

A Project Report on
**USE OF SOLAR ENERGY USING SOLAR PANEL
IN RESIDENTIAL BUILDING**

Submitted in partial fulfillment of the requirements for the degree of
Bachelor of Engineering

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2020-2021



CERTIFICATE

This is to certify that the project entitled “**Use of solar energy using solar panel in residential building**” is a bonafide work of **Shaikh Abdul Junaid, Khan Jainulabdeen , Jagdale Aniket , Parkar fahad** submitted to the University of Mumbai in partial fulfilment of the requirement for the award of the degree of “Undergraduate” in “Civil Engineering”

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(Director, AIKTC)

APPROVAL SHEET

This dissertation report entitled “Use of solar energy using solar panel in residential building” by Shaikh Abdul Junaid, Khan Jainulabdeen , Jagdale Aniket , Parkar fahad is approved for the degree of “Civil Engineering”



Examiners

1.

2.

Supervisors:

1.

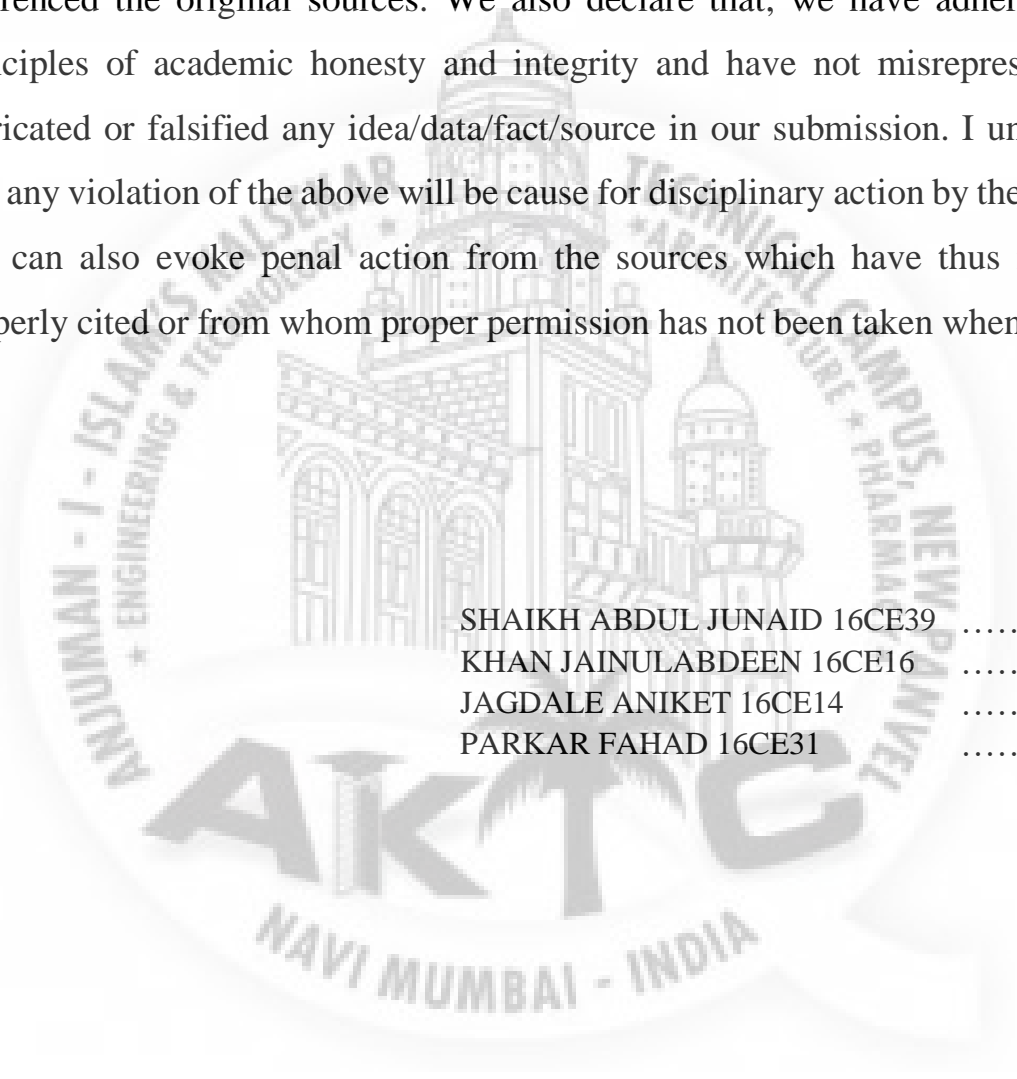
2.

Date:

Place: Panvel

DECLARATION

We declare that this written submission represents my ideas in our own words and where others ideas or words have been included, we have adequately cited and referenced the original sources. We also declare that; we have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.



