Solar Energy- The Ultimate Renewable Energy

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Abstract: Renewable energy can be particularly suitable for developing countries. In rural and remote areas, transmission and distribution of energy generated from fossil fuels can be difficult and expensive. Producing renewable energy locally can offer a viable. The market for renewable energy technologies has continued to grow. Climate change concerns, coupled with high oil prices, peak oil, and increasing government support, are driving increasing renewable energy legislation, incentives and commercialization alternative.

Keywords— Solar energy , Ultimate energy ,Need of solar plant in India ,Steps taken by GOVT.OF INDIA.

Introduction:

‘Solar’ is the Latin word of ‘sun’ and the sun is the fount of all energy on the Earth. It is the source of life for plants, the cause of flow in the atmosphere and water it is what makes life possible. None can exist without it. Each square meter of Earth facing the sun receives about 1380 joules of energy. This quantity is known as solar constants. Solar technologies are used to convert sunlight into useful output. The International Energy Agency said that ‘the development of affordable, inexhaustible and clean solar energy technologies will have huge long term benefits. It will enhance sustainability, reduce pollution, lower the costs of mitigating climate Change, reduces the global warming’.[1]

The utilisation of solar energy in India has seen a new dimension with solar Energy based grid power generation. Today, the installed capacity for solar grid power has reached over 1040MW and the major part of it came in the 11 January 2010 with the launch of the Jawaharlal Nehru National Solar Mission. It is poised to take a leap to about 20000MW by the year 2022. In this paper we are going to study types of solar cells, manufacturing steps Of solar cell, specification of solar cell, cost estimation of solar plant, advantages and disadvantages of solar energy, steps taken by GOVT OF INDIA for implementing solar plant in different parts of country.

Electricity is the important part of our daily life, with the help of solar plant. We can generate Electricity which can be provided to the rural areas of our country for education as well as for comfort life. 20th August as “Rajiv Gandhi Akshay Urja Diwas” on the occasion of former Prime Minister late Shri Rajiv Gandhi’s Birthday.[2]

- All natural energy flows that are inexhaustible (i.e., renewable) from an anthropogenic point of view: solar radiation; hydropower; wind; geothermal; wave, and tidal energy; and biomass energy flows which occur naturally and repeatedly in the environment, such as wind and solar.

SOLAR DEVELOPMENT THROUGHOUT THE WORLD

Photovoltaic’s since 2007 has been increasing at twice the rate of wind - an average of 63.6%/year, due to the reduction in cost. At the end of 2011 the photovoltaic (PV) capacity world-wide was 67.4 GW, a 69.8% annual increase. Top capacity countries were, in GW: Germany Many solar photovoltaic power stations have been built, mainly in Europe. [4]

As of May 2012, the largest photovoltaic (PV) power plants in the world are the Agua Caliente Solar Project (USA, 247 MW), Charanka Solar Park (India, 214 MW), Golmud Solar Park (China, 200 MW), Perovo Solar Park (Ukraine, 100 MW), Sarnia Photovoltaic Power Plant (Canada, 97 MW), Brandenburg-Briest Solarpark (Germany, 91 MW), Solarpark Finow Tower (Germany, 84.7 MW), Montalto di Castro Photovoltaic Power Station (Italy, 84.2 MW), and the Eggebek Solar Park (Germany, 83.6 MW) There are also many large plants under construction. The Desert Sunlight Solar Farm is a 550 MW solar power plant under construction in Riverside County, California, that will use thin-film solar photovoltaic modules made by First Solar. [5] The Topaz Solar Farm is a 550 MW photovoltaic power plant, being built in San Luis Obispo County, California [6] The Blythe Solar Power Project is a 500 MW photovoltaic station under construction in Riverside County, California. The California Valley Solar Ranch (CVSR) is a 250 MW solar photovoltaic power plant, which is being built by SunPower in the Carrizo Plain, northeast of California Valley. [7] The 230 MW Antelope Valley Solar Ranch is a First Solar photovoltaic project which is under construction in the Antelope Valley area of the Western Mojave Desert, and due to be completed in 2013. [8]

SOME SOLAR PLANTS AVAILABLE IN INDIA

- The Jantar Mantar Solar Power Plant generates 9KW of power and its cost Rs.25 lakh to install it.
- Safdarjung Tomb Power Plant producing almost 10.4 KW of energy cost about the same.
- In year 1992 very first solar power plant was installed in village Lamni, in the district of Bilaspur.
- 800 KW grid connected SPV power plant at Narnaul, Haryana.
- Solar panel at the cultural centre, Keti Bunder.

