

ROAD MAP FOR ENCOURAGING USE OF SOLAR ENERGY IN INDIA

- By S.K Chawla (CEO) – Company Winnerspitch

Executive Summary / Acknowledgements: *This write is addressed to readers who wish to glance through the road map for energy optimization- a dire need for sustenance for our society. The material given below is referred from Sustainable Development and Energy Mix (source JNSM), Demand And Supply of Energy in India upto 2030 (source JNSM and Integrated Energy Policy), Impact of Thermal Energy in Terms of Emissions and Climate Change (source Article on Climate Change-by Author), Role of Renewable Energy especially Solar, Wind, Tidal and Small Hydro etc. (Source: Planning Commission Report), International Scenario (source: IAE reports), National Plans (source: Planning Commission/CEA documents), Role of Different Agencies (source: JNSM/Kirit Parikh), and Recommendations and Conclusion by the experience of the author.*

SUN GOD – THE SAVIOUR FOR ENERGY CRISIS

Use of energy by mankind is as old as humanity itself. Various forms of energy - Animal, Bio, Coal, Petroleum and Gas, Coal Hydro, Solar, Wind, Nuclear etc provided power as the history evolved impacting our civilization. Based on the need and governing sense the options also evolved towards energy efficiency considerations and ease of exploitation. Interestingly, and somewhat ironically the attention towards sources outside our planet came a little later, but realizing that the ones on our planet were finite our attention was drawn much later, towards SOLAR and WIND Energy. Fortunately, the Government of India has formally categorized Solar as a subject of National Importance and is treating it as a mission, having launched as Jawahar Lal Nehru Solar Mission.

The Solar Mission was launched on the 11th January, 2010 by the Prime Minister. The Mission has set the ambitious target of deploying 20,000 MW of grid connected solar power by 2022 is aimed at reducing the cost of solar power generation in the country through (i) long term policy; (ii) large scale deployment goals; (iii) aggressive R&D; and (iv) domestic production of critical raw materials, components and products, as a result to achieve **grid tariff parity** by 2022. Mission will create an enabling policy framework to achieve this objective and make India a global leader in solar energy. This mission is one of the Six National Missions released by Hon'ble Prime Minister Dr. Manmohan Singh under an overall gamut of Sustainable Development of the Country. With reference to other National Missions the aspect of climate change also occupies an important position and the Himalayan Mission generally deals with that. It is also true that the impact of environmental pollution on account of Carbon emissions needs to be dealt aggressively, both from health point of view and the economics of monetizing carbon footprints credits.

While launching the mission the Prime Minister stated that "**Our vision is to make India's economic development energy-efficient.** Over a period of time, we must pioneer a graduated shift from economic activity based on fossil fuels to one based on non-fossil fuels and from reliance on non-renewable and depleting sources of energy to renewable sources of energy. We will pool our scientific, technical and managerial talents, with sufficient financial resources, to develop solar energy as a source of abundant energy to power our economy and to transform the lives of our people."

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 emerging cost and technology trends, both domestic and global. The aim would be to protect Government from subsidy exposure in case expected cost reduction does not materialize or is more rapid than expected.

The immediate aim of the Mission is to focus on setting up an enabling environment for solar technology penetration in the country both at a centralized and decentralized level. The first phase (up to 2012- 2013) will focus on capturing of the low-hanging options in solar thermal; on promoting off-grid systems to serve populations without access to commercial energy and modest capacity addition in grid-based systems. In the second phase, after taking into account the experience of the initial years, capacity 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 use of the renewable 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 availability of international finance and technology.

The issues involved shall require conditions and capability

- To create favorable conditions for solar manufacturing particularly solar thermal for indigenous production and market leadership.
- To promote programs 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.

Whereas the above statements are specifically focused on the role of Solar Energy, it is pertinent to understand the overall energy basket in the country. Solar though, may appear as a small percentage, it's role is crucial and offers a big scope towards energy security as such.

