

# SOLAR POWER: A RENEWABLE SUSTAINABLE SOURCE AND ITS CURRENT STATUS IN INDIA

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## ABSTRACT

Solar energy is important because the sun is a sustainable source of energy that can be used to power homes and businesses globally. Fossil fuels are finite, so it's important that alternative energy sources be embraced. As of 2017, it is widely believed that fossil fuels are causing global warming. The importance of the work is to determine that to what level electricity requirement of general is fulfilled by the use of solar energy panels. Even this can be done at very low cost and is a long lasting method.

**Key words:** - Solar Power, Solar Energy, Sustainable Source, Wind energy, Photovoltaic (PV), Sunlight, electricity etc.

## INTRODUCTION

Solar energy is the energy radiated out by the sun in the form of heat or light and is the mother of all the source of energy on the earth. It is one of the renewable sources of energy which is widely used by people and is even used to generate electricity. The heat radiated by the sun in one day is more than the energy used by the people of the world in a complete whole year. Sun is a mass of gas ball consisting of hydrogen and helium gas; sun is the big star among the entire star. Inside the sun or in the core of sun there occurs a process of nuclear fusion which means nucleus are fused with each other to make a bigger nucleus with higher energy. Sun takes just a little over eight minutes to travel the 93 million miles to Earth. Solar energy travels at the speed of light, or 186,000 miles per second, or  $3.0 \times 10^8$  meters per second. Very small amount of sun energy of visible light area reaches the earth which is even more than our daily. All the life on earth whether it is Human, other animals or plants, rely on the suns for warmth and food to live.

We human harness the sun's energy in many different ways. For example, fossil fuels, decayed plant mater which has solar energy stored in it since millions of years ago, of past geological age, is used for the production

of electricity and its generation. Another good example in our daily life is of biomass in this sun energy is converted and stored in the form of fuel which can be used for heat and electricity generation.



Source: - [adssolar.com.au](http://adssolar.com.au)

Wind energy, even today is also used to provide mechanical energy and is even used in transportation also. When the air gets heated by the sunlight becomes light and rises in the air that air current is nothing but wind energy, it has an immense amount of energy in it even wind energy is produced by the rotation of the earth. A large number of turbines are being placed which are used to convert the wind energy into electricity. Today hydroelectricity is also produced by sun's energy. In which the sun's heat evaporates water and then it is condensed at the top, and then it comes back again in the form of rainfall into the dam and hence used for the production of electricity.

Today's latest method and widely used is Photovoltaic (PV) it is very cheap and simple and can be placed anywhere is the one method to harness the sun's heat energy. PV equipment's commonly known as solar cells are the unique process in which the direct sun energy is falling on the solar panels is converted into electricity where no type of pollution occur not even the technical parts are moved no hard work and is very much reliable and with a long life. Solar cells are based on the same principles and equipment's which are behind the computer revolution which is known as CDROM which in itself completely defines the operation, use, and applications of photovoltaic devices and systems.

## REVIEW OF LITERATURE

According to **Patel and Vishwanath (2012)**, the demand of energy has been increased over the years due to increasing world population and expansion of global industries especially for food and basic requirements, and he has also suggested that we are unable to meet the complete requirement hence the crisis is there for energy in today's world. Mostly of the energy consumption is used in power generation, industries & factories, transportation, and community sectors. Hence, to fulfill our requirement people are mostly dependent on energy, taken from fossil oil, gas, and coal.

According to **Bagher, Vahid and Mohsen (2015)** The Earth receives an incredible amount of heat or light in the form of solar energy. The sun, an average star, inside the core of sun, has a fusion reactor which is burning for 4 billion years. This provides enough energy in one minute which is even more than the world's energy requirement for one year.

In one day, the sun provides more energy than our present scenario population would consume in 27 years. In fact, "The amount of solar radiation striking the earth over a three-day period is almost same as to the energy which is stored in all fossil energy sources.

"Solar energy is a free, inexhaustible resource, renewable resource yet harnessing it is a really a new concept. According to a study by **Bagher, Vahid, and Mohsen (2015)**, they considered the first practical solar cells were made less than 30 years ago, we have to come a long way. The prolongation of professional solar companies designing unique and specific solar power systems for individual homes means there is no longer an excuse not to consider solar power for our home. The biggest jumps inefficiency came "with the advent of the transistor and accompanying semiconductor technology. There are several advantages of photovoltaic solar power that make it one of the most promising renewable energy sources in the world."

