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Analysis of Operational Performance in Solar Power Plants Vs Rooftop Systems in Different Locations India

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Analysis of operational performance in solar power plants Vs Rooftop systems in different locations india

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ABSTRACT

Study and review with performance of solar photovoltaic power plants and Rooftop system in variable locations in India. Our analysis of power plant performances consideration in regional wise (south India & north India) in India. Our main aim of this paper his Renewable energy plants of solar photovoltaic performance of in variable locations in India. In this way our work done by the review and analysis & performance of Photovoltaic power plants in variable locations in north India 1. 10MW Solar Photovoltaic power plant at Rajkot, Gujarat 2.100kw solar rooftop at American School Gurgaon and South India 1.5MW Solar power plant Mahabubnagar, Telanagana 2.100KW Solar Rooftop solar power plants in Mount Carmel college Bangalore consideration of complete system review and analysis and generation performance with consideration of system design, plant system performance and operation & maintenance of plant data with performance of plant

As per plant Consideration of solar radiation, temperature, wind data and design of solar system to performance of module output and difficulties of module performance and stringing of module by connect to combiner box with cabling, to connect the inverter by consideration of grid synchrization and output collecting of grid with availability it's all consider to develop the new plant . Also O&M of plant maintenance with operational difficult by different modules performances.

For MW Power plant consider in the Gujarat location and Telangana location and for the rooftop plants Haryana and Karnataka locations are studying the performance of plant output and operational maintenance. In this paper study of 4 projects of 4different locations, different type of operational & performance and weather conditional vary output data performances.

KEYWORDS *:* Generation of solar power1, solar design2, Technical specifications of equipments3, Plant orientation4, power plant operation & maintenance, analysis of generation data5, rooftop power plant design6, energy data, analysis of site7, ,Nasa data8.

I. INTRODUCTION

Photovoltaic energy is a green energy with carbon less output energy development system its very useful source of world. It's also called zero emission energy and present
Still has much to develop, and renewable energies. In front of conventional sources, the renewable energies are clean and inexhaustible resources provided by the nature with practically no impact on the Environment.

the sun sheds on the surface of the Earth, four thousand times the energy we use and will continue for several billion of years, India [9] electricity demand is about 1205 Billion Wh. The daily average solar-power-plant generation capacity in India is 0.25 kWh per m^2 of used land area, equivalent to 1500–1800 peak capacity operating hours in a year it is clear that the sun gives us more energy than we can consume, due to the efficiency used to exploit it. Electricity installation capacity in India 356.817GW in this 79.8% share of fossil energy & remaining share of renewable energy 17.3% and its demand power 1205 BWh its 2.5% to 4.5% of oral power .it's should be going to renewable power developments its very useful for green power with environmental benefits still now 2,1974.MtCo2 GHG emission from electricity and other point of way transmission & distribution losses 21.2% to 24.2% so solar photovoltaic power park plant projects development very good solution for covering the transmission & distribution losses .

Indian states are widely exposed to natural sunshine, especially Andhra Pradesh, Telanagana, Rajasthan, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Tamil Nadu, Orissa and Uttar Pradesh, Punjab, Haryana, Maya Pradesh, Tamilnadu, during almost the entire year. Precisely, Indian regions harvest 5–6.5 kWh/m2/day as energy yield which leads to the Capacity Factor (CF) of 16–24%. For various parts of India, the GHI (Global Horizontal Irradiance) resource map published by National Renewable Energy Laboratory (NREL) and Ministry of New and Renewable Energy (MNRE) is used. The total installed solar power capacity in India as of 31 May 2019 is 28.38GW