In this connection, a report titled ‘The Rising Sun’ published by KPMG in September 2012 is relevant. In this report, they have stated that “The challenges in the power sector continue. India is facing a power deficit of 9 percent and this is likely to continue over the next few years. In many states, industries are facing upto 50 percent power cuts. The gap between the power purchase costs and the power tariffs has severely constrained the finances of state power utilities with net losses estimated at around INR 88,170 crore in 2012-13. India faced massive power black-outs in July, 2012 due to overdrawing and grid indiscipline. On the other hand, solar power costs have reduced rapidly in the last few years. Globally, the solar photovoltaic (PV) market has grown from around 9.5 GW in 2007 to 69 GW of cumulative installations by 2014. Accordingly, the solar PV industry has grown from USD 17 Bn in 2007 to USD 93 Bn in revenue by 2011.”

While, these statement is specific to solar energy scenario, it is pertinent to have a look on the **overall power situation** in the country.

India's installed power capacity as on 31-05-2013 = 2.25 lakh MW

The **projections** for the five year plan (2012 – 2017) and 13th five year plan 2017 are as under.

Particulars of Energy basket	2012 -2017	2017 - 2022
Total	3.32 lakh MW	4.50 Lakh MW
Coal, Oil and Gas (Thermal)	2.22 lakh MW (66% of total)	2.71 Lakh MW(60% of total)
Hydro	50.5 thousand MW (15% of total)	70.05 thousand MW(16% of total)
Renewable (wind, Biomass, Solar and Small hydro)	46 .0 thousand MW (13% of total)	76.50 thousand MW(17% of total)
Nuclear	10.1 thousand MW (3% of total)	40.60 thousand MW (9% of total)

Reference – Article “Solar Energy” – A Solution of Power Requirement of India by Mr. C.R. Prasad (Former CMD, GAIL (INDIA) Limited

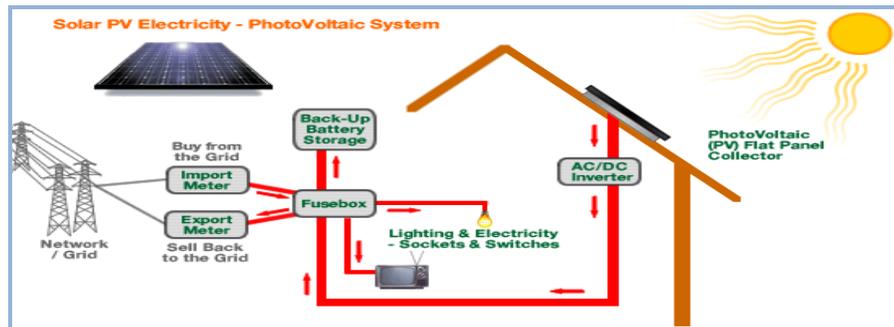
By 2030, India is planning to increase the power generation capacity to 8 lakh MW to achieve an expected GDP growth rate of 8%.

Our neighbor China has already made tremendous progress in power generation and installed capacity of 10.7 lakhs MW two years back. Over the next few years, the share of solar energy in the total basket shall change.

It is a well known fact solar energy is a radiant light and heat from the Sun and its harness using a range of ever evolving technologies such as Solar Heating, Solar Photovoltaic, Solar Thermal, Solar Architecture etc. Solar techniques include use of Photovoltaic Panels and Solar Thermal Collectors to harness the energy.

The Earth receives 174 Peta Watts (PW, 1 PW = 10 to the power of 15) of incoming solar radiation at the upper atmosphere. Approximately, 30% is reflected back to Space while the rest is absorbed by Clouds, Oceans and Landmasses. The amount of Solar Energy reaching the surface of the Planet is so vast that in one year it is about twice as much as obtained from all of the Earth's non – renewable resources of Coal, Oil, Natural Gas and mined Uranium combined. While the work done and progress made in different segments of Renewable Energy Sector has shown different results in different states. For instance, the installed capacity of solar plants in Gujarat is 824MW, in Rajasthan 442 MW, Maharashtra 34 MW, Andhra Pradesh 23MW, Tamil Nadu 17MW, Jharkhand 16 MW, Karnataka 14 MW, Odisha 13 MW and Uttar Pradesh 12 MW showing that a lot more potential is available to be harnessed not only in these states but also the once that have not been mentioned.

On the technology side the principle of harnessing solar power is indicated below in a simple diagram



If we look at the market scenario, we can see several dimensions in promoting solar energy. Some organizations deal with pure engineering and development of technology used in PV cells, and films on the panel arrays whereas the others look at **the preferential applications specific to the location as well as best mix of grid power, diesel generating sets and solar**. In fact it is the optimum mix which is economically viable on case to case business.