This project is non-polluting, it has no parts which could break down easily, requires little maintenance and not much supervision, and has a life of 20-30 years with is cost-effective or can say is in our cost limit. It is unique in its designing because no large-scale installation is required in its set up. Remote areas can easily generate their own supply of electricity by constructing as per their requirement on a small or a large scale. Solar power generators are installed in a residential area which is simply distributed to homes, schools, or businesses; their assembly does not require extra development or land area and their function is safe and quiet and hence no people is affected by its plantation. As with time communities grow, more solar energy panel's capacity can be added.

According to **Sharma, Sharma and Kumar Jain (2015)** “The Sunlight is never ending renewable source of energy which is free of all kind of pollution, and it is more reliable. This solar energy can fulfill the requirement of the energy which was provided or was drawn from the non-renewable sources like such as fossil fuels and petroleum deposits inside the earth. The manufacturing of solar cells has passed through a large number of steps and has improved a lot since many generations or can be said that many generations has passed away making solar cells to develop completely and to take the work of nonrenewable source.

Solar energy is mostly using the plant in the developing countries; the fastest growing segment of the photovoltaic's market is the solar energy market. People can go without electricity during the day because the sun beats down on the land, as solar power is the utmost energy choice. The researcher said that "Governments are finding its modular, decentralized character ideal for filling the electric needs of the thousands of remote villages in their countries." It is practically more useful than the use of expensive power lines into far remote areas, where people are not able to pay the money conventional electricity which is costly for them even not more reliable. There are merely two primary disadvantages of using solar power installation in any area: the amount of sunlight and cost of equipment installed. The amount of sunlight falling on location depends or varies greatly on their geographical location, time of day, season and clouds; sunlight could be variable at a variable position at the same time.

As we come to know the importance of the use of solar cells and efficient use of solar energy in human life adapted to them, in this article the author has examined the various types of solar cells. A solar cell, or photovoltaic cell, is an electrical device which converts the sun's energy directly into electricity by the photovoltaic effect, which is a physical and chemical phenomenon that takes place.

Passive solar and daylighting are stored in materialistic things at a very high rate but unable to quantify the actual amount which can be stored. Hence Well-Created passive solar systems decrease the requirement for additional comfort heating requirements almost by 15% for existing buildings and about 40% for new buildings.

The Production of electricity using PV panels is today's a worldwide phenomenon. Cabeza said that by using PV Panels “Assisted by supportive pricing policies, the compound annual growth rate for PV production from 2003 to 2009 was more than 50%—making it one of the fastest-growing energy technologies in percentage terms. As of the end of 2009, the installed capacity for PV power production was about 22 GW. Estimates for 2010 give a consensus value of about 13 GW of newly added capacity.” Today mostly of installations are mounted on the roof or is grid-connected. The production of electricity from CSP installations has increased so much effectively in a highly planned capacity in just a few years, hence. As a result several countries beginning

to experience significant new installations of PV Panels. Solar energy conversion is today's the highest priority in a family of technologies which has a broad range of use everywhere and everywhere and its energy service applications are: lighting, comfort heating, hot water for buildings and industry, high-temperature solar heat for electric power and industry, photovoltaic conversion for electrical power, and production of solar fuels, for example, hydrogen or synthesis gas (syngas).

Oil usage is today the dominant factor in the transport sector, technology sector, same as in government sectors and policies which results in diversification of electricity generation by the previous sources such as gas, coal, nuclear, hydropower and other renewable sources and hence their dependency has decreased, and solar dependency has increased.

According to **Teske, Dominish, Ison, and Maras (2016)**, Today's scenario is such that the global energy market is changing rapidly. Renewable energy technologies are now used in new power plants which are constituted worldwide every year because today we are moving towards the renewable source of energy.

According to Author "In 2014, growth rates for coal use stalled globally for the first time, including in China. This trend continued through 2015". Today as is it seen, oil and coal prices are at a low record, and hence which has decreased the development of most new coal and oil mining projects worldwide. According to them "While electric vehicles still have a negligible share of global car transport, this is likely to change as most international car manufacturers prepare for a massive shift toward electric vehicles. It is possible that the market for electric vehicles could follow the same exponential development pathways as the solar photovoltaic (PV) market. Between 2010 and 2015 solar technology suddenly took off, with increasing market shares and a significant drop in investment costs".