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ABSTRACT

Energy resources can be categorized as renewable energy resources and non-renewable energy resources. Due to some harmful environmental impacts such as air pollution, climate changes, and natural resources decay, people are focused on using renewable energy resources to generate energy. Solar energy is one of the widely discussed renewable energy resources. Improvements should be made in the solar energy field to fulfill the global energy demands and increase energy efficiency. The electricity cannot be generated at night is a massive weakness of the traditional solar cell. In this study, we mainly focus on solar energy and discuss innovation, improvements, and future view of solar energy technologies. The change in global climate is one of the significant environmental concerns of our time. The only way to overcome or to reduce the disaster is to cut down the level of greenhouse gases. Many different measures have been adopted worldwide to limit the greenhouse gas emission and thus to reduce the harm to the environment. Many developing countries have put various initiatives to stabilize the carbon dioxide emissions to a sustainable level. Solar is profitable and operational, most viable renewable energy resources and one of the largest power sources in terms of renewable energy sector. By this project, we are going to tell all important aspects of solar energy and especially solar panel by showing its benefits, use, cost, area required, and all the detail review about solar panel, its type, its setup, how it works, and the real case study of a plan or site visit. By all this renewable resource, we can save or protect our environmental issue by simple and viable techniques, also save much cost and for a longer period of time by investing once.

Keywords: solar energy, solar panel, Renewable resource.

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ABBREVIATION NOTATION AND NOMENCLATURE

AC ALTERNATING CURRENT

ACC ANNUAL SOLAR SAVE

B BATTERY

C CADMUM

MW MEGAWATT

PV PHOTOVOLTAIC

V VOLT



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Chapter 1

INTRODUCTION

1.1 General

The change in global climate is one of the significant environmental concerns of our time. The only way to overcome or to reduce the disaster is to cut down the level of greenhouse gases. Many different measures have adopted worldwide to limit the greenhouse gas emission and thus to reduce the harm to the environment. Many developing countries has put various initiatives to stabilize the carbon dioxide emissions to a sustainable level. The use of renewable energy is one of most effective policies taken by the power sectors of all the regions in the world. Solar is profitable and operational most viable renewable energy resources and one of the largest power sources in terms of renewable energy sector

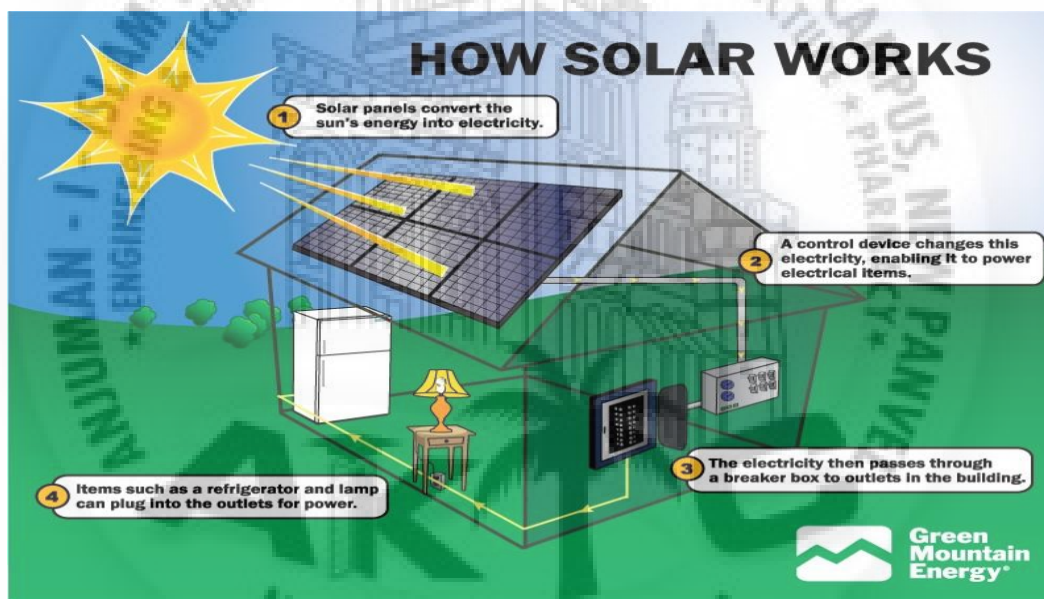


Figure 1.1-Working of solar energy

Solar energy is generally produced by using the techniques of solar photovoltaic (SPV) or concentrated solar power (CSP). We are going to discuss about all the parameter factors and key players associated with the solar power generated by SPV or CSP in India. We also talk about the detail review about solar panel including its total cost including setup and maintenance, area required and recovery period of it

1.2 Use of solar energy

- Solar panels to heat water
- Solar panels to heat air
- Solar electric power generation
- Industrial uses
- Vehicles running on solar power
- Heating living spaces
- Practical applications through solar cookers



1.3 Solar panel

- Solar panels collect heat energy from the sun .We call this heat solar thermal energy . A simple example of solar panel is a closed box with the top made of a transparent material such as glass or plastic .



