

Education for Knowledge, Science & Culture.

- Shikshanmaharshi Dr. Bapuji Salonkhe

**VIVEKANAND COLLEGE,  
KOLHAPUR  
(EMPOWERED AUTONOMOUS)**

**ENVIRONMENTAL STUDIES PROJECT**

**ON**

**USES OF SOLAR ENERGY IN  
INDUSTRIAL SECTOR**

**Group Members: –**

1) Jesika Pravin Chopade	6144
2) Amruta Pandurang Ekshinge	6165
3) Sakshi Sanjay Patankar	6293
4) Sanika Sunil Ghadge	6174

**B.Com-II**

**Under the guidance of  
Prof. Mr. A.S. Kadam Sir  
Year 2023-24**

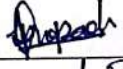
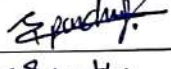
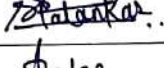
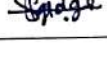
# DECLARATION

We the undersigned hereby declare that the project entitled **USES OF SOLAR ENERGY IN INDUSTRIAL SECTOR** is an original work prepared by us under the guidance of Prof. Mr. A. S. Kadam Sir for the degree course in Environmental Studies and submitted to Vivekanand College, Kolhapur (Empowered Autonomous). The finding in this report are based on data collected by us. This matter included in this report is not a reproduction from any other sources.

We undersigned that from any other sources is liable to be punished as the authority deem fit.

Date: 17/02/2024

Place: Kolhapur

Sr. No.	Name of Student	Roll No.	Signature
1	Jesika Pravin Chopade	6144	
2	Amruta Pandurang Ekshinge	6165	
3	Sakshi Sanjay Patankar	6293	
4	Sanika Sunil Ghadge	6174	

# CERTIFICATE

This is certify that the project entitled

## USES OF SOLAR ENERGY IN INDUSTRIAL SECTOR

Submitted by:

- 1) Jesika Pravin Chopade
- 2) Amruta Pandurang Ekshinge
- 3) Sakshi Sanjay Patankar
- 4) Sanika Sunil Ghadge

In the partial fulfillment for the degree course in environmental studies to the Vivekanand College, Kolhapur (Empowered Autonomous) has been completed under guidance and supervision

To the best of our knowledge and belief the matter presented in the project report in original and based on their own work.

Date: 17/02/2024

Place: Kolhapur

Marks obtained 28 out of 30

  
17/2/2024

Prof. Mr. A.S. Kadam Sir  
(Project Guide)  
Vivekanand College, Kolhapur  
(Empowered Autonomous)



# ACKNOWLEDGEMENT

“The completion of our project depends upon the co-operation, coordination & Combined efforts of several resources of knowledge, inspiration & energy.” I always knew that in an college, the work atmosphere yields enormously on an individual’s productivity and quality of work. The competence & expertise of students around us at was a factor that motivated us to strive & achieve nothing short of perfection.

We owe a great many thanks to all those, without whom this environmental project wouldn’t have been as much a learning experience & as successful. To those, who helped & supported us during the project.

My deepest sense of gratitude for Prof. Mr. A.S.Kadam Sir, for constant guidance, professional help & support during the work of the project, for guiding us & helping us at all times during the project. He is the key inspirer for us & without his guidance this project would have been a distant reality.

We thank our another group members for providing constant encouragement & help. We indebted them for their timely help & the enthusiasm they expressed in helping bring this project to the fruitful end.

---

---

# INDEX

Sr. No.	Contents	Page No.
<b>1</b>	Introduction	<b>06</b>
<b>2</b>	Research Methodology	<b>11</b>
<b>3</b>	Reporting	<b>13</b>
<b>4</b>	Summary & Conclusion	<b>18</b>
<b>5</b>	References	<b>20</b>

# CHAPTER : 1



## A) Introduction about Environment

Environment is nature's gift that helps in nourishing life on Earth. The environment plays an important role in the existence of life on the planet Earth. Earth is a home for different living species & we all are dependent on the environment for food, air, water & other needs. It is important for every individual to save & protect our environment.

Environment can be defined as a sum of total of all the living & non-living elements & their effects that influence human life.

Environment means what surrounds us. The term "Environment" refers to the surroundings in which living organisms, including humans, exist & interact with each other & their surroundings. It encompasses both the natural & built elements that shape our lives & influence our well-being.

---

---

## B) Solar Energy

Energy from the Sun that is converted into thermal or electrical energy, it is called a Solar Energy or electromagnetic energy.

