systems to export their excess energy back to the grid as shown in fig 1 .Net meter has a billing mechanism that credits solar power plant

processors for the power that has been exported to the grid.

A residential customer has a solar power plant on their roof top, this solar plant may engender more electricity than household or commercial utility during daylight hours. Then net meter exports solar generated power to power grid for which credits are provided against the power that is devoured at night or other periods. When the energy exploited exceeds the solar plant output. Customers billed only for their net energy utilized. On an average, only 20-40% of a solar power energy output exported to grid. The connections of net meter connected to solar power plant is shown in Fig 2.



Fig-1 Net meter connection to a domestic use

Single Line Diagram of Rooftop Facility for Net Metering Interconnection

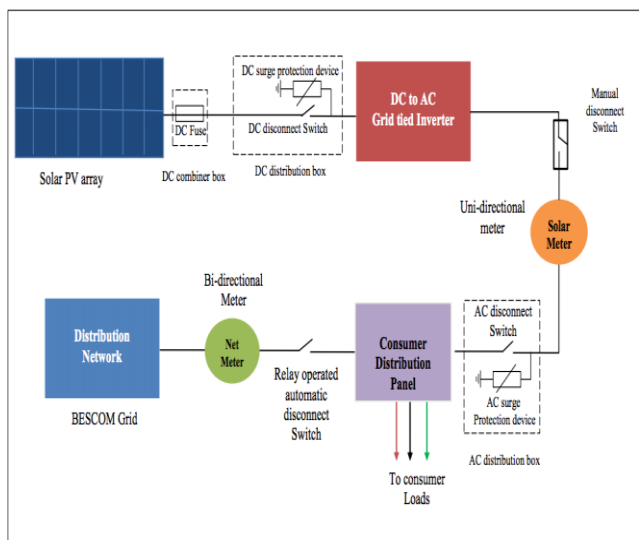


Fig-2 Connecting diagram of net meter

## 2.2 Advantages of net meter

The advantages of net metering are specified below

1. Electricity bill can be minimized.
2. Expensive battery storage system need not be installed.

3. Net meter abates pressure on electric grids.
4. Processor will be inspired to use renewable energy.
5. Conserves natural energy resources.
6. Mostly environment friendly.

## 3. CASE STUDY ON ANNUAL LOAD CURVES

Annual Data Considered of ACE Solar Plant of Capacity 20kW

Months	Solar Power Generated (Units)	Solar Power Exported (Units)	Power consumed by ACE college (Units)
Jan-20	12320	1860	10460
Feb-20	12,750	660	12090
Mar-20	14,100	666	13434
Apr-20	13,180	5573	7607
May-20	13,280	4508	8772
Jun-20	11,880	3748	8132
Jul-20	10,280	3560	6720
Aug-20	9,330	4432	4898
Sep-20	10,120	2930	7190
Oct-20	8,710	2747	5963
Nov-20	8,120	2388	5732
Dec-20	12,150	3518	8632
Total	136220	36590	99630

### 3.1 FLOWCHART

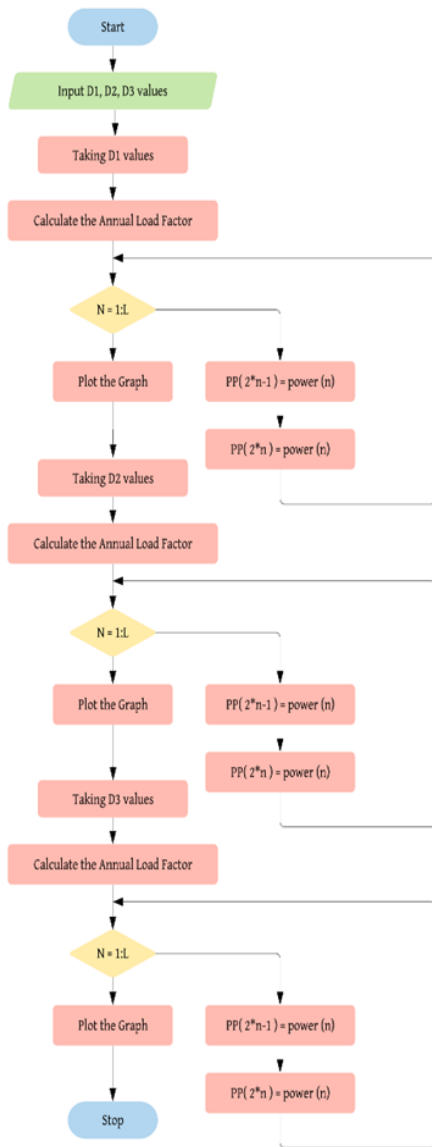


Fig - 3 Flowchart of annual load curve

This flowchart projects annual load curve of the net meter readings. Three matrices' readings (i.e., generation, consumed and exported power) are considered and three different graphs i.e., fig 4, fig 5, fig 6 for the respective readings are realized by calculating annual load factor.

