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DESIGN OF GRID INTERACTIVE SOLAR SYSTEM FOR COMMERCIAL BUILDING USING SOLAR PRO

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ABSTRACT

Energy productions from photovoltaic system can be generated in simple manner when compared to other sources. The number individual components used in solar PV system are quite low when compared to other system. It does not involve any large size components also. Solar PV systems are classified into two: standalone or off-grid photovoltaic system, and grid connected or on-grid photovoltaic system. In earlier days photovoltaic installations are mostly based on off grid type and works on isolated conditions. But due to advancements in PV technology, and power electronics these systems were started booming as on-grid PV system . At present in most of the nations, the PV installations are working on grid connected mode and still contribute to electricity mix.

An on-grid or grid-tied solar system is a system that works along with the grid. This means that any excess or deficiency of power can be fed to the grid through net metering. Many residential users are opting for an On-grid solar system as they get a chance to enjoy credit for the excess power their system produces and save on their electricity bills. You will always have power either from the solar system or from the grid.

Keywords: Solar panels, Inverters, photovoltaic ,solar energy.

I. INTRODUCTION

On-grid solar photovoltaic system is the one that generates electrical power with the help of solar photovoltaic harvesters and delivers the power to electric utility. Unlike off-grid systems they are not designed to be a substitute for grid power. Grid-connected systems are normally found in urban areas that have readily available mains supply and instead of storing the electricity generated by the PV system in batteries, the power is fed back into the grid. In this way the grid acts as a kind of storage medium and when power is needed in the building it can be imported from the grid. One of the key benefits of this is that the system does not have to supply enough electricity to cover the property's power demand as in an off-grid system. The property can be powered by the PV system, the electricity grid or a combination of the two. meaning that the system can be as small or large as the owner desires. Excess power generated by the PV system will be exported to the power grid and in many areas the system owner is paid for the exported power. The major components of a grid-connected PV system include the PV array, inverter and the metering system. In addition to these major components are the necessary cables, combiner boxes, protection devices, switches, lightning protection and signage.

II. METHODOLOGY

Collecting the required data for entering into the solar pro software is the first important step.And which location you select how much plant capacity calculate ,which type of roof you select ,and how many inverters are used,how much power is generated in 1 month or annually .

The following steps taken to done the project

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- Open the solar pro software 3.2 version
- Select the country and area
- Select the modules (manufacture & model)
- Calculate the plant capacity 100kw
- Find number of arrays (horizontal & vertical)
- Select the shape of the roof
- Select the number of inverters(parallel &series)
- Load setting(monthly)
- Cost setting (constructional & running cost)
- Calculate power (per month & per day)