Solar energy usage is very cheaper as compared to electricity taxes which are mostly used in industrialized countries. As such, it is now under their cost limit for many households, and so they can produce their own power. Today it is found that Wind power is the cheapest technology worldwide for new power plants being to set up. They described briefly "This led to a huge global market for wind with 63,000MW of capacity added during 2015 – equivalent to installing a new turbine every 10 minutes. These global developments are already having an impact on Australia's energy market, and this impact can only increase in the coming years."

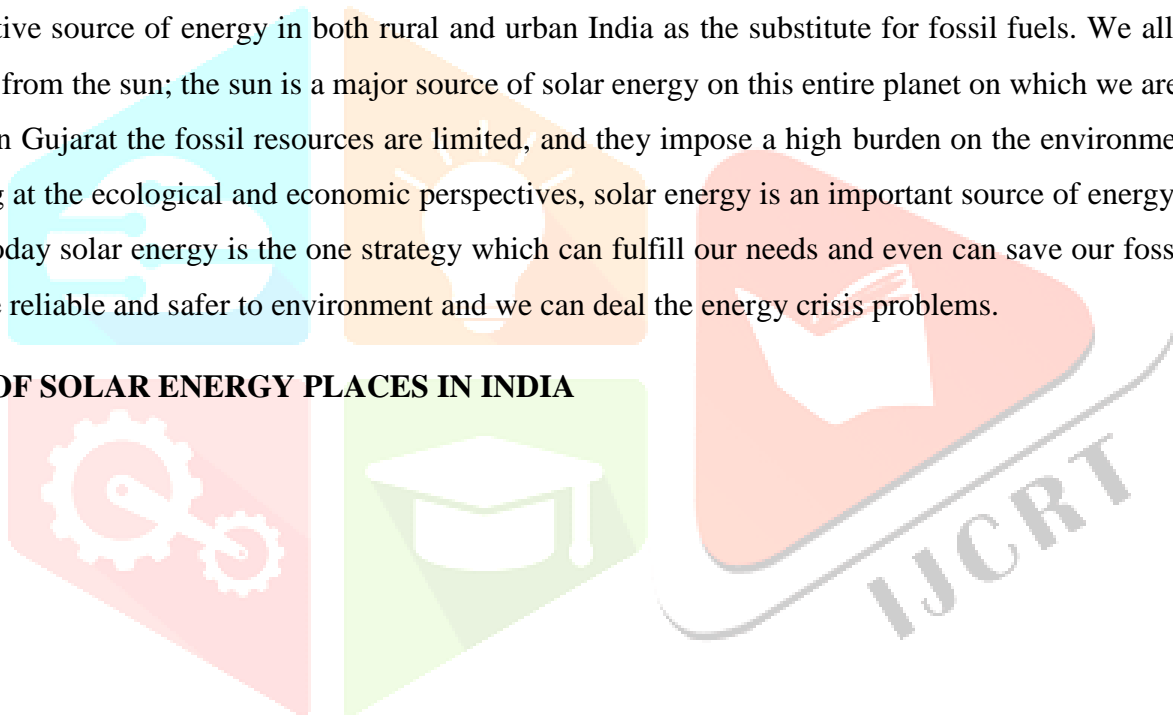
According to **Kammen (2015)** the growth of the U. S. and global solar energy are dependent on each other as well as this industry depends on a strong relationship between science and engineering development, manufacturing, and cycles of designing the policies related to them and its advancement in this way to the more usage of solar energy and beneficial to country and environment both. Hence proving this author describes by

giving an example “The mixture of the academic and industrial engine of innovation that is Silicon Valley, and the strong suite of environmental policies for which California is a leader work together to both drive the solar energy industry, and keep Silicon Valley competitive as China, Europe and another area of solar energy strength continue to build their clean energy sectors.”

## INDIAN SCENARIO

In India which is a developing country more than 70% of the population lives in the rural areas where more than 85% of the energy which is consumed comes from non-conventional sources, the common one is fuelwood. The conventional fuel is very costly which is not in the estimation of normal rural people hence the necessity of other energy sources arrives to meet the demands of people. Hence today solar energy provides an alternative source of energy in both rural and urban India as the substitute for fossil fuels. We all get the solar energy from the sun; the sun is a major source of solar energy on this entire planet on which we are living. Patel says “In Gujarat the fossil resources are limited, and they impose a high burden on the environment, therefore, looking at the ecological and economic perspectives, solar energy is an important source of energy for the state. Thus today solar energy is the one strategy which can fulfill our needs and even can save our fossil fuel, and it is more reliable and safer to environment and we can deal the energy crisis problems.

