

REVIEW ON POWER GENERATION FROM NON-CONVENTIONAL ENERGY SOURCE IN INDIA ESPECIALLY FROM SOLAR

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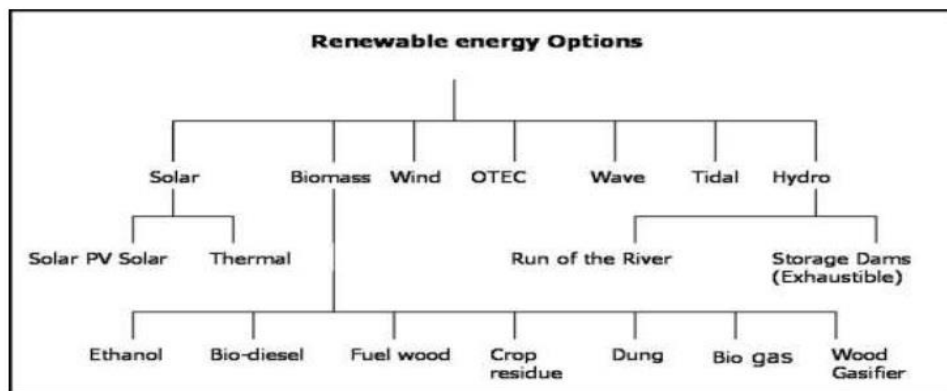
ABSTRACT

The energy demand is growing day by day in everywhere. The Conventional energy sources are very less available and also limited. Renewable energy resources have important role in the future. In 2009 Government of India had launched Jawaharlal Nehru National Solar Mission (JNNSM). The target was to start Solar Projects of 20 GW up to 2022. Government has decided to make 100GW project up to 2022. The decision is taken in May 2015. This paper provides information of solar energy in India. It reviews the existing status of solar energy in terms of current capacity, along with historical scope of solar energy. In this also focuses on the technical and economical problems and challenges for development and uses of solar energy technology. The paper also reviews government act and regulatory policies in support with solar energy development in India. Policy is helpful to achieve the goals of Govt. Finally, a review of power generation from non-conventional energy sources in India especially from solar is presented.

Index Terms – Solar Power, Non-Convention Energy Source, Renewable Energy, Indian Policies.

INTRODUCTION

India is the fastest growing country regards with energy consumption. Currently, India is the fifth largest consumer of energy in the world, and will be make third largest up to 2030. At the same time, the country is maximum dependent on fossil sources of energy for most of regular demand. This has necessary the country to start fast pursuing alternative energy sources - solar, wind, small hydro, bio-fuels and more other etc. (1)



India has an potential of renewable energy around 89,000 MW from commercially sources of use: Wind 47000 MW, hydro 16000 MW and bio-energy 26000 MW. Plus, The potential in India is to generate 37 MW per square km using solar thermal & photovoltaic energy. Also proposed extra 16000 MW of Renewable Energy generation capacities during the specific time. Wind energy generation projects form 75 percent of the extra capacity addition, while Hydro Projects accounts for 9.3 percent of extra capacity addition. In the alternative energy sources solar is one in the main energy source in world today. Maximum energy comes from the Sun which we can use to make electricity for a year. Sunlight is easily available in anywhere.

Solar is very large source and emitting lots of hot power in the form of rays. We can take this power easily anywhere and can use it for power generation, and that generated power we can use for our day today life as it is essential for now days.

Sun is transmit both type of rays like heat and light. The heat came from sun we can use to make thermal energy from that we can heat the water and get hot water and hot air is used for commercial and residential heating purpose, and the energy generation used with steam or engines. The light is used for photovoltaic systems to convert light as a electrical energy and in this areas our solar industry is doing efforts today. Our aim about this paper is to help decision makers understand potential of solar energy for future importance, the

many problems that may prevent solar technologies from realizing that type of potential, and the part of sound public policies that could reduce current problems.

Overview about Solar Energy

Solar energy generated by direct photovoltaic's or indirect by solar thermal energy. The photovoltaic power plant a solar cell or photovoltaic cell is used which is a element that changes light into electric energy using the photoelectric effect. Photovoltaic cell is solid state device having thin layer of semiconductor material that generate electrical power when exposed to light. PV generation of power consist of solar energy having number of solar cells connected with some pv materials. Mono-crystalline silicon material used for PV & poly-crystalline silicon, cadmium telluride and copper indium sulfide[18]. The Energy Agency has classified the PV applications into four categories as off-grid domestic, off-grid nondomestic, grid connected distributed and grid connected centralized[17]. In a Concentrating Solar Power plant the heat is collected by using lenses or mirrors and transformed to mechanical energy by using a steam turbine and then into electricity[19]. Wide ranges are done into technologies CSP plant; The developed are parabolic trough, solar power tower, concentrating linear Fresnel reflector & sterling dish. The different techniques are used to track the sun & focus light[18]. In this paper we are giving information about both type of plant.