Figure 1.2 Solar panel and its types

1.4 How solar panel works

- Photovoltaic cells absorb the sun's energy and convert it to DC electricity
- The solar inverter converts DC electricity from your solar modules to AC electricity, which is used by most home appliances
- Electricity flows through your home, powering electronic devices
- Excess electricity produced by solar panels is fed to the electric grid

Chapter 2

LITERATURE REVIEW

2.1 Review of Literature

INITIAL COST OF SOLAR PANEL

Initial cost of solar panel is depend upon range of solar and type of inverter and type of panel chosen . e.g. The cost of grid connected PV panel range from Rs 50,000 to 75,000 per KWP and cost varies battery , panel etc There panel cost cost anywhere between Rs 30 to Rs 50 per Watt include value cost battery , panel, cable used in this panel Cost of roof top solar is Rs 1,00,000 per KWP Include installation charges in case backup battery added then 25,000 Rs will added in cost This panel is used in building , institutes They are 30% of subsidy in this solar panel ministry of new renewable energy promotes the installation of PV system.

Description	Cost
Cost of 1 KW rooftop solar system	1,00,000
Subsidy at 30%	30,000
Cost after subsidy	70,000
Accurated description at 80%	56,000
Tax rate at 35% saved after All deduction	19,600
Net cost after subsidy and all deduction saving	50,400

Table 2.1-Initial cost of solar panel

INSTALLATION COST

Solar panel should be installed by professional installer Any mistake in installing solar panel will lead to lesser efficiency and loss in power generation The standard solar panel installation cost is between Rs 10 to Rs 15 per watt depending upon location ,the distance between panel and inverter and weather installation of ongrid solar system

MAINTENANCE COST OF SOLAR PANEL

Solar panel are low maintenance product however it is important to clean solar panel on a regular basis to clear off the dust particles are get accumulated on it . A cleaner solar panel might generate 25% more power the cost if maintaining solar panel is zero to few hundred rupees a year Most of solar panel have silicon cells laminated and framed which ensure long life and less maintenance Clean in a way that it may not scratch the glass Keep solar panel out of shade .

LIFE SPAN OF SOLAR PANEL

- Most of solar panel came with 25 years warranty in india.
- However the life span of a solar panel can go up to 30 years depending upon brand and quality.
- In a monsoon or rainy season solar panel is work during the night.
- Solar panel will produce comparatively less energy during monsoon more sunlight better solar panel works.

AREA REQUIRED FOR SOLAR PANEL

- 1 KW solar panel generates on an average 4KWH in day depending on weather condition.
- In sunny days might generate 5 units while in rainy season generate 3 units in day. (1KW=1000 watts=1 unit)
- A solar panel has standard length of 2 meter and width of 1 meter.
- Installation of 1 KW solar panel requires 2 solar modules.
- The space taken by 1KW solar panel shall be
Solar panel size X No of panels
 $2 \times 1 \times 2 = 4$ square meter
The above area required for solar panel

How much money consumption or save in solar panel and efficiency

- 1000 watts panel will save around 1000 per month on average.
- More the number of panels more electricity you can produce and which will result in more savings.
- A 1 KW grid system can save around Rs 1500 per month.
- The efficiency of solar panel is the way to calculate the density of solar module.
- Formula of calculation efficiency of solar panel.
- $\text{Efficiency} = \frac{\text{power}}{\text{length} \times \text{width} \times 1000} \text{ Watt/min}$

Summary

SR	Name	Title of paper	Author	Reasearch
1	Solar Energy	Solar Energy Technology Adoption : select Literature review and Indian Evidences	Dr Subrat Sah	Solar energy technologies
2	Renewable and sustainable energy reviews	Recent developments of solar energy in India : Perspective strategies and future goals	Subhojit Dawn Prashant kumar Arup kumar Manash kumar	Sustainable energy
3	Solar Energy	Potential of Solar Energy in India : A Review	Harendra kumar Vijay kumar Vinay kumar	Renewable energy in India
4	PV Technology	A Review on Solar Photovoltaic Technology and future Trends	Shafqat Mughal Yog Raj sood Rk jarial	Global environmental issue and renewable energy resource

Table 2.2-list of reference paper

Chapter 3

METHODOLOGY

3.1 Solar photovoltaic Technology

- The sunlight is absorbed by the cells of the panel which creates an electric field across the layer cause electricity
- Photovoltaic materials and devices convert sunlight into electrical energy
- A single PV device is known as Cell
- The individual PV cell is usually small typically producing about 2 watts of power
- They are connected together in chains to form larger unit known as Panel
- The panels are used in individually or several can be connected to form arrays
- The Photo voltaic power is generated primarily based on two technologies ,crystalline silicon C-Si and thin film
- Traditionally , C-Si has been used for bulk power generation whereas the various thin film technologies currently in the market are amorphous silicon , cadmium sulphate and so on.



