International Journal of Pure and Applied Researches http://ijopaar.com; 2018 Vol. 2(1); pp. 27-33, ISSN: 2455-474X

Solar Power Generation Technology in India

Dr. Mohammad Miyan

Associate Professor, Department of Mathematics,
Shia P. G. College, University of Lucknow, Lucknow,
Uttar Pradesh, India -226020.

Email: mabbas_7786@yahoo.com

Abstract

The future of solar energy in India for the foremost half depends on achieving the formidable energy generation target of one hundred GW by 2022. With the accumulative star capability increasing to 15.6 GW, as on 2017, the market sentiment is upbeat because of the record vary of installations. Whereas 2017 to register addition of 8-10 GW, we've got an inclination to would possibly to boot face a lag among the short term as not many tenders square measure being free. Whereas the forceful reduction in tariffs may result during a heap of demand, it's to boot left investors concerned. But with device costs on the face of it to plummet a lot of and energy storage technologies resurgent the efficiency equation for the upper, they need to not have easy to stress relating to. The govt. will majorly drive the demand with the NTPC, NLC, CIL, NHPC and Railways all inviting tenders for solar come. In line with the Bloomberg New Energy Outlook 2017 report, tons of economical batteries will provide flexibility of use and boost the reach of renewable, cutting the worth of solar energy by 66 %. With energy storage discovering and costs becoming increasingly viable, this formidable combination will facilitate manufacture an awfully property theme and decrease carbon dioxide considerably.

Keywords: Solar energy, Solar technology, Thermal power.

1. Introduction

India distended its solar-generation capability eight times from a 650 MW on 2014 to over 20 GW as on 2018. The country else three GW of star capability in 2015-2016, five GW in 2016-2017 and over ten GW in 2017-2018, with the typical current value of star electricity dropping to eighteen below the typical value of its coal-fired counterpart (McGrath, 2017).

A rooftop solar energy account for 3.4 GW, of that 70 percent is industrial. Additionally to its large-scale grid-connected star PV initiative, India is developing off-grid solar energy for native energy desires. Solar merchandise have progressively helped to fulfill rural needs; by the tip of 2015 slightly below a million star lanterns were oversubscribed within the country, reducing the necessity for lamp oil. That year, 118,700 solar home lighting systems were put in and forty 6,655 solar street lighting installations were provided underneath a national program; simply over 1.4 million solar cookers were

distributed in Asian country. In 2019, Indian Railways declared to install 4 GW capabilities on its tracks (Wiki, 2017).

2. Technology

Solar Photovoltaic

Solar electrical phenomenon (SPV) cells convert radiation (sunlight) into electricity. An electric cell may be a semi-conducting device fabricated from Si and/or different materials, which, once exposed to daylight, generates electricity. Solar cells are connected serial and parallel mixtures to create modules that offer the desired power.

- Crystalline Si star cells (C-Si): Mono-crystalline and crystalline.
- Thin-film star cells: Amorphous Si star cells (A-Si), CIGS, CdTe.

PV modules are factory-made by collection the star cells once stringing, tabbing and providing different interconnections. The given figure-1 shows the structure of solar voltaic cell.

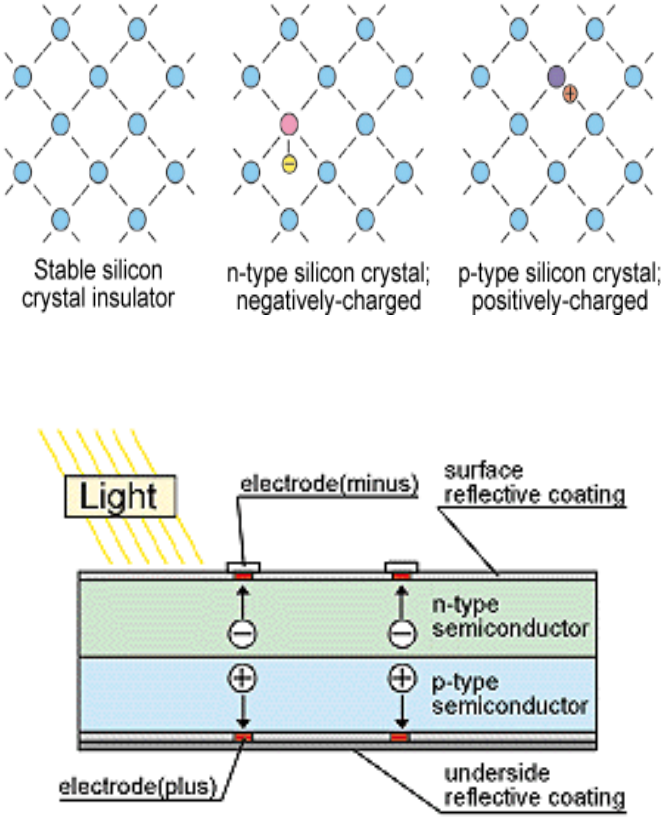

Figure-1 (Photo Voltaic Cell)