Based on feasibility conditions for renewable energy in India, the social and cultural benefits that suppose to humanity and the good business opportunity so on this paper expose the review and analysis & performance of photovoltaic power plants in variable locations in north India 1. 10mw solar photovoltaic power plant at Gujarat 2.100kw solar rooftop at gorgon and south India 1.5mw solar power plant telangana 2.100kw solar rooftop solar power plants in Bangalore consideration of complete system review and analysis and generation performance with consideration of system design, plant system performance and operation & maintenance of plant data with performance of plant. The aim of this paper is review of study the project, with consideration of Design of plant, solar module performance, string monitoring system and heart of solar project as a solar inverter performance also consider to collect the data to check the performance of plant or project. Also performance of monitoring system of SCADA with substation also consider the grid synchronization process of maintaining the balance of grid and pumping of power to check looses of after submit the energy meter of billing energy meter so that plant performance calculated the performance of plants Anyway, further evaluation of the current energetic, environmental and economic situation in a real photovoltaic plant ought to Be conducted and compared. With all radiation and billing data collected from the real plant, there will be developed energetic, environmental and economic balances of the situation. By this analysis, it will be possible to visualize how the equipment works and the contribution exercised by each one of the elements within the plant. Aside of the technical and economical aspects of the proposed solution, the environmental problems are also taken into consideration according to the IEC & BIS with ISO standard and needs.

Analysis of Design, Techno- stands material, Skelton of project, O&M, performance of plant.

Fig1: Location maps of solar projects

II. DESIGN OF SOLAR POWER PLANT-ORIENTATION

Solar Photovoltaic power plants are design mainly consideration of solar PV module, inverter, transformers, grid connection, and monitoring of substation with SCADA system. power project mainly part of solar[1] Photovoltaic panels (PV) are arranged in series and parallel connecting of Sting Combiner Box its controlling of string of panel in voltages control with connecting of parallel to grid tie inverter its converter to DC/AC energy conversion. Its main heart of project. After output of inverter AC power connect to LT Panel to control the flow of energy to connect the setup Transformer input and Setup Transformer are increase the voltage range to HT Panel its control the energy power constant maintain the looses of energy to connect the switch yard main board to monitoring the energy performance to connect the Grid line with in between energy meter also connect to billing of project output performance are recording. It's also connecting to the control system of SCADA full of control of power plant by performance of project output. And operation & maintenance are main role of solar power project its control of design with output performance of project.

Earthing System

Earthing system shall be provided for complete PV power plant, Neutral earthing at various voltage levels to establish the ground reference of the electrical system. • Safety ground connections for protecting personnel from injury and property from damage • Equipment earthing to ensure a low impedance return path for ground current should an electrical fault occur between the live conductors and the equipment enclosure, The earth mat of the station shall be designed such that the total ground resistance does not exceed 1 ohm

In photovoltaic power plant mainly earthing and lighting arrestor s system very important for system protection system to get the clean energy of output.

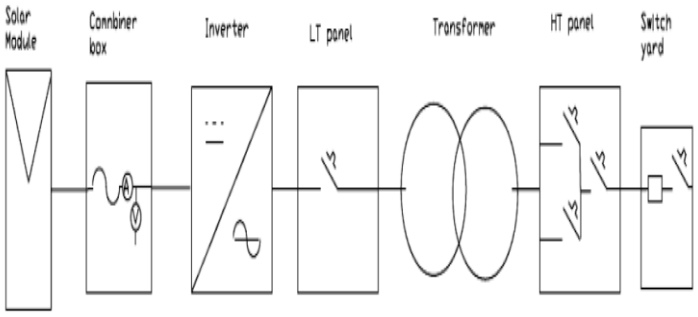

Fig2: Layout of Solar power plant and orientation

Solar Power Plant SLD for main operational system on the MW solar power projects.

III. STUDY AND ANAYSIS OF GRID POWER PLANTS:

Our Study and Analysis in 10MW SOLAR POWER PLANT at Meravadar, Rajkot, Gujarat

I. 10mw Solar Power Project Rajkot, Gujarat.

As per Monitoring of plant good operational maintenance and construction of power plant, and it's very clean and green production with high performance production delivered plant and plant saving the carbon energy credits are annual average GHG emission reductions are 16,497 tCO2e

Power plant constructed as a [4] Photovoltaic Cd Thin film module technology its very suitability of location base on Temperature and light emission availability in daily hours are very high so that output of plant performance are very high compare to as per standard data. Solar irradiation

Daily availability 6- 8 hrs /day and high temperature it's very suitable of thin film modules of output performance.

Design of plant: A solar photovoltaic (SPV) system converts solar irradiation in to DC (direct current) electricity and then inverts in to AC (alternating current) power and steps up the voltage levels in transformer such that the energy generated shall be exported to grid with synchronization or to meet the load.