Fig 3.1-Solar PV panel at ground



fig 3.2-Solar PV panel at rooftop



Figure 3.3-Solar PV panel at building terrace

3.2 Solar thermal : Concentrating solar power(CSP)

- Concentrating solar power (CSP) technologies use mirrors to reflect and concentrate sunlight onto the single point where it is collected and converted into heat
- This thermal energy can then be used to produce electricity
- Concentrating solar power systems are generally used for utility scale projects
- The mirrors in CSP plants focus sunlight onto a receiver that heats a high temperature fluid , which is used to spin a turbine or power an engine that drives a generator
- The final product is electricity
- There are four types of CSP systems available
 - a)Linear concentrator system
 - b)Dish/Engine system
 - c)Power tower system
 - d)Concentrating solar power thermal storage system

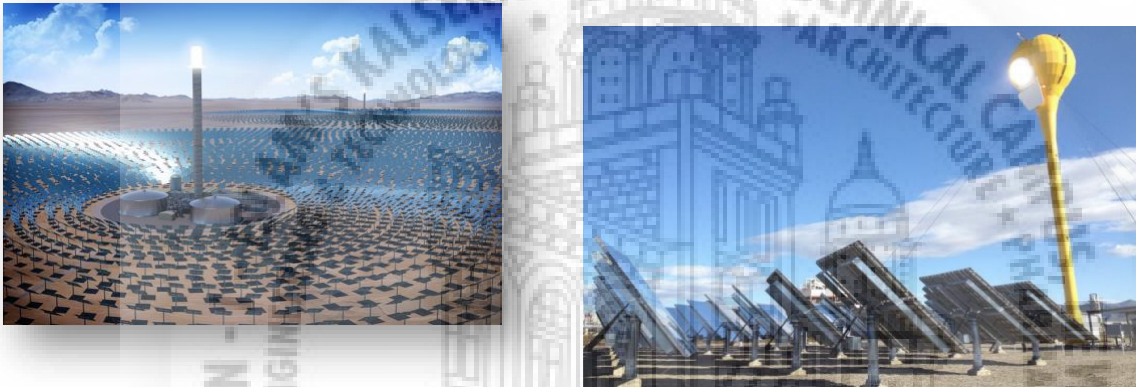


Figure 3.4-Solar CSP Technology for Electricity production



Figure 3.5-Solar CSP technology working

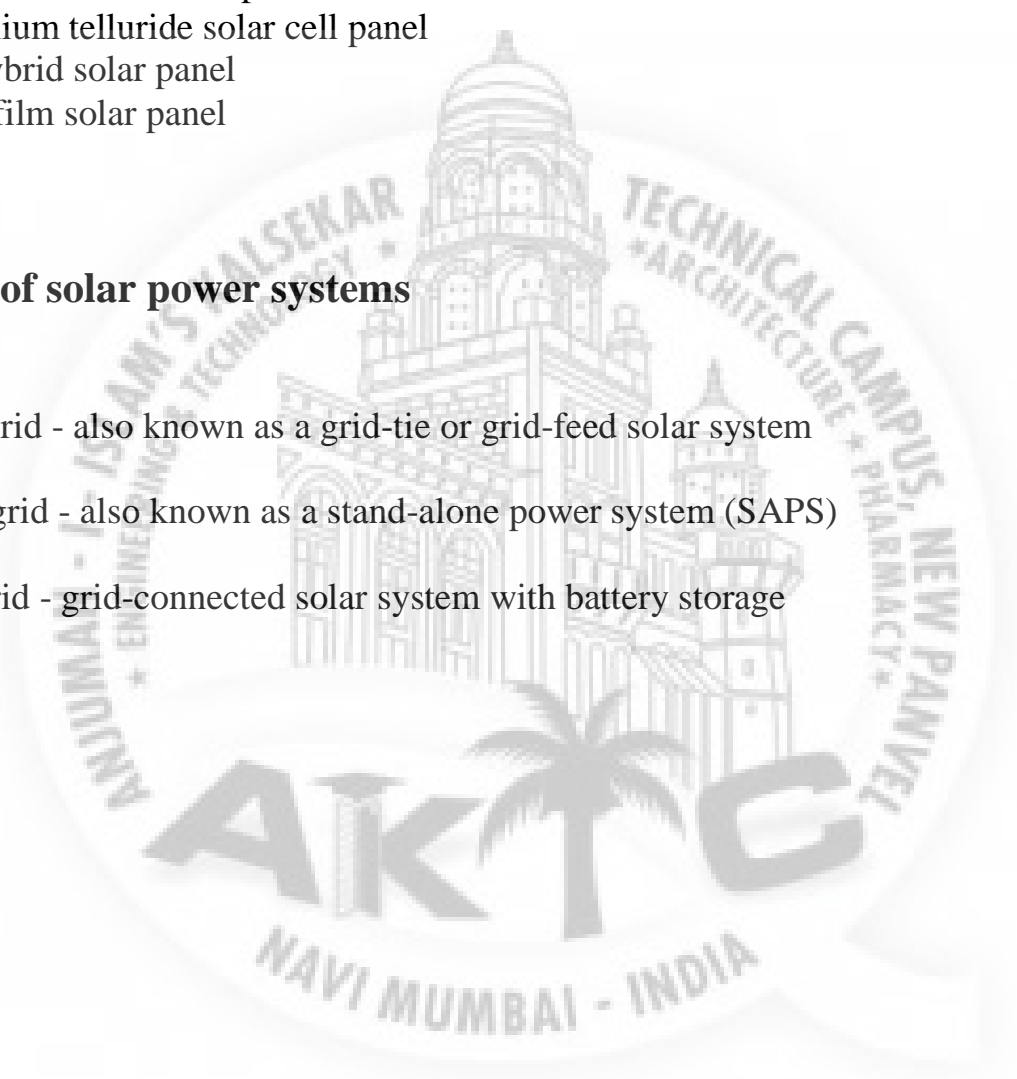
3.3 TYPES OF PANELS

There are 7 type of solar panel

- Monocrystalline solar panel
- Polycrystalline solar panel
- Thin film amorphous silicon solar panel
- Concentrated PV cell pane
- Cadmium telluride solar cell panel
- Biohybrid solar panel
- Thin film solar panel

3.4 Types of solar power systems

1. On-grid - also known as a grid-tie or grid-feed solar system
2. Off-grid - also known as a stand-alone power system (SAPS)
3. Hybrid - grid-connected solar system with battery storage



ON GRID SYSTEM

- On-grid or grid-tie solar systems are by far the most common and widely used by homes and businesses.
- These systems do not need batteries and use either solar inverters or micro-inverters and are connected to the public electricity grid.
- Any excess solar power that you generate is exported to the electricity grid and you usually get paid a feed-in-tariff (FiT) or credits for the energy you export.