III. MODELING AND ANALYSIS

Block diagram

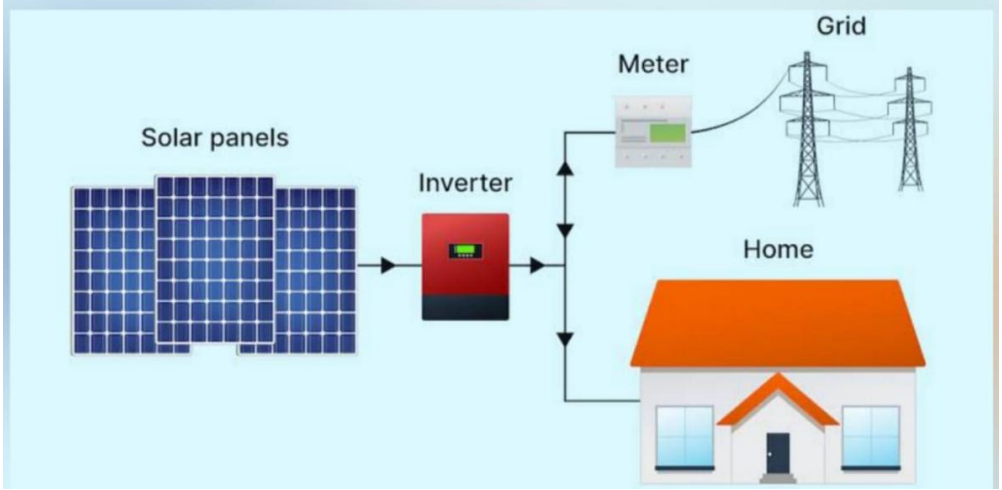

Figure1:Block diagram of ON-GRID solar system

Flow chart for load calculations for ON-GRID solar system

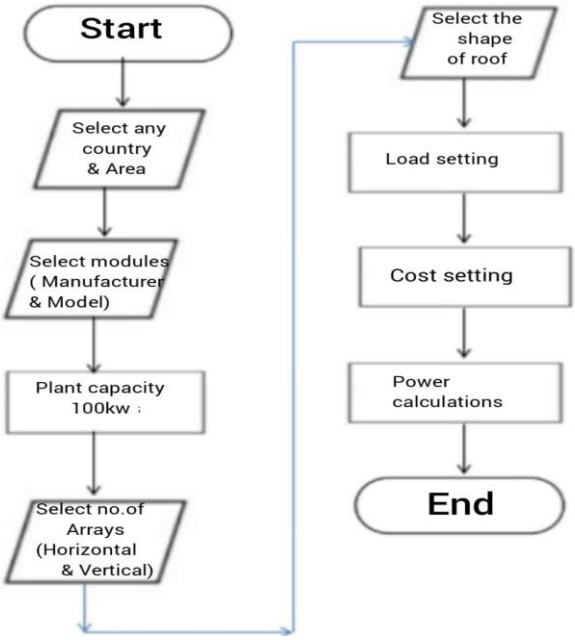

Figure 2:Flow Diagram

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LOAD CALCULATIONS:

Table 1:Load Calculations

Months	Day time (12hrs)	Night time (12hrs)	Total Per day	Per month
Jan(31)	60kw*12hrs=720kwh	40kw*12hrs=480kwh	720+480=1200kwh	1200*31=37,200kwh
Feb(28)	70kw*12hrs=840kwh	50kw*12hrs=600kwh	840+600=1440kwh	1440*28=40,320kwh
Mar(31)	80kw*12hrs=960kwh	60kw*12hrs=720kwh	960+720=1680kwh	1680*31=52,080kwh
Apr(30)	90kw*12hrs=1080kwh	70kw*12hrs=840kwh	1080+840=1920kwh	1920*30=57,600kwh
May(31)	110kw*12hrs=1320kwh	80kw*12hrs=960kwh	1320+960=2280kwh	2280*31=70680kwh
Jun(30)	100kw*12hrs=1200kwh	70kw*12hrs=840kwh	1200+840=2040kwh	2040*30=61,200kwh
Jul(31)	90kw*12hrs=1080kwh	50kw*12hrs=600kwh	1080+720=1800kwh	1800*31=55,800kwh
Aug(31)	80kw*12hrs=960kwh	60kw*12hrs=720kwh	960+600=1560kwh	1560*31=48,360kwh
Sep(30)	60kw*12hrs=720kwh	40kw*12hrs=480kwh	840+480=1320kwh	1320*30=39,600kwh
Oct(31)	70kw*12hrs=840kwh	40kw*12hrs=480kwh	720+480=1200kwh	1200*31=37,200kwh
Nov(30)	60kw*12hrs=720kwh	35kw*12hrs=420kwh	720+420=1140kwh	1140*30=34200kwh
Dec(31)	50kw*12hrs=600kwh	30kw*12hrs=360kwh	600+360=960kwh	960*31=29,760kwh
			18540kwh	2,64000kwh

Load calculations:

Jan(31)=here calculate the day time(12hrs) and night time(12hrs).

And also calculate total per day and per month.