Solar Energy potential in India

India is maximum solar energy potential. Most area of India get 300 days of sun rays a year[20]. About 5,000 trillion kWh per year energy is comes over Indian land area with maximum area get 4-7 kWh per sq. meter per day[1]. Hence, Two technology solar thermal and solar photovoltaic's are effectively provide maximum capability for solar in India land. Solar also provides power ability to generate on a classified basis. suppose 10% conversion efficiency for PV modules it is three orders of magnitude max than the likely electric energy demand for India on the year 2015[2]. Figure 1 shows solar radiation information in map of India. It is observed that highest annual global radiation is came in Rajasthan and northern Gujarat area.

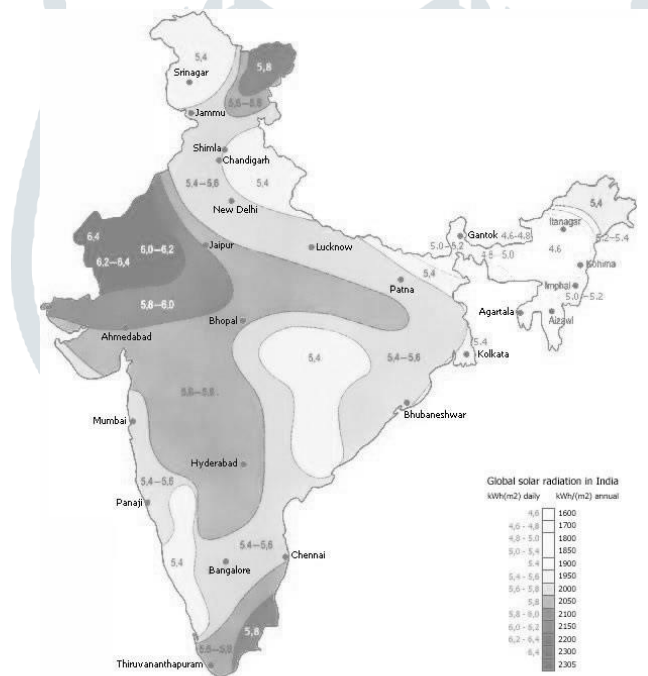


Figure 1. Solar radiation of india (Source: solar energy in india, solar energy association, Maharashtra). (1)

Current Status - India Solar Energy

India is ranked 11th in solar energy generation in the world as noticed on Jan. 2014[13]. Government was given fund to solar energy in India. As per 2005 only accounted for about 6.4MW/yr of power. In 2010 capacity of 25.1MW was included and 468.3MW in 2011 year and in 2012 the capacity increase more than 2 times and become made 1205 MW. As per 2013 capacity added to 1114MW and during 2014 capacity increased to 313MW[15]. And in August 2015, the installed grid connected solar energy capacity is 4.22 GW. The solar energy price has come from Rs. 17.90 per unit in 2010 to about Rs. 7 per unit in 2015. It is expected in future that with technology improvement & market competition solar energy will reach grid to 2017-18[3]. The Grid parity meaning the cost of electricity generated from alternative energy from solar becomes equal or less than the cost of purchasing energy from the grid[1,4]. Grid parity is very important concept in the solar system & preferably photovoltaic panel[5]. The Charanka Solar Park[6], having current installed capacity of 224 MW is the largest Solar Park in Asia, was commissioned on April 19, 2012[7]. Many solar power plant of

India is shown in the Table 2. In India, Rajasthan having largest share of solar power generation of 28.4% and Gujarat share is 24.4% as on September 2015[8]. Table 3 shows information about current solar power capacity of India's different state.

Table 2. Some solar plants of india. (1)

Plant Name	Peak Power (MW)	Year
Charanka Solar Park, Charanka village, Patan, Gujarat	224	April 2012
Welspun Solar MP project ,Neemuch, Madhya Pradesh	151	March 2013
Mahagenco Solar Project, Maharashtra	130	March 2013
Rajgarh Solar PV (NTPC),Rajghar Madhya Pradesh	50	March 2014
Welspun Energy Rajasthan Solar Project ,Phalodhi, Rajasthan	50	March 2013
Talcher Kaniha Solar PV (NTPC), Odisha	10	March 2014
Unchahar Solar PV(NTPC), Unchahar, Utter Pradesh	10	March 2014

Table 3. Current solar power capacity in some state as on september 2015 (1)

Sr. No.	State Name	Capacity (MW)
1	Andhra Pradesh	279.44
2	Arunachal Pradesh	0.265
3	Chattisgrah	73.18
4	Gujarat	1000.05
5	Haryana	12.8
6	Jharkhand	16
7	Karnataka	104.22
8	Kerala	12.025
9	Madhya Pradesh	673.58
10	Maharashtra	378.7
11	Orissa	56.92
12	Punjab	200.32
13	Rajasthan	1199.7
14	Tamil Nadu	157.98
15	Telangana	72.25
16	Tripura	5
17	Uttarpradesh	71.26
18	Uttarakhand	5
19	West bangal	7.21
20	Andaman & Nicobar	5.1
21	Delhi	6.712
22	Lakshadweep	0.75
23	Puducherry	0.025
24	Chandigarh	5.041
25	Daman & Diu	2.5
26	Others	0.79
Total		4346.818

PROBLEMS & CHALLENGES ON SOLAR ENERGY IN INDIA

Various problems and challenges on solar energy in India have been given below.