## MAP OF SOLAR ENERGY PLACES IN INDIA





Source: - Windergy India 2017

The start of the National Solar Mission assumes essential part of sunlight based vitality in India.

The Features Are As Per The Following

Installed limit will upgrade up to 20,000 MW by 2022.

A solitary window financial specialist inviting Mechanism.

For next 30 years, arranged a speculation of Rs 90,000 crores.

Government of India gave first cost of Rs 4337 crores for the main period of the mission Target for control age.

For first Phase (finishing 2013): 1300 MW (PV + CSP).

Grid Connected (33 kV): 1000 MW (PV + CSP).

Rooftop PV and Small Solar: 100 MW.

Off-Grid PV Applications: 200 MW.

Source: - Power Electronics and Its Application to Solar Photovoltaic Systems in India

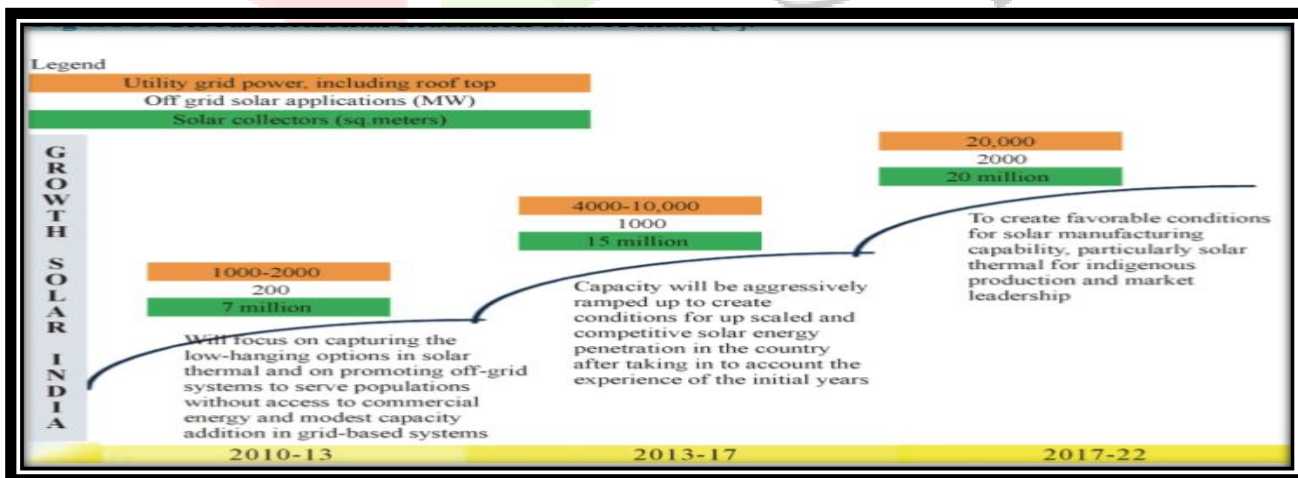




Source: - ETEnergyworld.com

The arrangement of US \$19 billion to create 20 GW of solar power or sunlight based power by 2020, in July 2009 is to be disclosed by India, appeared in above figure. The utilization of sun based controlled gear and applications would be made obligatory in all administration structures, and additionally clinics and inns, under the arrangement. India was prepared to produce 1000 MW of energy by 2013 on eighteenth November 2009 by propelling National Solar Mission under the National activity anticipate environmental change (Kulkarni, & Virulkar, 2016).