Solar Thermal

Solar Thermal Power systems, additionally referred to as concentrating solar energy systems, use focused radiation as a hot temperature energy supply to provide electricity mistreatment thermal route. Hot temperature alternative energy collectors area unit primarily of 3 types:

- Parabolic trough system: at the receiver will reach 400° C and manufacture steam for generating electricity.
- Power tower system: The mirrored rays of the sun area unit invariably aimed toward the receiver, wherever temperatures well on top of 1000° C will be reached.
- Parabolic dish systems: Parabolic dish systems will reach 1000° C at the receiver, and reach the very best efficiencies for changing alternative energy to electricity.

Figure-2 (Solar Panels)

3. Current Projects (includes both- installed and under installation projects)

S. No.	State	Photovoltaic Capacity (MW)	Solar Thermal Capacity (MW)
1.	Rajasthan	43	400
2.	Gujarat	722	45
3.	Maharashtra	133	-
4.	Karnataka	10	-
5.	Andhra Pradesh	20.5	-
6.	Uttarakhand	4	-

7.	Punjab	5	-
8.	Haryana	7.8	-
9.	Uttar Pradesh	11	-
10.	Jharkhand	16	-
11.	Chhattisgarh	4	-
12.	Madhya Pradesh	7.25	-
13.	Odisha	11	-
14.	Tamil Nadu	12	-
TOTAL		**1006.55**	**445**

4. Advantages of Solar Energy in India

Some of the benefits of solar energy that makes it all the lot of appropriate for India are as follows:

- This is inexhaustible supply of energy and therefore the best replacement to different non-renewable energies in India.
- Solar energy is atmosphere friendly. Once in use, it doesn't unharnessed carbon dioxide and different gases that bemire the air. Thus it's terribly appropriate for India, India being one amongst the foremost contaminated countries of the globe.
- Solar energy will be used for sort of functions like as heating, drying, cookery or electricity, which is appropriate for the agricultural areas in India. It may be employed in cars, planes, giant power boats, satellites, calculators and plenty of a lot of such things, simply apt for the urban population.
- Solar power is inexhaustible. In energy deficient country like India, wherever power generation is expensive, alternative energy is that the best alternate means that of power generation.
- You don’t would like an influence or gas grid to induce alternative energy. An alternative energy system will be put in anyplace. Solar panels will be simply placed in homes. Hence, it's quite cheap compared to different sources of energy.

5. Disadvantages of Solar Energy in India

We cannot generate energy throughout the getting dark with solar energy.

- And, additionally throughout day time, the weather is also cloudy or rainy, with very little or no sun radiation. Hence, this makes alternative energy panels less reliable as an answer.

- Only those area units that receive sensible quantity of daylight are appropriate for manufacturing solar energy.
- Solar panels additionally need inverters and storage batteries to convert direct electricity to alternating electricity therefore on generate electricity. Whereas putting in a solar array is kind of low-cost, putting in different equipments becomes valuable.
- The land house needed to put in a star plant with solar array is kind of giant which land house remains occupied for several years altogether and can't be used for different functions.
- Energy production is kind of low compared to different styles of energy.
- Solar panels need considerable maintenance as they're fragile and may be simply broken. Therefore additional expenses area unit incurred as further insurance prices.

6. Solar Energy Power in India: Future

In solar power sector, several giant comes are planned in India. Thar Desert has a number of India's best solar energy comes, calculable to come up with 700 to a 2,100 GW. On March 1st, 2014, the then Chief Minister of Gujarat, Narendra Modi, inaugurated at Diken in Neemuch district of Madhya Pradesh, India's biggest solar energy plant. The Jawaharlal Nehru National Star Mission (JNNSM) launched by the Centre is targeting 20,000 MW of solar power by 2022. Gujarat's pioneering solar energy policy aims at 1,000 MW of solar power generation.

In 2009, a $19 billion solar energy arranges was undraped that projected to provide 20 GW of solar energy by 2020. About 66 MW is put in for numerous applications within the geographic region, amounting to be utilized in star lanterns, street lighting systems and star water pumps, etc.

India is slowly gaining its prominence within the generation of solar energy thanks to the great and impressive state and therefore the Centre's solar policies and comes and National Solar Mission. Within the latest 2014 budget, minister Jaitley declared that the govt. has planned five hundred crore rupees to develop some mega solar energy plants in Gujarat, Tamil Nadu, Rajasthan, and Ladakh. He additionally aforementioned that solar powered agricultural water pumping stations associated one MW solar parks on canal banks are developed within the country at an calculable price of $74 million and $18.5 million, severally. Considering of these facts, we have a tendency to do have a bright image before folks as India's potential to be a solar energy driven country of the globe.