Radiation from the Sun capable of producing heat, causing chemical reactions, or generating electricity. The total amount of Solar energy incident on earth is vastly in excess of the world's current & anticipated energy required. If suitably harnessed, this highly diffused source has the potential to satisfy all future energy needs. In the 21<sup>st</sup> Century solar energy is expected to become increasingly attractive as a renewable energy source because of its inexhaustible supply & its nonpolluting character, in stark contrast to the finite fossil fuels coal, petroleum & natural gas.

### Importance, Advantages & Disadvantages

#### ● Importance of Solar panels in Industrial Sector

- 1) Solar panels reduce overhead costs. Labor & operational materials, business overhead encompasses a wide range of expenses overhead. Going solar helps you cut down on the electricity bills drastically.
- 2) Solar power can reduce India's dependence on non-renewable source of energy, which can help reduce the country's energy import bill. By generating their electricity,

businesses can contribute to the country's energy independence & reduce their carbon food print.

- 3) An Industrial photovoltaic system or industrial solar PV system refers to a systems with a power output greater than 100kwp, an ideal capacity per many types of companies for purpose of self-consumption as well as production & sale of electrical energy.
- 4) Solar energy can be used to generate heat for a wide variety of industrial applications, including water desalination, enhanced oil recovery, food processing, chemical production & mineral processing.
- 5) Industrial Solar panels, therefore, is a way to Reduce the peak loading of the grid & to away with high tariff rates for the peak hours.
- 6) There are two types of panels used in industrial sector. Domestic Solar panels can be used in generating electricity at home & in the industrial panel, we use it to generate electricity in mass.

### • Advantage of Solar panels in Industrial Sector

#### 1) Reduced Electricity Bills

Electricity expenses are constantly increasing. Usually, it has been seen that there is around 15% of the total cost reduction. Solar energy has become a sustainable & cost-effective energy alternative for business owners with a fixed-cost solution. The tariff rates for energy are cheaper by about 20% than convential/electricity.

#### 2) Renewable Energy

Solar power is a 100% clean, renewable energy source that helps to reduce the dependence on oil, coal, natural gas for electricity production.

#### 3) Increase the value of energy efficiency

Installing Solar panels on your company's / industries roofs can increasing the property value & helps you to sell faster if you intend to do that in future.

#### 4) Reduced Carbon emission

Saving the planet helps in reducing Carbon foot prints & fossil fuel consumption, Unlike fossil fuels solar panels generate electricity without air or Carbon pollution & ash or other waste products.

#### 5) Solar Energy for manufacturing



The technology of generating power from the Sun has been around for decades, but in the 20<sup>th</sup> century, it needed to be more genuinely viable. With modern photovoltaic cells & the innovations introduced by entrepreneurs like Elon Musk & Solar City, homes all over the country are "going Solar"

6) **Branding**

The Companies are branding themselves as environmentally friendly. Construction companies boast of "green" building practices while food services promise to make use of the sustainable inventory.

• **Disadvantages of Solar Energy in Industrial Sector**

1) **High Upfront cost**

The first initial investment for solar panel installation is quite high & not every industrial will be able to afford them. Unfortunately this is a downside to solar panels however the future is bright as prices are coming down.

2) **Requires sunny weather to work best**

Energy can only be generated when sunlight is hitting the face of the panel & being converted. Although Solar panels can still generate power on cloudy days (as it's the UV Light that generates the energy) they perform best on sunny days.

3) **Cannot be used effectively at night**

This is a disadvantage of solar panels that may be overcome in the future with new technology. There are already talks about an 'anti solar panel' that is able to produce power at night.

4) **Disposal of old Solar panels can be harmful to the environment**

Unfortunately, when we use old solar panels it requires them to be dismantled down which can produce some harmful chemicals in the process. Not only this, but it can be harmful to the local area that this occurs in.

5) **Low energy Conversion rate**

Even the most advanced Solar panels still only convert around 20.25% of the sun's energy into power it goes to show how much opportunities there is to develop better technology to optimize the full force of the sun.

---

---

## C) Objectives

1) **To Study the Cost effectiveness of Solar Energy**

With the high energy demands of most businesses, solar energy can help significantly reduce energy bills & contribute to long-term cost savings.

2) **To Study of Sustainability of Solar Energy**

By adopting Solar energy, businesses can demonstrate a commitment to sustainability & reduce their Carbon footprint.

3) **To create awareness about use of Solar Energy in Society**

Businesses that prioritize sustainability are often viewed more favorable by consumers, helping to improve brand identify & customer loyalty.