The plant has been divided into 8 modular plots, with each plot comprising of 1.25 MWp of solar PV and two 630 kW inverters. The inverters convert the DC electrical output from the PV modules into AC. The PV modules face southwards and are titled at an angle of 15 ° from the ground to maximize solar irradiation on the panels. A summary of the technical details is given below

Model representation of 15 panels in each array and the output voltage of each array will be 36.3V of 80W. An average solar radiation 1000 W/m^2 with 25^{o}C temperature are used as inputs to PV panel to observe optimum voltage

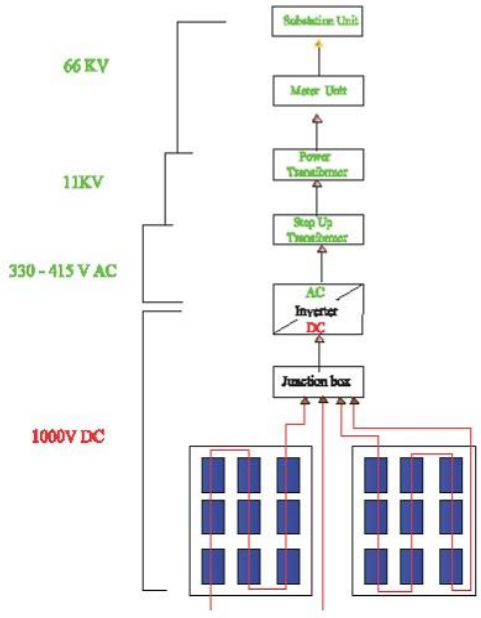

Fig: 3 solar power project SLD of Module to Substation 1000V DC to 66 KV AC grids

A. Structural Design:

Structure design considers the wind speed and ground bearing capacity with strength soil and sustainability of structural steel with weight consideration of dead load, live load and wind load to calculate to design the structure of module mounting. It's once installed its 25years of life with stand the structure using the galvanized MS material using the structure design .for the of Voltage regulators are designed as per the standards

Each structure consider of 24modules and 15modules using in the string connecting of plant and angle of structure 15° And fixed system maintenance with less cost of system. With construction of nearly 15years very less maintenance of structure its construction very ease for O&M

Table .1 10MW Solar power plant monthly generation data.

10MW solar power plant generation data showing on Table.1 for the performance of monthly generation data with MW solar Power plant generation data of as per performance of the plant its generation data.

Total energy generated during various months- Rajkot, Gujarat 10MW				
Month	**kW h/kWp)**	**(kWh/M2)**	**(GWh)**	Eshare **(%)**
Jan	153.45	4.95	1.14	7.28
Feb	164.08	5.86	1.22	7.79
Mar	208.94	6.74	1.56	9.92
April	220.8	7.36	1.64	10.48
May	230.95	7.45	1.72	10.96
June	189.3	6.31	1.41	8.98
July	144.9	4.83	1.08	6.88
Aug	142.91	4.61	1.06	6.78
Sep	170.1	5.67	1.27	8.07
Oct	181.35	5.85	1.35	8.61
Nov	156.55	5.05	1.17	7.43
Dec	143.53	4.63	1.07	6.81
Year	**175.57**	**5.78**	**15.70**	**100.00**

B. *Operation and Maintenance*

Mode of Operation

The PV system basically consists of the following components:

1 PV arrays convert Sun light into DC Power.

2 This generated DC power is passed through the Inverter to convert DC power into AC power.

3 This converter AC power at 415V is stepped up to 11 kV using a step-up transformer.

4 11KV Power output connected to Main power transformer of 66KV and its 66 kV is connected to the Grid at the same voltage.

5 Both on DC side of generation as well as AC side of conversion, protection and safety devices are provided to ensure safe and reliable operation of the complete Solar Power Generating system.

6 Monitoring and Analysis system provided with the power plant will record, store and transfer data that are essential for the same purpose

Maintenance requirements

The following measures will help in reducing the break down maintenance and also help in planning for preventive intendances.

1 Careful logging of operation data and periodically processing it to determine abnormal or slowly deteriorating conditions.

2 Careful control and supervision of operating conditions. Wide and rapid variations in voltage and frequency conditions do contribute to increased maintenance.