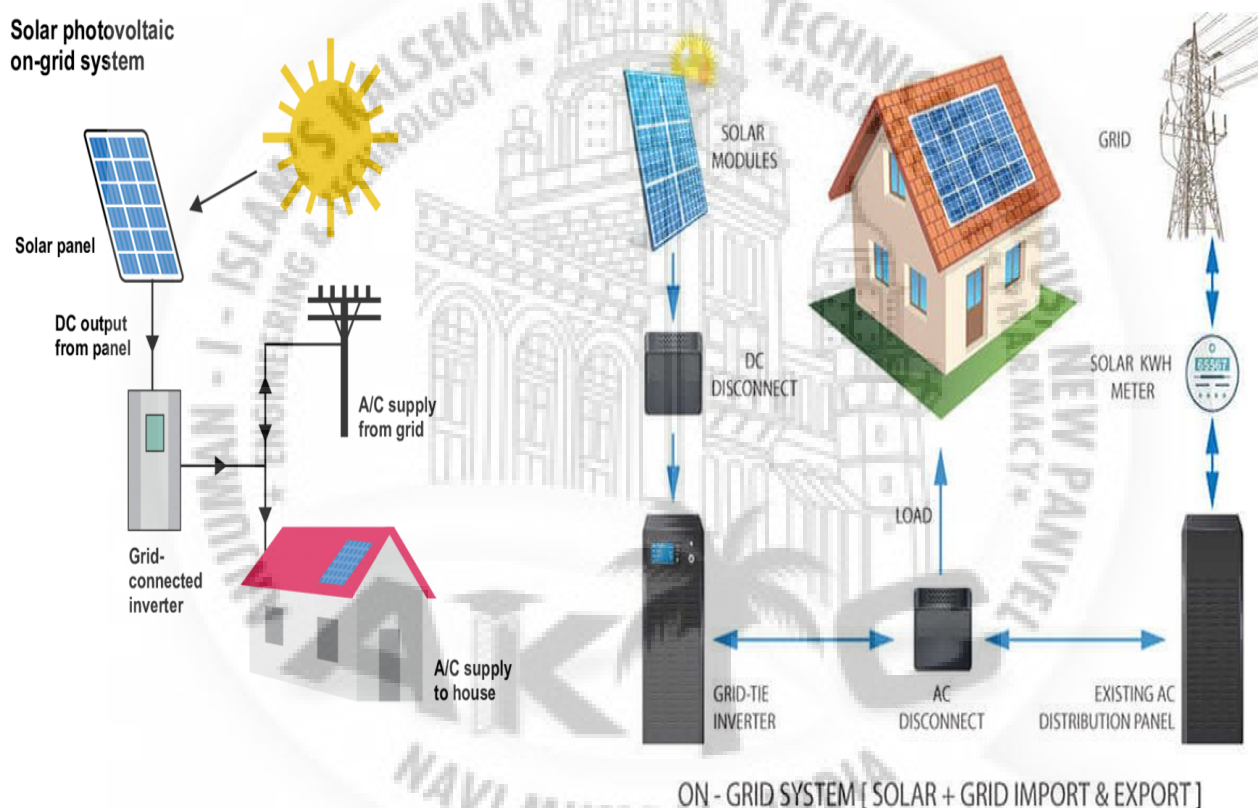


FIGURE 3.6 ONGRID SYSTEM

OFF GRID SYSTEM

- An off-grid system is not connected to the electricity grid and therefore requires battery storage.
- Off-grid solar systems must be designed appropriately so that they will generate enough power throughout the year and have enough battery capacity to meet the home's requirements, even in the depths of winter when there is generally much less sunlight.
- The high cost of batteries and off-grid inverters means off-grid systems are **much more expensive** than on-grid systems and so are usually only needed in more remote areas that are far from the electricity grid.

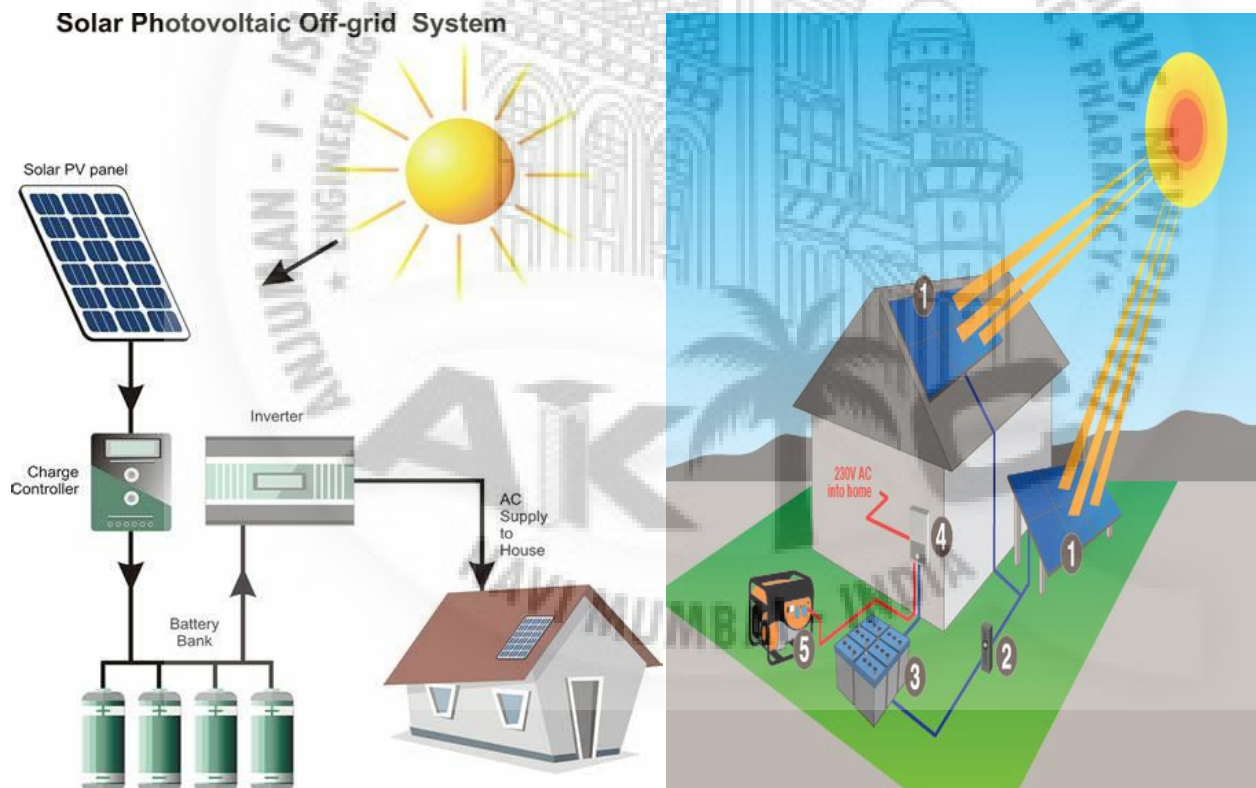


FIGURE 3.7-Off grid system

HYBRID SYSTEM

- Modern hybrid systems combine solar and battery storage in one and are now available in many different forms and configurations.
- Due to the decreasing cost of battery storage, systems that are already connected to the electricity grid can start taking advantage of battery storage as well.
- This means being able to store solar energy that is generated during the day and using it at night.
- When the stored energy is depleted, the grid is there as a back up, allowing consumers to have the best of both worlds.
- Hybrid systems are also able to charge the batteries using cheap off-peak electricity (usually after midnight to 6am).