4) **To study the advantages & Disadvantages of Solar energy**

Solar as an alternative means of power supply that can supply energy for more than 15 hours per day without not only payment of tax but also without any breakage.

It will constitute a major contribution by India to the global efforts to meet the challenges to climate change. The objective is to establish India as a global leader in Solar duffusion across the country as quickly as possible.

---

---

# CHAPTER : 2



## • Research Methodology

Sun light Can be converted to usable energy in the form of heat & electricity directly. Solar energy techniques can be broadly classified into two categories.

- 1) Direct electricity generation using solar photovoltaic panels.
- 2) Indirect conversion using solar thermal collectors.

The technologies which convert solar to heat are parabolic through, Linear Fresnel, Heliostat tower & Dish striling engine, etc.

Many industrial processes work in temperatures intervals where solar thermal technology could supply a considerable amount of the total energy input at an acceptable price.

## • Study Area

With a population of 1.4 billion and one of the world's fastest growing major economies, India will be vital for the future of the global energy markets. The Government of India has made its impressive progress in recent years in attaining self-sufficiency in producing green energy through National Solar Energy Mission-2020. Report on India 2020 energy policy review states that India successfully implemented a range of energy market reforms and carried out a huge amount of renewable electricity deployment, notably in solar energy & other renewable including wind energy.

It is recognised that India is one among the several countries of the world and has made huge strides to ensure full access to electricity, bringing power to more than 700 million people since 2000. By the end of 2030 India is planned to bring secure, affordable & sustainable energy to all its citizens so that India can make its significant.

The present study reports explain how to beneficial use of solar energy in industrial sector.

## • Methods

For our Project Report we used Secondary Data Collection.

---

---

# CHAPTER : 3

## • How is Solar Power being used for Industrial Process

Solar-Thermal power is capable of generating heat at a wide range of temperatures, from below  $400^{\circ}\text{C}$  to over  $1000^{\circ}\text{C}$ , depending on the technology, this makes CSP well suited for a variety of Industrial Applications, from relatively low-temperature food-production processes to chemical processes that requires high temperatures. It even has the potential to generate heat for industrial applications like enhanced oil recovery, mineral processing, cement manufacturing & iron & steel production, Researchers are making progress on technologies that use CSP to produce solar fuels.

## • How does Solar works?

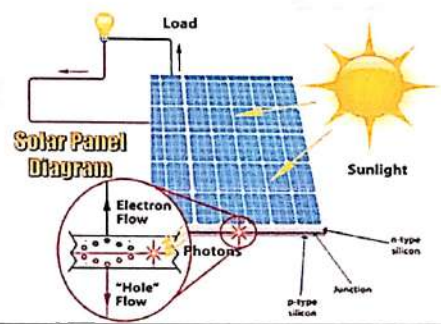
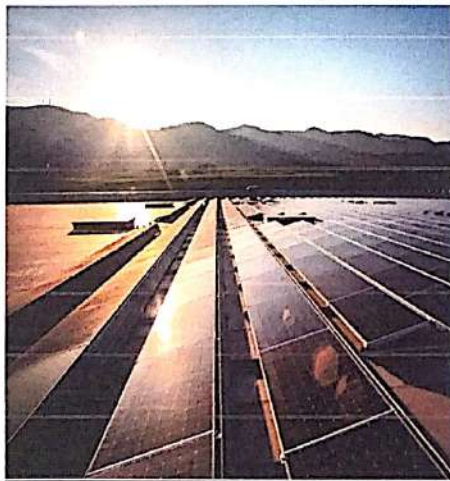
The amount of Sunlight that strikes the earth's surface in an hour & a half is enough to handle the entire world's energy consumption for a full year. Solar energy technologies convert sunlight into electrical energy either through mirrors that concentrate Solar radiation. This energy can be used to generate electricity or be stored in batteries or thermal storage.

## • Solar Radiation Basis.

There are various types in Solar Radiation Basis. But we focused on two most & foremost important types such as Photovoltaic (PV) & Concentrating Solar-Thermal Power Basics.