IMPORTANCE OF RENEWABLE ENERGY:

The market for renewable energy technologies has continued to grow. Climate change concerns, coupled with high oil prices, peak oil, and increasing government
support, are driving increasing renewable energy legislation, incentives and commercialisation. New government spending, regulation and policies helped the industry weather the 2009 economic crisis better than many other sectors.

Renewable energy can be particularly suitable for developing countries. In rural and remote areas, transmission and distribution of energy generated from fossil fuels can be difficult and expensive. Producing renewable energy locally can offer a viable alternative. Technology advances are opening up a huge new market for solar power: the approximately 1.3 billion people around the world who don’t have access to grid electricity. Even though they are typically very poor, these people have to pay far more for lighting than people in rich countries because they use inefficient kerosene lamps. Some Small Island Developing States (SIDS) are also turning to solar power to reduce their costs and increase their sustainability.

MNRE led national R &D initiative on solar power – Technologies & Products for Solar Energy Utilisation (TAP-SUN). Utilisation through network ‘TAP-SUN’ envisages to crate network of Research Institutes, academics and industry with an objective to integrate various components of Technology development. To achieve this objective, it has established a network of Institutes for solar energy Called CSIR-NISE. TAP-SUN programme seeks to make solar energy accessible, cost effective & fuel of popular Choice. In doing so, it has enumerated the following objectives.

- generate less expensive solar energy.
- provide OFF grid electricity options to communities/villages for powering small appliances and fulfill domestic needs.
- Develope, demonstrate and deploy new application of solar energy for rural, urban and industrial sector.

**WHY RENEWABLE ENERGY IMPORTANT IN INDIA**

- Energy is the golden thread that connects economic growth, increased social equity, and an environment which powers the world to thrive.
- Widespread energy poverty condemns billions to darkness, to ill health, and to missed opportunities for education and prosperity.
- This poverty must end and renewable energy is the only way it can do so.

**FUTURESCOPE OF SOLAR ENERGY IN INDIA**

- The cost of labour for fabrication and erection of solar thermal systems is relatively less.
- Due to these conducive factors, many companies and organisation have been in the forefront in developing new technologies.
- Implementation of solar plant in India provides electricity which can be used for house appliances, industrial application, educational training, and health center based on solar energy in rural areas.

**STEPS TAKEN BY GOVT. OF INDIA FOR IMPLEMENTING SOLAR PLANT**

Jawaharlal Nehru National Solar Mission (JNNSM) was launched on 11 January 2010 by the Prime Minister of India.
- This mission aims at creating an enabling policy framework with the following purposes:
  - Deployment of 20000 MW of solar power by 2022.
  - Promotion of programmes for off grid applications of 2000 MW equivalent capacity by 2022.
  - Accumulation & utilization of 20 million sqm of solar thermal collector area by 2022 for various heat application viz. solar water heater, industrial process heat application etc.
  - Deployment of 20 million solar lighting system for rural areas by 2022.

**MISSION IS IMPLEMENTED IN THREE PHASES AS FOLLOWS**

- **Phase1:** solar power purchase obligation for states may start with 0.25% by 2013 & go up to 3% by 2022.
- **Phase2:** provision of solar specific renewable energy certificate mechanism to complement the policy of solar RPOs to allow solar power generation companies to sell certification to the utilities to meet their solar power purchase obligation whenever there is a shortfall in solar power generation capacity in that particular state.
- **Phase3:** states are being encouraged to bring out state specific solar policies for buying solar power & setting up of grid connected solar projects.

**STATUS OF IMPLEMENTATION**

- Total 1154 MW capacity of solar grid power has been allocated.
- 1054 MW of large solar power project connected to 33KV & above.
- 100 MW of smaller projects connected to less than 33 KV.
- Large projects include 84 MW under migration 620 MW as new project under Batch1, 350 MW PV projects under Batch2.
- Phase2 of JNNSM proposes to supports 3000 MW capacity of solar power projects & additionally 6000 MW capacity is expected to come through compliance of solar RPOs.
- A very clear agenda, a well thought out plan of action & the almighty sun at the core of its work, the Mission seeks to make a great strides in the sector of renewable energy.