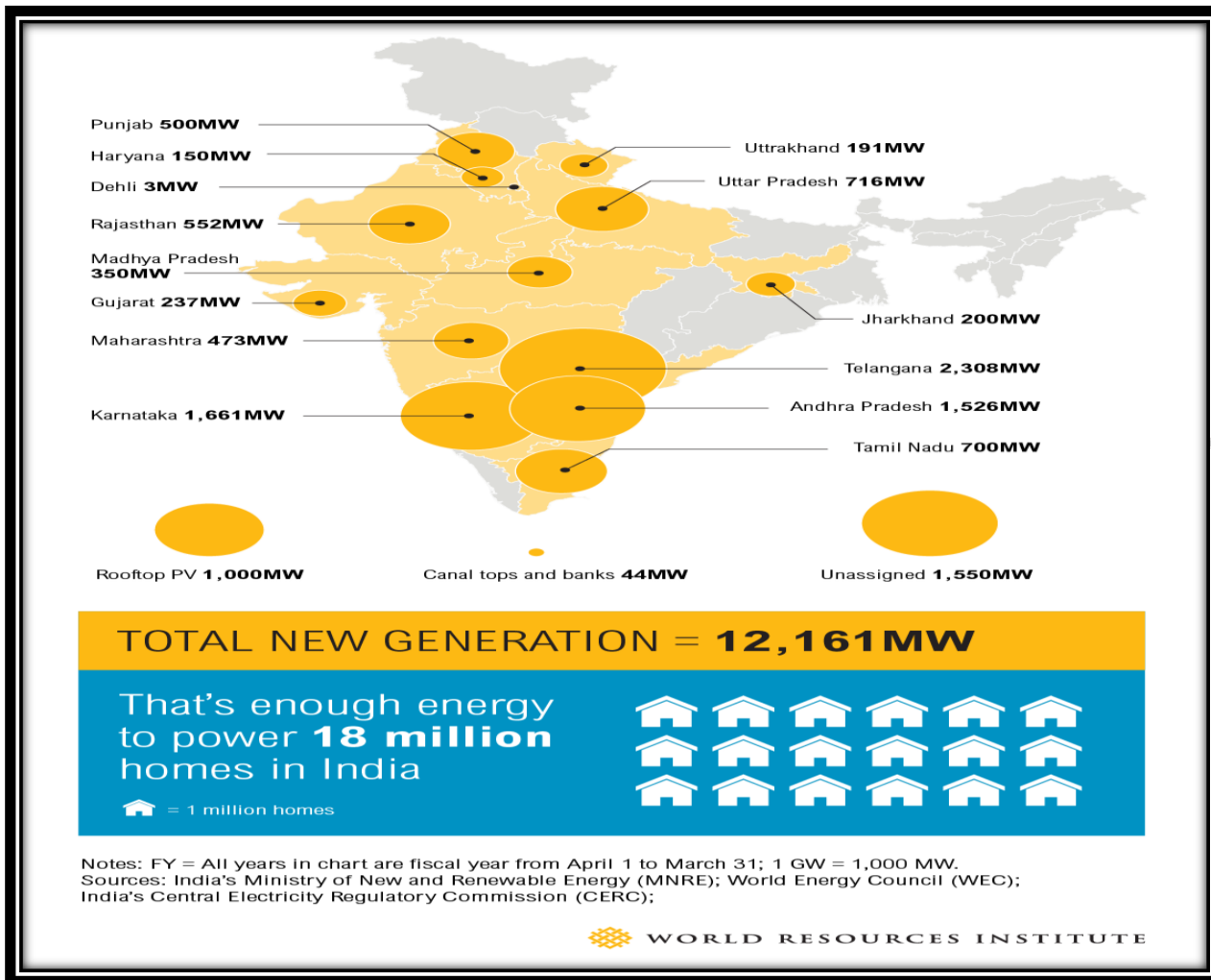
### PLAN OF GROWTH OF SOLAR POWER IN INDIA



Source: - National solar mission in India.

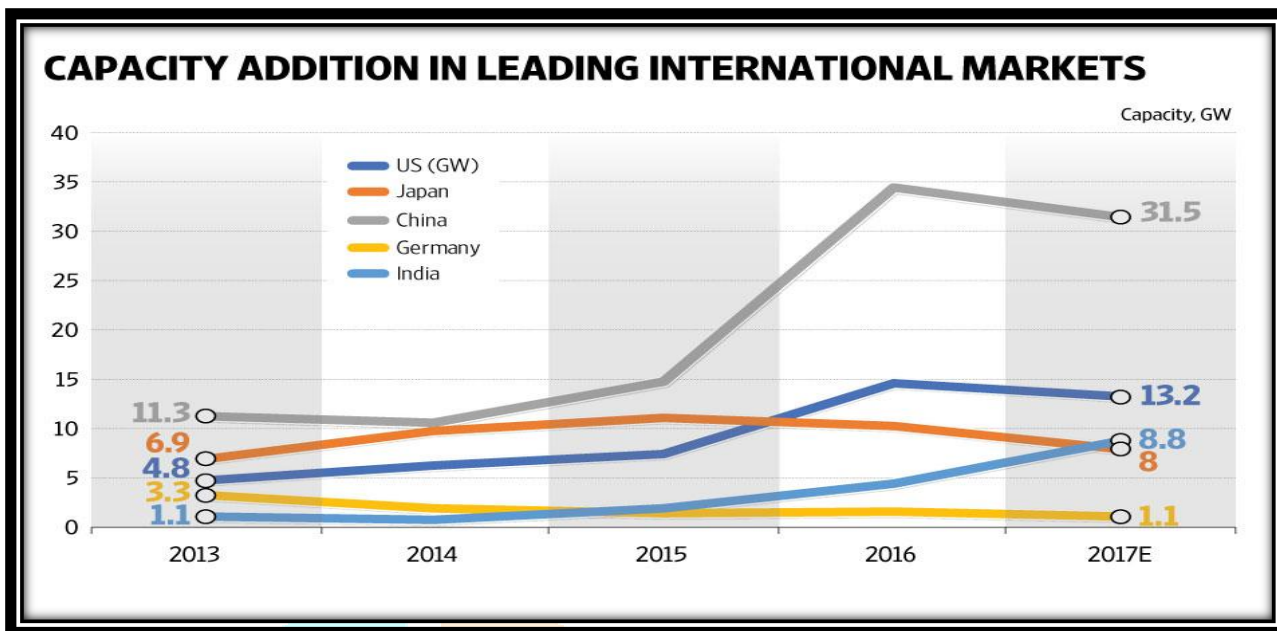
India is likewise finding a way to address issues of monetarily unviable state electricity retailers and an insufficient network. For instance, the Green Energy Corridor (GEC)— an activity conceptualized and executed by the POWERGRID Corporation of India Limited and other state transmission utilities—will commission new transmission foundation to permit more renewables to be put on the matrix, while in the meantime handling issues with control discontinuity. The venture has been gaining relentless ground crosswise over various states like Andhra Pradesh, Rajasthan, and Tamil Nadu.