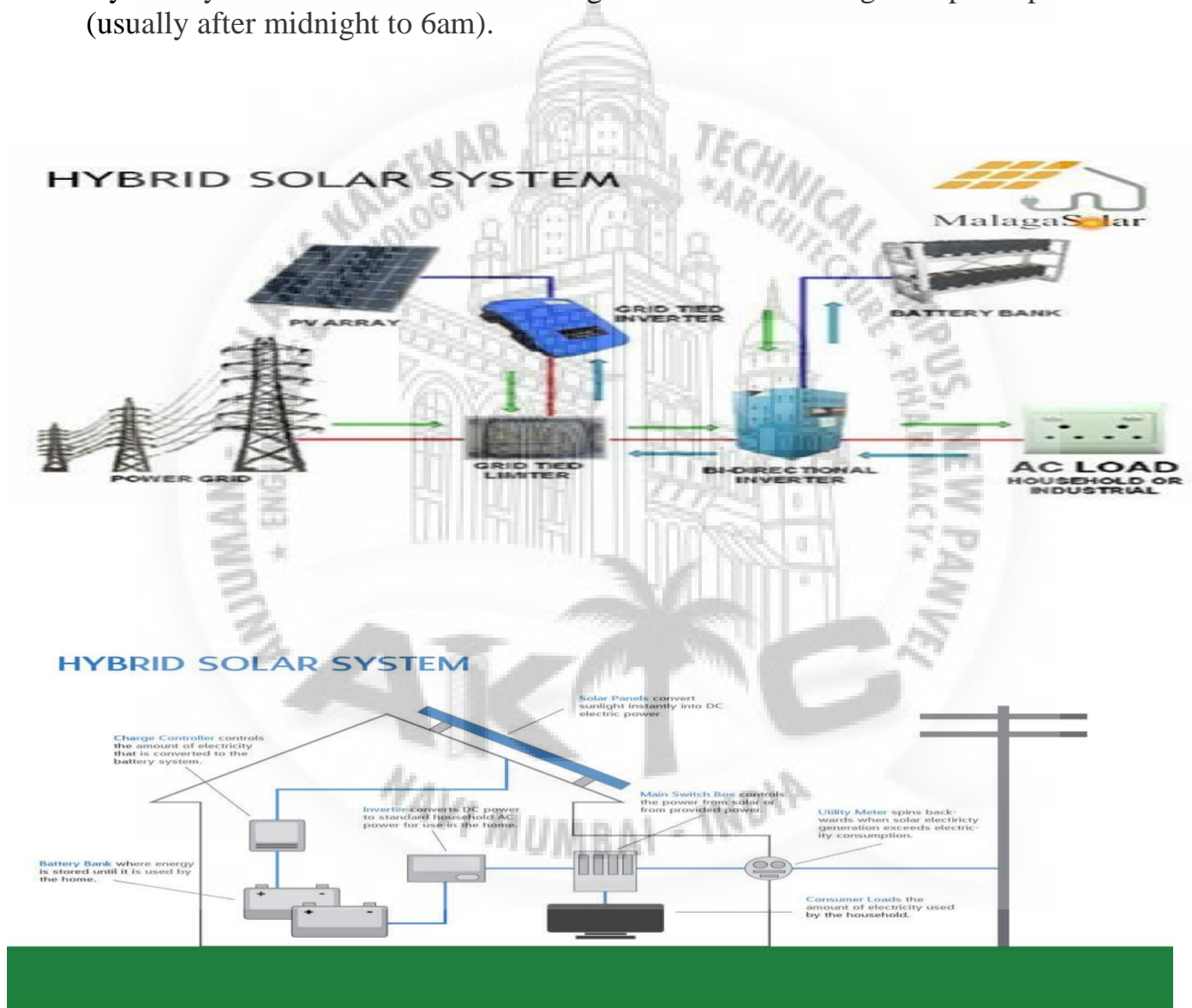


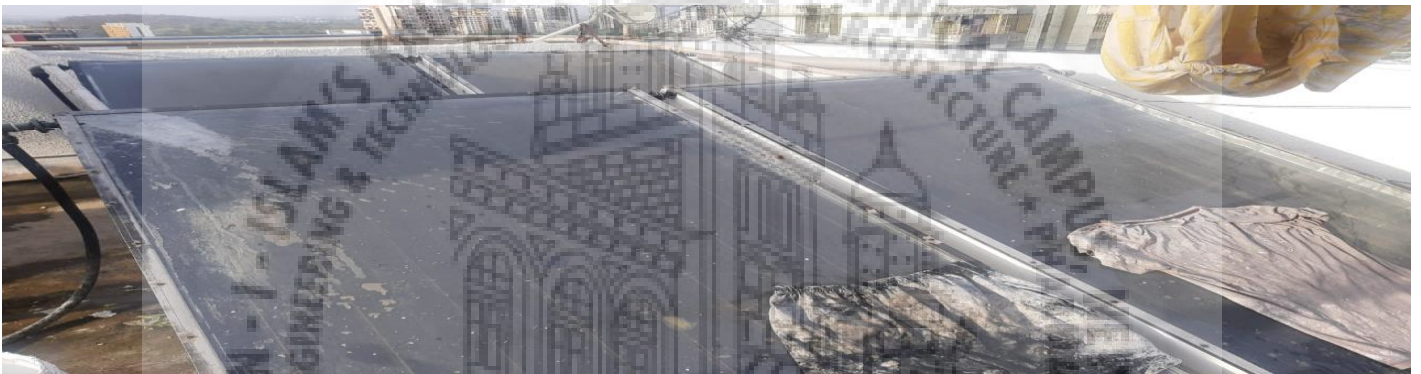
Figure 3.8-Hybrid system

CHAPTER 4

CASE STUDY AND DATA COLLECTION



Site visit at kalyan having solar panel at roof top of 5KW set up in 2018 for public use
Can save a bill upon 1500-2000 Rs per month use for building or society office club house.



Pictures of solar panel at building terrace of portion contain 2 KW plant and one portion having 5 KW plant. 2 KW plant setup in the year 2013 and the other portion which is 5 KW plant setup in the year 2018



LIST OF BILL SAMPLES COLLECTED

महा विद्युत
 BILL OF SUPPLY FOR THE MONTH OF 25-11-2020

MR. SARAJUJIDDI M A KHAN
 PLOT NO 334 SHOP NO 282C TOR 1 GHANSOLI 400701

बिल नं. (CGN) 00000874136973
 बिल दिनांक 25-11-2020
 मूल्य 6300.00

बिल दिनांक 09-12-2020
 मूल्य 6310.00

विवरण	दिनांक	मूल्य	कुल
18-10-2009	2.00 KW	2000.00	
21-11-2020	2.00 KW	21.11	
21-10-2020	2.00 KW	21.10	

मोटर स्थिति: Normal

बिल नं. 14171, मूल्य 14100, मूल्य 100, कुल 71

TO PLACE YOUR AD HERE
CONTACT addcity009@gmail.com

महा विद्युत
 BILL OF SUPPLY FOR THE MONTH OF 13-08-2020

MR. SARAJUJIDDI M A KHAN
 PLOT NO 334 SHOP NO 282C TOR 1 GHANSOLI 400701

बिल नं. (CGN) 00000874136973
 बिल दिनांक 13-08-2020
 मूल्य 1500.00

बिल दिनांक 13-08-2020
 मूल्य 1510.00

विवरण	दिनांक	मूल्य	कुल
18-10-2009	2.00 KW	2000.00	
21-07-2020	2.00 KW	21.07	
21-03-2020	2.00 KW	21.03	

मोटर स्थिति: Normal

बिल नं. 13957, मूल्य 13955, मूल्य 1.00, कुल 92

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 10 कार आणि 533 स्मार्टफोन जिंका!

CHAPTER 5

SUMMARY AND CONCLUSION

Summary

- The images you can see is from our site visit or case study at kalyan
 - The solar system is a on grid type solar system of 5KW located at a terrace of a building
 - It was set up in the year 2018
 - The system is setup for society office general use and bills generated in the name of secretary of the society