**PROGRESS IMPLEMENTATION OF OFF GRID PV APPLICATION UNDER JNNSM**

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<th>Year</th>
<th>Target</th>
<th>Project sanctioned</th>
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The objective of the National Solar Mission is to establish India as a global leader in solar energy, by creating the policy conditions for its diffusion across the country as quickly as possible. The Mission will adopt a 3-phase approach, spanning the remaining period of the 11th Plan and first year of the 12th Plan (up to 2012-13) as Phase 1, the remaining 4 years of the 12th Plan (2013-17) as Phase 2 and the 13th Plan (2017-22) as Phase 3. At the end of each plan, and mid-term during the 12th and 13th Plans, there will be an evaluation of progress, review of capacity and targets for subsequent phases, based on the experience of the initial years. Capacity addition in grid-based systems and off-grid systems will be aggressively ramped up to create conditions for up scaled and competitive solar energy penetration in the country.

To achieve this, the Mission targets are:

- To create an enabling policy framework for the deployment of 20,000 MW of solar power by 2022.
- To ramp up capacity of grid-connected solar power generation to 1000 MW within three years – by 2013; an additional 3000 MW by 2017 through the mandatory purchase obligation by utilities backed with a preferential tariff. This capacity can be more than doubled – reaching 10,000MW installed power by 2017 or more, based on the enhanced and enabled international finance and technology transfer. The ambitious target for 2022 of 20,000 MW or more, will be dependent on the ‘learning’ of the first two phases, which if successful, could lead to conditions of grid-competitive solar power. The transition could be appropriately up scaled, based on the availability of international finance and technology.
- To create favorable conditions for solar manufacturing capability, particularly solar thermal for indigenous production and market leadership.
- To promote programmes for off grid applications, reaching 2000 MW by 2022 including 20 million solar lighting systems.
- To achieve 20 million sq. solar thermal collector area by 2022.

The Government has given In Principle approval to the over all targets proposed for the various activities covered under the Jawaharlal Nehru National Solar Mission.

- The Government has also decided to approve the implementation of the first phase of the Jawaharlal Nehru National Solar Mission during 2009-2013 and the target to set up 1,000 MW grid connected (33 KV and above) solar power plants,100 MW of roof top and small solar plants connected to LT/11 KV grid and 200 MW capacity equivalent off-grid solar applications in the first phase of the Mission, till March, 2013. An amount of Rs.4337 crore has been approved for the activities proposed under the first phase of the Mission till March 2013.

- The implementation of the target of 1,000 MW of grid connected (33 KV and above) solar power plants will be through a subsidiary of NTPC Limited. NVVN will directly purchase the solar power from the project developers as per the norms and guidelines fixed in this regard.

- 100 MW capacity of solar roof top and small grid connected solar power plants will be connected to LT/11 KV grid of the distribution utility and the solar power will be directly purchased by the distribution utilities as per the norms and guidelines fixed in this regard.

- 200 MW equivalent capacity of off-grid solar applications, both solar thermal and photovoltaic will be implemented through a combination of low interest bearing loans and /or central financial assistance. as per the norms and guidelines fixed in this regard.

- In addition, the Mission will support various activities, as considered necessary, on R&D, Human Resource Development, Technical Assistance, training, publicity and awareness etc. for successful implementation of the Mission.

- The detailed guidelines for implementation of each of the above components of the Jawaharlal Nehru National Solar Mission will be issued separately.

**RESEARCH & DEVELOPMENT**

Following centers of excellence have been sanctioned by Ministry.
- CEPT University , Ahmedabad – Solar passive architecture & green building technologies(2010-11)

**35 R & D Projects supported by MNRE are under implementation which includes following projects**
Indian Institute of Chemical Technology, Hyderabad.
- National Chemical Laboratory, Pune.
- National Physical Laboratory, Delhi.
SECI (Solar Energy Corporation Of India) has been set up for implementation of various activities under JNNSM. Board of Director of SECI headed by scientist Dr. Anil Kakodkar.[2]

CONCLUSION
Solar PV is gradually becoming economical & sustainable with both crystalline silicon & Thin film converters. India has a varied geographic pattern with some areas having to suffer grid inaccessibility or very weak power flows.
Under this diversity of power flows, solar PV power is being utilised as stand alone power for solar lanterns & lighting system (5w-200w) to penetrate areas with grid inaccessibility or unavailability of power. Solar PV stand alone application have a growing market.
Phase 2 of JNNSM proposes to support 3000MW capacity of solar power projects & additionally 6000MW capacity is expected to come through compliance of solar RPOS. A very clear agenda, a well throughout plan of action & the almighty Sun at the core of its work, the mission seeks to make great of renewable energy.

REFERENCES

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