3 Regulate routine maintenance work such as keeping equipment clean, cleaning of module, proper maintenance of inverters etc.

4 Correct operating procedures.

5 Frequent testing of plant equipment by 'Walk Down' checks to internal condition of equipments such as module performance, inverter efficiency test, monitoring system testing etc.

6 Close co-ordination with the manufacture to effect improvements in plant layouts and design, use of better material, introduction of such facilities as lightning protection, etc.

7. Cleaning of module on every 15days its performance of module output more.

8. Removing on unnecessary trees on shadow effect on module its cut and maintaining of shadow effect on module area.

2. *5MW Solar Power Project Mahabubnagar, Telangana.*

5MW Photovoltaic power plant at mahabubnagar, Telangana Temperatures maintaining remaining good level so output of plant higher values. [3] Annual average value of PR ratio is nearly 85.18%. Sun availability daily nearly 330 – 360 days/ year and day availability 6.3hrs so higher output of plant performance.

Power plant constructed as a Photovoltaic Crystalline module of multi crystalline technology using its very suitability of location base on Temperature and light emission availability in daily hours are very high so that output of plant performance are very high compare to as per standard data. Solar irradiation daily availability 6- 8 hrs /day and high temperature it's very suitable of SPV Crystalline modules of output performance.

Design of plant: Solar Modules are made in maximum possible voltage or optimal voltage from a solar PV cell is limited to its design, irradiance, and temperature. Hence, it is required to connect the required number of cells in series framing an array.

Model 250Wp string in 24 panels each array its connected to 630kw inverter its connected to 33kv substation of 5mw the output voltage of each array will be 36.3V of 250W 1000 W/m^2 with 25ºC temperature are used as inputs to PV panel to observe optimum voltage

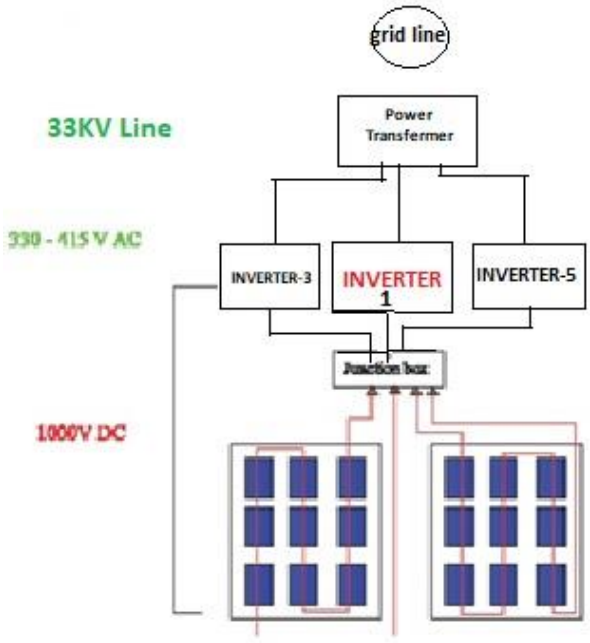

Fig: 4 solar power project SLD of Module to Substation 1000V DC to 33 KV grids

A. Structural design:

Structure using this plant fixed angle of 15° used with consider the input of site wind speed and ground bearing capacity with strength soil and sustainability of structural steel with weight consideration of dead load ,live load and wind load to calculate to design the structure of module mounting . It's once installed its 25 years of life with stand the structure using the galvanized MS material using the structure design .for the of Voltage regulators are designed as per the standards

Each structure considers of 24modules using in the plant and fixed system maintenance with less cost of system. With construction of nearly 15 years very less maintenance of structure its construction very ease for O&M

B. *Operation and Maintenance*

Mode of Operation [8]

The PV system basically consists of the following components:

1 PV arrays convert Sun light into DC Power.

2 This generated DC power is passed through the Inverter to convert DC power into AC power.

3 This converter AC power at 415V is stepped up to 33 kV using a step-up transformer.

4 AC power at 33 kV is connected to the Grid at the same voltage.

5 Both on DC side of generation as well as AC side of conversion, protection and safety devices are provided to ensure safe and reliable operation of the complete Solar Power Generating system.