7. Challenges and opportunities

The land is scarce in India, and per-capita land accessibility is low. Dedication of land for the installation of solar arrays should contend with different desires. The number of land needed for utility-scale alternative energy plants is regarding one km^2 (250 acres) for each 40–60 MW generated. One various is to use the water-surface space on canals, lakes, reservoirs, farm ponds and therefore the ocean for giant solar-power plants. These water bodies may also offer water to scrub the star panels. Highways and railways may additionally avoid the value of land nearer to load centers,

minimizing transmission-line prices by having solar plants regarding ten meters on top of the roads or rail tracks. Solar energy generated by road areas may additionally be used for in-motion charging of electrical vehicles, reducing fuel prices. Highways would avoid harm from rain and summer heat, increasing comfort for commuters.

The design best suited to most of India would be a collection of top power-generation systems connected via an area grid. Such an infrastructure, that doesn't have the economy of scale of mass, utility-scale solar-panel preparation, desires a lower preparation value to draw in people and family-sized households. Photovoltaic are projected to continue their price reductions, changing into ready to contend with fossil fuels.

Greenpeace recommends that India adopt a policy of developing alternative energy as dominant parts of its renewable-energy combine, since its identity as a densely-populated country within the tropical belt of the landmass has a perfect combination of high isolation and an outsized potential shopper base. In one state of affairs India may build renewable resources the backbone of its economy by 2030, curtailing carbon emissions while not compromising its economic-growth potential. A study urged that a hundred GW of solar energy can be generated through a combination of utility-scale and top star, with the realizable potential for top star between fifty seven and seventy six GW by 2024.

During the 2015-16 year NTPC, with one hundred ten MW alternative energy installations, generated a 160.8 million kWh at a capability exercise of 16.64 % (1,458 kWh per kW) - more than twenty percent below the claimed norms of the solar-power business.

It is thought-about prudent to encourage solar-plant installations up to a threshold (such as 7,000 MW) by providing incentives. Otherwise, substandard instrumentation with overrated plate capability might tarnish the business (Asthana, 2015), (Chandrasekaran, 2016). The customer, transmission agency and financial organization ought to need capability exercise and semi permanent performance guarantees for the instrumentation backed by amount within the event that the first instrumentation manufacturer ceases to exist (Prasad, 2015). Afraid by the caliber of apparatus, India issued draft quality guide lines in mighty 2017 to be followed by the star plant instrumentation suppliers orthodox to Indian standards (Wiki, 2017).

8. Conclusion

The future of solar power in India for the most part depends on achieving the formidable alternative energy generation target of 100 GW by 2022. With the accumulative star capability increasing to 15.6 GW, as on 2017, the market sentiment is upbeat thanks to the record range of installations. Whereas 2017 to register an addition of 8-10 GW, we have a tendency to might additionally face a lag within the short term as not several tenders are being free. Whereas the forceful reduction in tariffs can result in a lot of demand, it's additionally left investors involved. However with electrical device prices seemingly to plummet more and energy storage technologies dynamical the potency equation for the

higher, they ought to not have abundant to fret regarding. The govt. can majorly drive the demand with the NTPC, NLC, CIL, NHPC and Railways all invitatory tenders for star comes. In line with the Bloomberg New Energy Outlook 2017 report, a lot of economical batteries can give flexibility of use and boost the reach of renewable, cutting the price of solar power by sixty six percent. With energy storage discovering and prices changing into progressively viable, this formidable combination can facilitate produce a very property scheme and cut back carbon footprint significantly.

References

[1]. Asthana, S. (2015); How solar energy is changing the power sector's dynamics, Business Standard India. Retrieved 25 November 2015.

[2]. Chandrasekaran, K. (2016); National lab policy for renewable energy soon, The Economic Times. Retrieved 25 July 2016.

[3]. Prasad, R. (2015); Shadows of thermal power gloom loom over solar industry, The Economic Times. Retrieved 28 November 2015.

[4]. McGrath, M. (2017); Five effects of a US pull-out from Paris climate deal, BBC. Retrieved 2017-06-01.

[5]. Solar power in India (2017); From Wikipedia, the free encyclopedia. Available at: https://en.wikipedia.org/wiki/Solar_power_in_India

[6]. India Solar Energy; http://www.eai.in/ref/ae/sol/sol.html

[7]. https://www.mapsofindia.com/my-india/india/scope-of-solar-energy-in-india-pros-cons-and-the-future

[8]. https://economictimes.indiatimes.com/industry/energy/power/indias-solar-power-capacity-crosses-12-gw/articleshow/58113364.cms