- The most of the problem regarding solar energy is its unavailability. The availability of solar radiation is dependent upon weather. So, we can't give assurance that in a particular time the energy from solar will be available to us.
- For solar power plant Large land area is necessary, which sometimes is not possible. The total land required for solar power plants is currently approx 1 km² for every 20–60MW power generation.
- 100 GW of solar mean about 10.5% share for solar energy in total generation of energy in India. So large share of sources requires maximum investments in the power grid infrastructure for transmission supply and demand management.
- To get a capacity of 60 GW for scale projects to 2022, the requirement of about 2800 billion Rs. The government currently required a big share of this to come from international sources. But the international fund of solar projects in India is very low[9].

•The problem for storage is also very serious. If the demand of power is not so maximum then the electricity generated by the solar plant have to be store somewhere to supply when demand will be there. This can be increases the total cost of the project or plant.

INDIAN GOVERNMENT INCENTIVES AND SUPPORT

Indian Government Acts and Policies for Solar Power Plant

India Government has Acts and Policies to support renewable Energy[10]. According to act 2003 the Electricity promotes electricity generation from co-generation and renewable energy sources. This Act accelerated the process of renewable energy development in the India. The guidelines given for competitive procurement have been done under Section 63 of the Electricity Act 2003 it states: “The Appropriate Commission will accept the tariff if such tariff has been found through transparent process of bidding with the guidelines decided by the Central Government”[11]. The policy of 2005 National Electricity stipulates that the share of electricity from non-conventional resources would need to be grow such purchase to distribution companies shall be through competitive way[2]. Tariff Policy 2006 states the Appropriate Commission will do a minimum percentage for purchase of energy[2] from non- conventional source as the availability of resources in that area and its affect on retail tariffs[21,22].

Solar mission Jawaharlal Nehru National Solar Mission (JNNSM) were launched in 11 January 2009 with the achieve for Grid Connected Solar Projects of 20,000 MW to 2022[20,19]. The Mission had taken a three-phase approach year. First four year (2009-13) had taken as Phase-I. The remaining four years of the twelfth Plan (2013–17) had been taken as Phase-II and the thirteenth Plan (2017–22) will be Phase-III of the project or plant .The aim of this project was to do addition 1,000 MW of grid solar power up to 2013, and another 3,000 MW to 2017[23]. The target for 2017 is higher based on the availability of international funds status and technology transfer status[20]. But in June 2015 The Union Cabinet of India given approval for stepping up of India’s solar power generation capacity[18] goal under the Jawaharlal Nehru National Solar Mission (JNNSM) to five times, reaching 100 GW to 2022. The target comprise of 40 GW rooftop and 57 GW through large and medium scale type of grid connected solar power plant[3]. By this step of government India is one of the greatest countries of the world in solar energy power generation[19]. Where new solar target of 100 GW is expected over 170 million tones of CO₂ over its life cycle process. The total investment shall be Rs.6,00,000 cr. (@ Rs.6 cr. per MW at current rate) for 100 GW power generation[3]. In Table 4 given the targets of power generation in classified years.

Table 4. Target of power generation in jnmsm by 2022 (1)

Year	Rooftop type solar power project (MW)	Ground Mounted type solar power project (MW)	Total (MW)
2015-16	200	1800	2000
2016-17	4800	7200	12000
2017-18	5000	10000	15000
2018-19	6000	10000	16000
2019-20	7000	10000	17000
2020-21	8000	9500	17500
2021-22	9000	8500	17500
Total	40000	57000	97000

Support from India’s Government

The India Government is giving Rs. 15,050 cr. subsidy to make promotion solar capacity addition in the country area[3]. This total subsidy giving for solar projects in many cities and towns. Solar power projects having investment of about Rs. 90,000 cr. would be taken developed using different method with thermal power[3]. Another, investment will come from huge Public Sector Undertakings (PSU) and Independent Power Producers (IPPs). Many states of the Government have also come with state solar policies to make promotion of solar energy technology.

CONCLUSION

The information about solar energy current status is given in this paper. The Ministry non- convectional energy resources, government of India is making efforts to increases the power capacity and achieve the goal of 100 GW up to 2022. This all information gives the status of solar energy is in good condition to survive but some extra things are required to do a better work regarding of solar source. Try to do less cost of solar power because the conventional energy sources having less cost as compare with non conventional energy source. It is very important to give support and subsidy to solar power plant till it takes as position of conventional energy source. The initiative given by India govt. is very good as India become one of the most part of solar powered country in world. Such type of initiatives are important to make growth in India.

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