6 Monitoring and Analysis system provided with the power plant will record, store and transfer data that are essential for the same purpose

Maintenance requirements

The following measures will help in reducing the break down maintenance and also help in planning for preventive intendances.

1 Careful logging of operation data and periodically processing it to determine abnormal or slowly deteriorating conditions.

2 Careful control and supervision of operating conditions. Wide and rapid variations in voltage and frequency conditions do contribute to increased maintenance.

3 Regulate routine maintenance work such as keeping equipment clean, cleaning of module, proper maintenance of inverters etc.

4 Correct operating procedures.

5 Frequent testing of plant equipment by 'Walk Down' checks to internal condition of equipments such as module performance, inverter efficiency test, monitoring system testing etc.

6 Close co-ordination with the manufacture to effect improvements in plant layouts and design, use of better material, introduction of such facilities as lightning protection, etc.

7. Cleaning of module on every 30 days its performance of module output more.

8. Removing on unnecessary trees on shadow effect on module its cut and maintaining of shadow effect on module area.

Table .2 5MW Solar power plant monthly generation data.

5MW solar power plant generation data showing on Table.2 for the performance of monthly generation data with MW solar Power plant generation data of as per performance of the plant its generation data.

Total energy generated during various months-Mahabubnagar,Telangana 5MW				
Month	**kW h/kWp)**	**(kWh/M2)**	**(GWh)**	Eshare **(%)**
Jan	170.19	5.49	0.65	7.91
Feb	175	6.25	0.67	8.13
Mar	210.49	6.79	0.80	9.78
April	211.8	7.06	0.80	9.84
May	216.38	6.98	0.82	10.05
June	178.8	5.96	0.68	8.31
July	166.2	5.54	0.63	7.72
Aug	165.23	5.33	0.63	7.68
Sep	165	5.5	0.63	7.67
Oct	167.09	5.39	0.63	7.76
Nov	164.61	5.31	0.63	7.65
Dec	161.2	5.2	0.61	7.49
Year	**179.33**	**5.90**	**8.18**	**100.00**

ROOFTOP SOLAR POWER SYSTEM DESIGN PROCESS:

Rooftop solar power by using the installation of Roof area of the particular in houses or industrials or hospital s or commercial building area .it's using and producing the energy without depends of EB Power.

The solar panels when exposed to sunlight generate DC electricity, The DC power goes through a solar inverter which is a critical component in a solar energy system.

It [2] performs the conversion of the variable DC output of the Photovoltaic (PV) module(s) into a clean sinusoidal 50- or 60 Hz AC current that is then applied directly to the commercial electrical grid or to a local, off-grid electrical network.

The intelligent Solar Inverter will first sense for the solar energy and supply it to the load. When there is no solar energy available then it will look for EB and supply to the load. When both Solar and EB is not available then it will back up the load from the Battery.

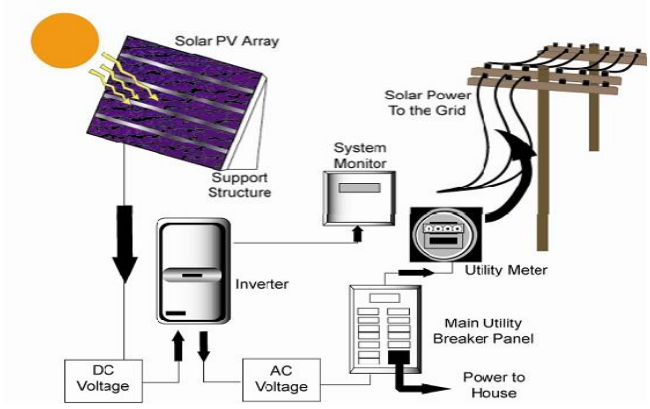

Fig5: Layout of Solar Roof top system and orientation

IV. STUDY AND ANAYSIS OF ROOFTOP POWER PROJECTS:

I. 100 KW ROOFTOP SOLAR POWER PROJECT Gurgaon

100KW Roof top Photovoltaic power plant at Gurgaon Haryana Temperatures maintaining remaining good level so output of plant higher values. [5] Annual average value of PR ratio is nearly 82.12%. Sun availability daily nearly 330 – 360 days/ year and day availability 5.5 to 7hrs so higher output of plant performance.