### 1) Photovoltaic Systems

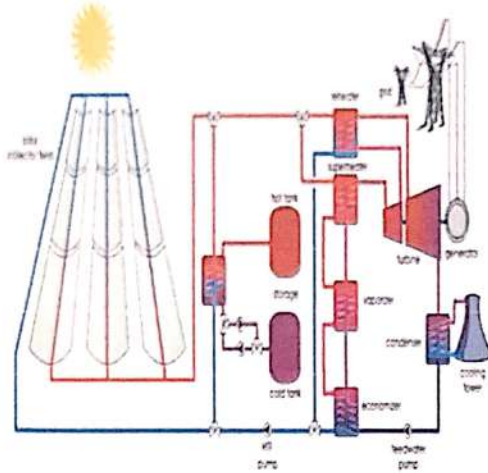
When the Sun shines onto a Solar panels, energy from the sunlight is absorbed by the PV cells in the panels. This energy creates electrical charges that move in responses to an internal electrical field in the cell, causing electricity to flow.



### 2) Concentrating Solar Thermal Power Basics



Concentrating Solar Thermal Power (CSP) systems use mirrors to reflect & concentrate sunlight onto receivers that collect Solar Energy & Convey it to heat, which can then be used to produce electricity or stored for later use. It is used preliminary in very large power plant.



## • Solar Energy process in Industry

Solar Energy can be used to generate heat for a wide variety of industrial applications, including water desalination, enhanced oil recovery, food processing, chemical production & mineral processing, among many others. This can be done either through Concentrating solar-thermal Power (CSP) technologies or by using resistive heaters or heat pumps powered by photovoltaic panels. When concentrating solar-thermal energy is used for industrial processes, mirrors are used to concentrate sunlight on to a receiver, which can readily reach very high temperatures, compared to electric heaters.

Because CSP is capable of reaching a wide range of temperatures, it is well suited for many industrial applications, from relatively low-temperature food production processes to chemical processes that require very high temperatures.

## • Industrial Statistics

- 1) In 2020, Solar energy accounted for 43% of all new electricity. Generating capacity in the US.
- 2) The average cost of commercial solar panels has dropped by 70% Since 2010.
- 3) By 2024, it's estimated that the US will have enough solar energy to power over 12 million homes.

- Some Industrial Sector which is use a Solar energy

Sectors	Contents
1) Food Sector	Drying, Washing, Pasteurising, Boiling, Sterilising, Heat treatment
2) Beverages	Washing, Sterilising, Pasteurising
3) Paper Industry	Cooking & Drying, Boiler feed water, Bleaching
4) Metal Surface treatment	Treatment, electro-plating
5) Textile Industry	Bleaching Dyeing, Drying, De-greasing, washing, fixing, pressing
6) Plastic Industry	Preparation, Distillation, separation, extension, drying, blending
7) Chemical Industry	Soaps, synthetic rubber, processing heat, pre-heating water

- In India

India is a country that is typically known for its love of coal. However, the country has recently started to embrace solar power in a big way. According to the IEA, India added 5GW of solar capacity in 2019, bringing its total installed capacity to 35GW. What's even more impressive is that solar power is increasingly becoming cheaper than coal in India, making it an obvious choice for the country's energy needs.

Despite being a developing country, India has emerged as a serious contender in the race to Zero-emission economies. The Country plans to generate 100GW of Solar power capacity by 2022 & has already made significant strides towards this goal with a total installed solar power capacity of over 35GW.



Another impressive fact about the country is the emergence of floating solar farms like the world's largest floating solar panels systems at the Omkareshwar Dam in Madhya Pradesh.



As a majority of the Indian industries are located at dry & hot areas with huge space, solar based captive power plants can be set up by the facilities which will be more profitable. Solar energy can be used for preheating boiler feed water in many plants. Industries can also use captive power plants on rooftops or in parks or other open spaces to meet factories loads & pumping water requirements.

---

---



# CHAPTER : 4

- Summary & Conclusion

With increasing awareness about the need to conserve our planet, the world is fast moving towards the “Go Green” revolution.

Therefore, the Industries are shifting towards ways to save energy. In India, huge electricity bills are a major concern for industry. So, industries like textile, steel, chemical, cement, paper, ceramic, etc. opting for solar panels is that they provide on ROI.

Within 4 to 5 years, And the solar panels for industrial units can be used for both on-grid & off-grid allowing the industries to use the panels at night as well. The high tariff rates & increasing demand for electricity necessitate the use of industrial solar panels. A massive 44.2% of the total electricity generated in India is used by the industries. Thus, it is one such sector that has high electricity demands & during the peak working hours, the grid gets high loads. Thus, solar panels installation is one of the best ways to curb the loads as well as meet industrial energy needs.

---

---

# CHAPTER : 5



• References

<https://ijcrt.org>

<https://www.eai.in>

<https://www.energy.gov>

---

---