### INDIA’S NEW SOLAR POWER PROJECTS, FY 2017



The report by BTI, a consulting firm in India’s clean technology market, said solar capacity in the country is expected to touch 18.7GW by the end of 2017, which is about 5% of global solar capacity.

As of March 2017, India had installed 12.2GW of utility-scale solar. In June 2015, the government had revised India’s solar power target to 100GW from 20GW, by 2022.



Source: - <http://www.livemint.com/Industry/9U7aHwYKlhmQGASjSqiavN/India-to-be-third-largest-solar-market-in-2017-report.html>

**Sharma (2011)** “The BTI report said the "aggregate new solar capacity limit expansion in the following five years is normal at 56GW". This, in any case, suggests that India would fall short of its 100GW target”.

As indicated by the BTI report, around 79GW of solar capacity limit is required to be included comprehensively in 2017, with Asian nations proceeding to overwhelm the business while Europe keeps on falling in rankings.

**TABLE 1.1:- CAPACITY ADDITION IN LEADING STATES**

Gujarat	Maharashtra	Punjab	Andhra Pradesh	Rajasthan	Tamil Nadu	Telangana	Karnataka	Madhya Pradesh	Uttar Pradesh	Others/ State (MW)
15	1	2					6			4
117	18	4	10	53	2	1				18
823	25.6	11.5	20	213	11	6	14	11.6	14	55.3
868.7	230.15	16.5	65.15	688.9	45	30	41	247.2	19	71.3
930.65	322.5	59.5	136.35	906.1	115.3	143.8	74	402.7	31	94.8
1024.95	398.1	202.75	176.7	1296.6	349.983	314.05	129	686.2	123.1	275.05
1111.85	411.47	704.75	1030.25	1326.6	1583.4	1022.65	515.5	855	229.6	521.7
1281.85	963.57	855.75	2900	2126.6	1755.4	2764	1545.5	1380	759.6	721.7

In India, the conditions of Tamil Nadu, Andhra Pradesh and Telangana have risen as the quickest developing as far as solar energy or sunlight based power limit expansion. In 2017 about 60% of the aggregate new limit option is required to originate from the southern states, the report included.

"Indian sunlight based market has developed by a normal 72% over the most recent three years and is presently worth around 8-9GW for every annum. Developing business sector estimate and solid government responsibility regarding the division have pulled on the planet's driving private area players and additionally brought about lower taxes for customers. As the division develops, be that as it may, there is an imposing new test emerging as for how to assimilate rising offer of discontinuous vitality into the framework," said Vinay Rustagi, managing director of BTI.

## CONCLUSION

While the Indian government has found a way to help the supply of sun based on the framework, it should now likewise concentrate its consideration on the interest for sun-powered vitality, by creating arrangements that give the private division access to moderate sun-powered. These arrangements must help disseminated and off-network age frameworks, and also the appropriation of capacity innovations—both of which are important to achieve India's eager sunlight based objectives.

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