Our study and analysis in 100 KW SOLAR POWER PLANT at Gurgaon Haryana

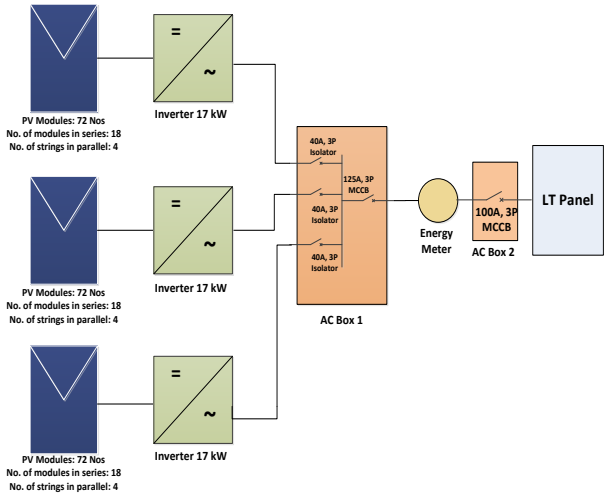

Fig 6 : SLD of Solar Roof top system

Power plant constructed as a Photovoltaic Crystalline module of multi crystalline technology using its very suitability of location base on Temperature and light emission availability in daily hours are very high so that output of plant performance are very high compare to as per standard data. Solar irradiation daily availability 6- 8 hrs /day and high temperature it's very suitable of SPV Crystalline modules of output performance.

Design of plant: Solar Modules are made in maximum possible voltage or optimal voltage from a solar PV cell is limited to its design, irradiance, and temperature. Hence, it is required to connect the required number of cells in series framing an array.

Model representation of 10 panels in each array and the output voltage of each array will be 39.6 V of 250W. An average solar radiation 1000 W/m^2 with 25^{o}C temperature are used as inputs to PV panel to observe optimum voltage String of 40 parallel and 10series connected to AJB and 6ajb are connected to 1MJB its connected to 1DCDB its connected to 100kw inverter and output of inverter connected to output also connected to batter y of 600ah/240v .

A. Structural design:

Roof base Structure using the design considers the wind speed and sustainability of structural steel with weight consideration of dead load, live load and wind load to calculate to design the structure of module mounting. It's once installed its 25years of life with stand the structure using the galvanized MS material using the structure design.

The plant and angle of structure 15° and fixed system maintenance with less cost of system. With construction of nearly 25 years very less maintenance of structure its construction very ease for O&M

B. *Operation and Maintenance*

Mode of Operation [7]

The PV system basically consists of the following components:

1 PV arrays convert Sun light into DC Power.

2 This generated DC power is passed through the Inverter to convert DC power into AC power.

3 This converter AC power at 240V is connected to LT Panel to supply the normal using

4 AC power connecting to LT Panel to through power using.

5 Both on DC side of generation as well as AC side of conversion, protection and safety devices are provided to ensure safe and reliable operation of the complete Solar Power Generating system.

6 Monitoring and Analysis system provided with the power plant will record, store and transfer data that are essential for the same purpose

7. Output of inverter on supply the power to LT Panel as per using of power consumption,

Maintenance requirements

The following measures will help in reducing the break down maintenance and also help in planning for preventive intendances.

1 Careful logging of operation data and periodically processing it to determine abnormal or slowly deteriorating conditions.

2 Careful control and supervision of operating conditions. Wide and rapid variations in voltage and frequency conditions do contribute to increased maintenance.

3 Regulate routine maintenance work such as keeping equipment clean, cleaning of module, proper maintenance of inverters, battery system, and junction box fuses etc.

4 Close co-ordination with the manufacture to effect improvements in plant layouts and design, use of better material, introduction of such facilities as lightning protection, etc.

Table .3 100KW Solar Rooftop power project monthly generation data.

100KW solar power plant generation data showing on Table.3 for the performance of monthly generation data with solar rooftop generation data of as per performance of the plant its generation data.