### 3.2 RESULT

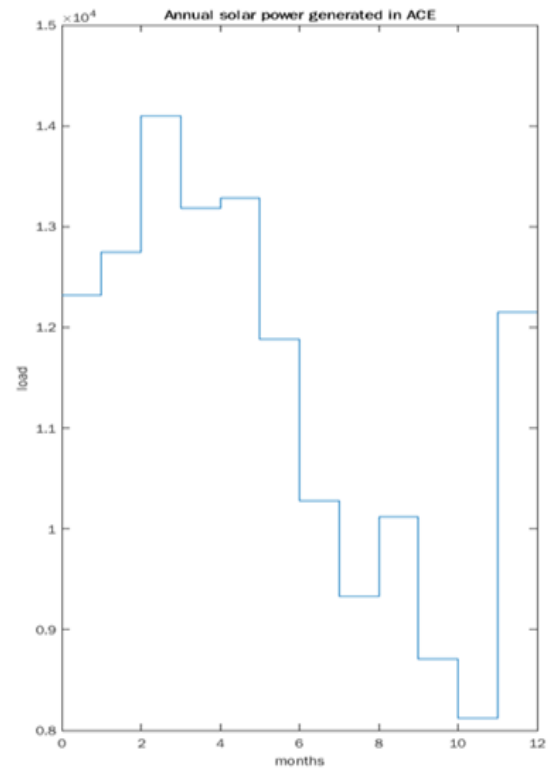
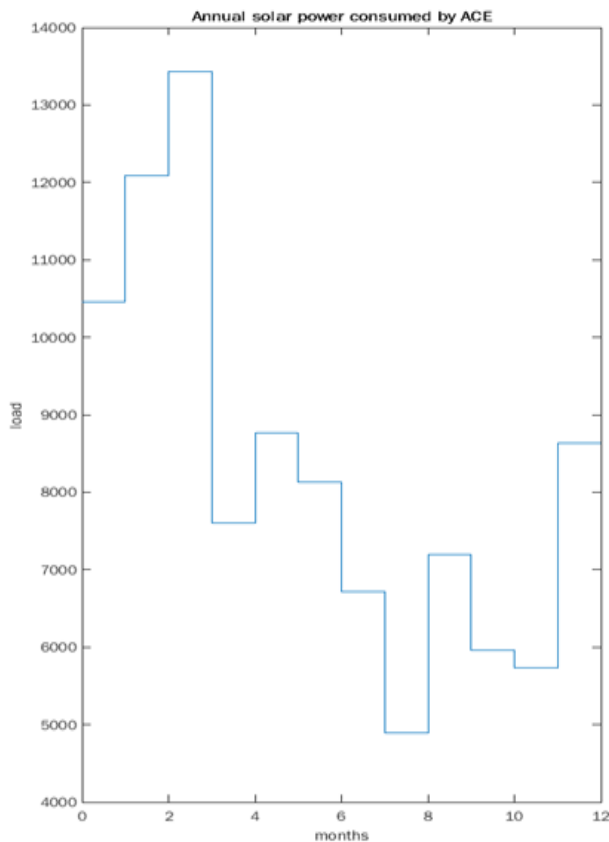


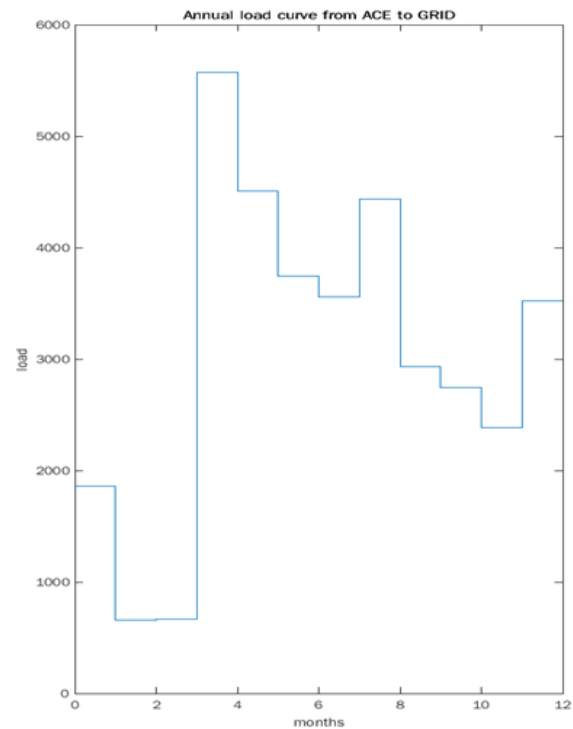
Fig-4 Annual solar power generated in ACE

The above graph it can be concluded as maximum power is generated in March month i.e., 14100 units and total number of units generated are 136220 units.



**Fig-5** Annual solar power consumed by ACE

The above graph concludes that maximum power that has been consumed in month of March i.e., 13434 units and total number of units generated are 90630 units.



**Fig-6** Annual load curve from ACE to GRID

The above graph concludes that maximum power exported to grid from ace is in month of April i.e., 5573 units and total number of units generated are 36590 units.

#### 4. CONCLUSION

This work projects the advantages of using a net meter. By using the data availed for our college (ACE college) solar power plant of 20kW rating for an annual net meter reading has been considered as case study. An annual load curve for an annum for net meter reading has been scrutinized using MATLAB. Three graphs have been plotted for solar power by ACE Engineering college those are power engendered by the solar plant, devoured by the building, power exported to the power grid.

#### REFERENCES

- [1] <https://us.sunpower.com/what-solar-net-metering-and-how-does-it-work>
- [2] <https://circuitglobe.com/load-curve.html>
- [3] <https://www.electrical4u.com/load-curve-load-duration-curve-daily-load-curve/>
- [4] <https://www.hindawi.com/journals/ijp/2020/4135860/>

- [5] <https://www.conserve-energy-future.com/what-is-net-metering-and-how-net-metering-works.php>.

## BIOGRAPHIES



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