Assume 60kw day time(12hrs)

Assume 40kw night time(12hrs)

Day time(12hrs)=60kw*12hrs=**720kwh**

Night time(12hrs)=40kw*12hrs=**480kwh**

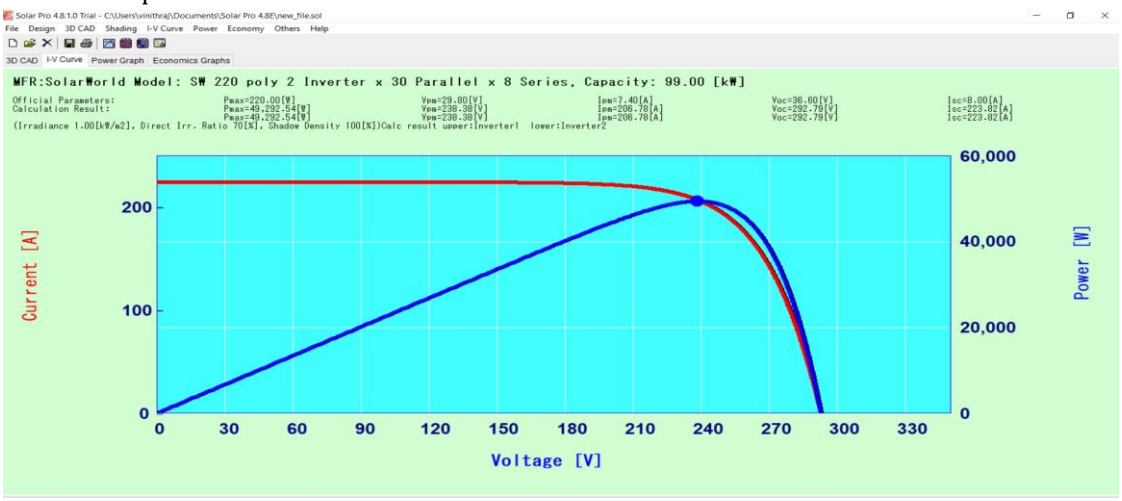
Total per day=720+480=**1200kw**

Per month=1200*31=**37,200kwh**

IV. RESULTS AND DISCUSSION

V-I CURVE

Solar module I-V Characteristics Curves are basically a graphical representation of the operation of a solar cell or module summarizing the relationship between the current and voltage at the existing conditions of irradiance and temperature.