Total energy generated during various months- Gurgaon 100KW				
Month	**kW h/kWp)**	**(kWh/M2)**	**(KWh)**	Eshare **(%)**
Jan	106.95	3.45	8769.90	5.56
Feb	133.28	4.76	10928.96	6.93
Mar	188.79	6.09	15480.78	9.82
April	204.9	6.83	16801.80	10.66
May	217.93	7.03	17870.26	11.34
June	190.2	6.34	15596.40	9.89
July	167.1	5.57	13702.20	8.69
Aug	167.71	5.41	13752.22	8.72
Sep	163.2	5.44	13382.40	8.49
Oct	156.24	5.04	12811.68	8.13
Nov	123.69	3.99	10142.58	6.43
Dec	102.3	3.3	8388.60	5.32
Year	**160.19**	**5.27**	**157627.78**	**100.00**

2. 100 KW Rooftop Solar Power Project Bangalore

100KW Roof top Photovoltaic power plant at Bangalore, Karnataka Temperatures very good suitable for module performance its output of [6] annual average value of PR ratio is nearly 82.12%. Sun availability daily nearly 330 – 360 days/ year and day availability 6.5hrs so higher output of plant performance.

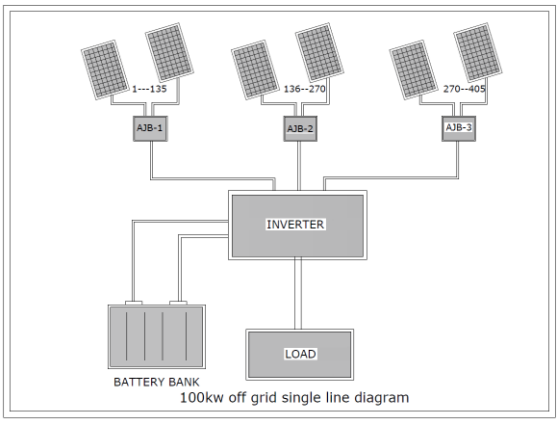

Fig 7 : SLD of Solar Roof top system

As per study of plant good operational maintenance and construction of power plant, and it's very clean and green production with high performance production delivered plant.

Power plant constructed as a Photovoltaic Crystalline module of multi crystalline technology using its very suitability of location base on Temperature and light emission availability in daily hours are very high so that output of plant performance are very high compare to as per standard data. Solar irradiation daily availability 6- 8 hrs /day and high temperature it's very suitable of SPV Crystalline modules of output performance.

Design of plant:

model using the plant 250wp multi crystalline using in the 10module in string total 40 string of system ,10modules in series and 40 in parallel connect to 100kw system with out put of 240v system to connect the LT Panel board system maintaining system with control of earthing system and lighting arrestor safety maintaining the rooftop project. An average solar radiation 1000 W/m^2 with 25^{o}C temperature are used as inputs to PV panel to observe optimum voltage

C. Structural design:

Structure design mainly consider to wind speed and weight of steel as per wind conditions 1.5times to maintain to design the structure as per available area using to install the structure with consideration of shadow effect calculation main important of structure. It's once installed its 25years of life with stand the structure using the galvanized MS material using the structure design .for the of Voltage regulators are designed as per the standards

The plant and angle of structure 15° and fixed system maintenance with less cost of system. With construction of nearly 15 years very less maintenance of structure its construction very ease for O&M

D. *Operation and Maintenance*

Mode of Operation

The PV system basically consists of the following components:

1 PV arrays convert Sun light into DC Power.

2 This generated DC power is passed through the Inverter to convert DC power into AC power.

3 This converter AC power at 240V is connected to Battery bank of 600AH/240V and also connected LT Panel to supply the normal using

4 AC power connecting to LT Panel to through power using.

TO START THE SYSTEM

1. Ensure that all the connectors on the various controls are secularly fitted well.
2. Switch on MJB (main junction box)
3. Switch on ISOLATOR PANEL BREAKER
4. Connect the solar array supply and turn on the array MCB, check that system indicates the default page on LCD panel.
5. Select required operation mode through front panel key pad.
6. Ensure that battery voltage shows on display is >Nominal battery voltage.
7. Switch ON Battery MCB
8. Switch ON inverter by pressing key "I" for two sec from keypad.
9. Now the power is available on the output terminals once you put ON output MCB
10. Switch ON AC input MCB

TO SHUTDOWN THE SYSTEM

1. Switch off output load MCB
2. Switch OFF battery MCB
3. Switch OFF array MCB
4. Switch OFF AC input MCB
5. Switch OFF ISOLATOR BREAKER

Maintenance requirements

The following measures will help in reducing the break down maintenance and also help in planning for preventive intendances.