 - You can clearly see the difference in the unit consumption in different months in some months the bill is quite high whereas in some months you can see the unit consumed is zero or very less it means the total energy produced is almost equal to the energy consumed and that's how it works
- About the costing we come to know that the solar system costs around 3,00,000-3,50,000 Rs including all cost and the also apply for subsidy and they gets the subsidy of Rs 90,000 which is nearly equal to 30% of the total cost and subsidy was sanction in 6 months
- The system generate electricity equals to 1000 to 1500 rs per month and the get the warranty of 25 years for panel and 7 years warranty for inverter means the maintenance cost is negligible.
 - By the project we show everything about solar energy which is an excellent form of renewable energy and how we can take a use of it in our day to day life
 - The main aspect is to show the use and benefits and detail plan of how we shift to natural resource or how we take a use of natural resource which is present in abundant just by making small change which is also useful for ourself and our environment.

CONCLUSION

- The sun provides a very abundant supply of energy that is available today with all of us
- If we covered only 4% of the worlds deserts area with solar panels this would supply the same as the worlds electricity today
- There is so much potential energy to be gain using solar energy
- The resource is not just available to businesses and major companies it is also available to everyday people who would like to utilize energy from the sun in their our space
- Backyard and roof top solar panels has being more and more all over the world
- As it is a good way to reduce the pollution and save some monthly cost

REFERENCE

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