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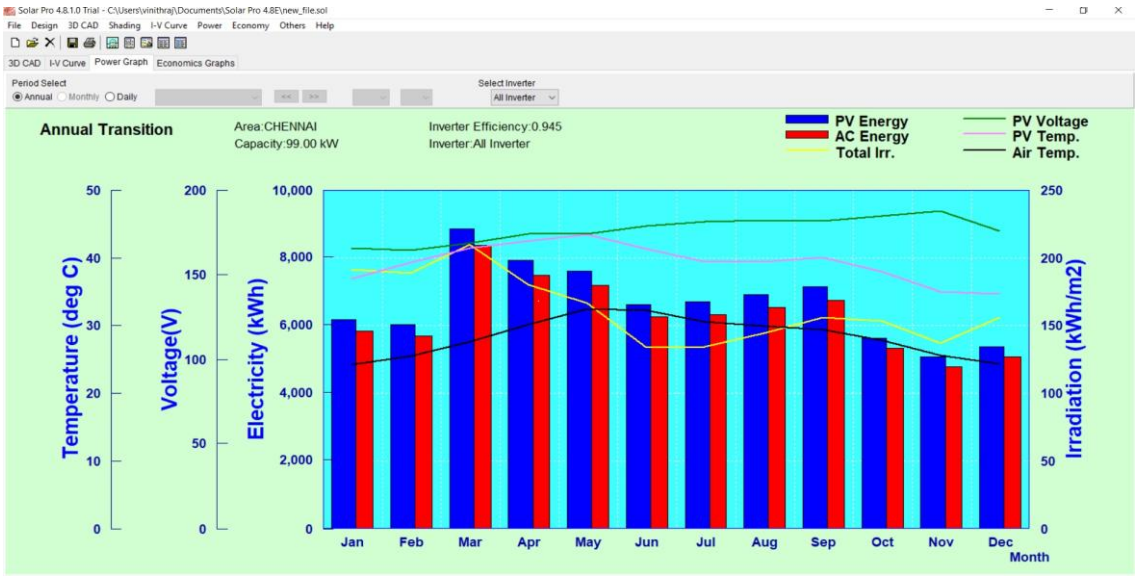
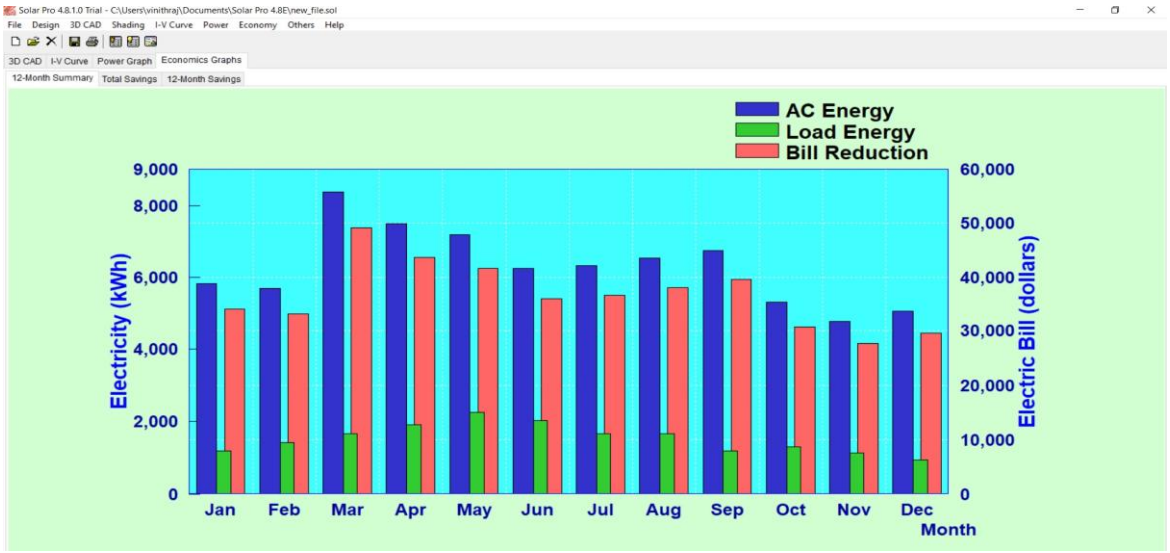
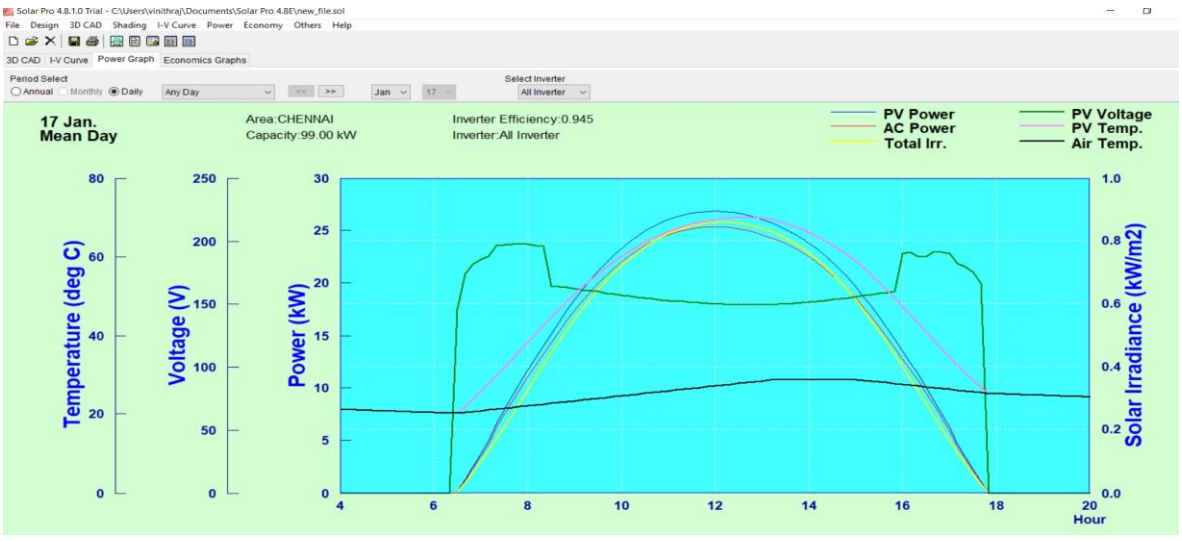
POWER GRAPH