1 Careful logging of operation data and periodically processing it to determine abnormal or slowly deteriorating conditions.

2 Careful control and supervision of operating conditions. Wide and rapid variations in voltage and frequency conditions do contribute to increased maintenance.

3 Regulate routine maintenance work such as keeping equipment clean, cleaning of module, proper maintenance of inverters etc.

4 Frequent testing of plant equipment by 'Walk Down' checks to internal condition of equipments such as module performance, inverter efficiency test, monitoring system testing etc.

5 Close co-ordination with the manufacture to effect improvements in plant layouts and design, use of better material, introduction of such facilities as lightning protection, etc.

Table .4 100KW Solar Rooftop power project monthly generation data.

100KW solar power plant generation data showing on Table.4 for the performance of monthly generation data with solar rooftop generation data of as per performance of the plant its generation data.

Total energy generated during various months- Bangalore 100KW				
Month	**kW h/kWp)**	**(kWh/M2)**	**(KWh)**	Eshare **(%)**
Jan	181.35	5.85	14145.30	8.53
Feb	182.84	6.53	14261.52	8.60
Mar	214.52	6.92	16732.56	10.09
April	206.1	6.87	16075.80	9.69
May	204.6	6.6	15958.80	9.62
June	170.7	5.69	13314.60	8.03
July	156.3	5.21	12191.40	7.35
Aug	159.96	5.16	12476.88	7.52
Sep	169.5	5.65	13221.00	7.97
Oct	157.17	5.07	12259.26	7.39
Nov	159.65	5.15	12452.70	7.51
Dec	164.3	5.3	12815.40	7.72
Year	**177.25**	**5.83**	**1,65,905.22**	**100.00**

V. CONCLUSION

In this paper, study and analysis of operational and maintenance of solar power plants and rooftop solar system in different locations of India .consideration of operations wise rooftop solar projects very easily compare to solar MW power projects and output of performance also up to energy meter rooftop system very good output and less losses performed. Also area consideration MW solar project using waste land utilization and rooftop solar project using non using roof to install the solar module system.

Also consideration of location wise 1.Gujarat good performance of output along year wise 2.operational and

maintenance wise Telangana MW project very easily operation compare to MW Project 3.rooftop system compare to Gurgaon location better for Bangalore location performance also better for Bangalore rooftop project as per analysis of output performance data.

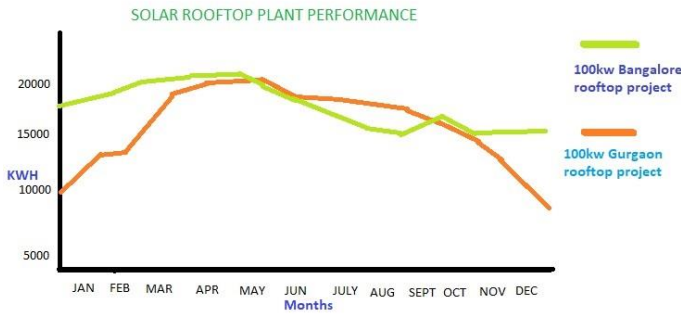

Fig 8 : Solar Roof top system performance data

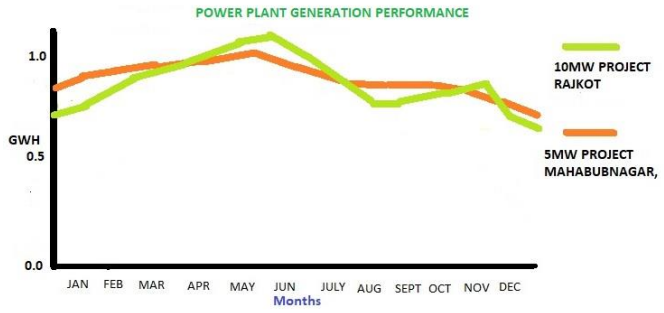

Fig9 : Solar MW power project different projects performance data

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