ECONOMICS GRAPH



ONE DAY TRANSACTION GRAPH



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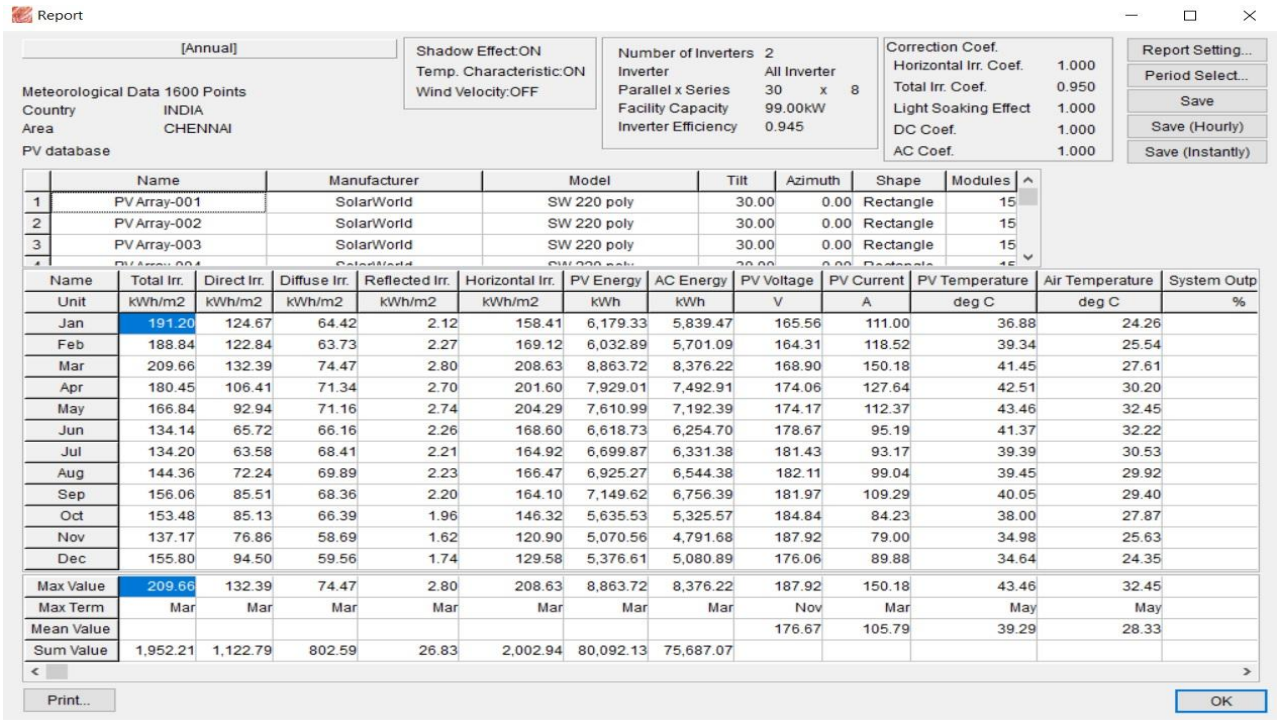
OUTPUT:

The diffused current is always less than the direct current . Both direct and diffused current is known as Total current.As well as PV current is always less than the PV voltage . And also same as PV temperature is always greater than the air temperature .The total irradiance maximum value is high in **MARCH.**

Table 2:Annual Report (power)



Report

[Annual]

Meteorological Data 1600 Points
Country INDIA
Area CHENNAI
PV database

Shadow Effect:ON
Temp. Characteristic:ON
Wind Velocity:OFF

Number of Inverters 2
Inverter All Inverter
Parallel x Series 30 x 8
Facility Capacity 99.00kW
Inverter Efficiency 0.945

Correction Coef.
Horizontal Irr. Coef. 1.000
Total Irr. Coef. 0.950
Light Soaking Effect 1.000
DC Coef. 1.000
AC Coef. 1.000

Report Setting...
Period Select...
Save
Save (Hourly)
Save (Instantly)

	Name	Manufacturer	Model	Tilt	Azimuth	Shape	Modules
1	PV Array-001	SolarWorld	SW 220 poly	30.00	0.00	Rectangle	15
2	PV Array-002	SolarWorld	SW 220 poly	30.00	0.00	Rectangle	15
3	PV Array-003	SolarWorld	SW 220 poly	30.00	0.00	Rectangle	15

Name	Total Irr.	Direct Irr.	Diffuse Irr.	Reflected Irr.	Horizontal Irr.	PV Energy	AC Energy	PV Voltage	PV Current	PV Temperature	Air Temperature	System Outp
Unit	kWh/m2	kWh/m2	kWh/m2	kWh/m2	kWh/m2	kWh	kWh	V	A	deg C	deg C	%
Jan	191.20	124.67	64.42	2.12	158.41	6,179.33	5,839.47	165.56	111.00	36.88	24.26	
Feb	188.84	122.84	63.73	2.27	169.12	6,032.89	5,701.09	164.31	118.52	39.34	25.54	
Mar	209.66	132.39	74.47	2.80	208.63	8,863.72	8,376.22	168.90	150.18	41.45	27.61	
Apr	180.45	106.41	71.34	2.70	201.60	7,929.01	7,492.91	174.06	127.64	42.51	30.20	
May	166.84	92.94	71.16	2.74	204.29	7,610.99	7,192.39	174.17	112.37	43.46	32.45	
Jun	134.14	65.72	66.16	2.26	168.60	6,618.73	6,254.70	178.67	95.19	41.37	32.22	
Jul	134.20	63.58	68.41	2.21	164.92	6,699.87	6,331.38	181.43	93.17	39.39	30.53	
Aug	144.36	72.24	69.89	2.23	166.47	6,925.27	6,544.38	182.11	99.04	39.45	29.92	
Sep	156.06	85.51	68.36	2.20	164.10	7,149.62	6,756.39	181.97	109.29	40.05	29.40	
Oct	153.48	85.13	66.39	1.96	146.32	5,635.53	5,325.57	184.84	84.23	38.00	27.87	
Nov	137.17	76.86	58.69	1.62	120.90	5,070.56	4,791.68	187.92	79.00	34.98	25.63	
Dec	155.80	94.50	59.56	1.74	129.58	5,376.61	5,080.89	176.06	89.88	34.64	24.35	
Max Value	209.66	132.39	74.47	2.80	208.63	8,863.72	8,376.22	187.92	150.18	43.46	32.45	
Max Term	Mar	Mar	Mar	Mar	Mar	Mar	Mar	Nov	Mar	May	May	
Mean Value								176.67	105.79	39.29	28.33	
Sum Value	1,952.21	1,122.79	802.59	26.83	2,002.94	80,092.13	75,687.07					

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V. CONCLUSION

Although solar energy is very useful in many applications, scientists conclude that the sun will be extinct after billions of years.

Humans should appreciate this free source of energy.

The output values of maximum power, maximum peak voltage, maximum peak current, open circuit voltage and short circuit current varies at different weather conditions of different locations.

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