As investors, we are usually inclined towards short term gains and tend to put the uncertainty of unknown in the back bag .Whether the factors are geo- political, or purely wave oriented, the urge to change for the better remains as a driver in decision taking. Trends to use Solar and Wind in Europe particularly are encouraging growth in all the verticals of Renewable energy and the trends are clearly toward setting up segmented SMEs and then work on integrated solutions.

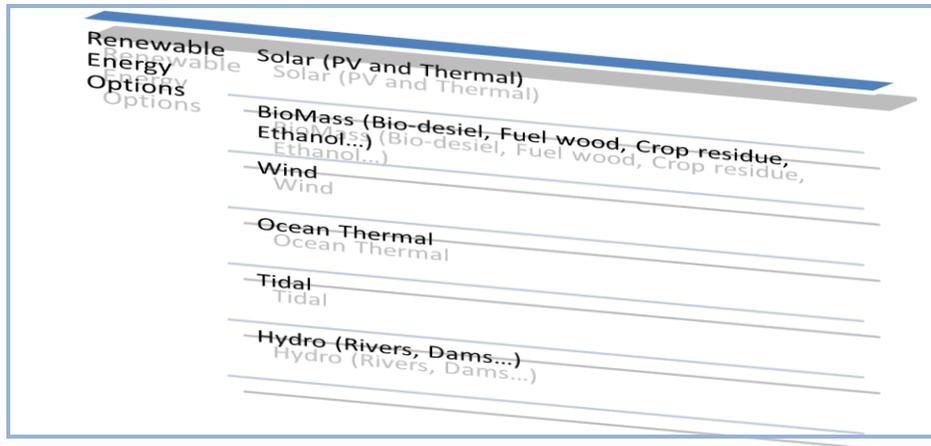
In our own country, we are being virtually crushed by spiraling price rise of Fossil Fuels and the uncertainty of swings on business relationships between USA, Mid East, SE Asia, Africa and so on, which are determining the shape of changing economies. Therefore, we have to find our own answers and harness those sources on which international influence is the least Nature is everyone's friend.

Solar Power is useful for roof top solar PV and other small Power plants connected to LT/11KV grid to replace conventional power and diesel based and generators. It is envisaged the distribution utility will pay the tariff for metered electricity generated from such applications.

Outside India, in US (California State in particular) there is a big lead being taken and they have launched for a program of million solar roofs under which the Capital grants are sanctioned to communities and attractive tariffs to home owners

Germany, China, Italy and Japan and some of other countries in Europe are progressing with development and targets for solar Energy as a new Source of electricity generation

While the need to optimize on the usage of alternate sources of energy is well recognized all over the world, the preference are obviously based on availability of specific source (wind, solar, ocean, small hydro etc.), the options can be as under



Way back in the year 2005, a document named Integrated Energy Policy was taken up by a high power committee, which in conclusion, gave the following recommendation for dealing with the challenging demand and supply gap in the country. Some of the recommendations are re - produced below.

- Reducing energy requirements – energy efficiency and conservation
- Augmenting energy resources and supply
- Accelerating power sector reforms
- Encouraging renewable and local solutions
- Promoting and focusing on energy R&D and security
- Creating and enabling environment and regulatory oversight for competitive efficiency

These recommendations in general and those which are solar applications specific should be the guiding factors for promoting the relevant options. Looking at the declining prices of solar energy and simultaneous rise in the cost of fossil fuels, it is evident that emphasis will swing more towards renewable sources of power. The KPMG report has given the following trends in the past which support this statement.

Solar Power Tariffs (INR/ kWh)

Exchange rate	Interest rate	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
		Grid Connected					
55	11%	8.34	8.07	7.59	7.3	6.95	6.55
50	10%	8.14	7.53	7.08	6.8	6.47	6.1
		Rooftop Connected					
55	11%	9	8.69	8.17	7.85	7.46	7.04
50	10%	8.79	8.14	7.65	7.34	6.98	6.58

Source: The Rising Sun - 2012, KPMG in India analysis

The trend of the market for various segments in solar energy is as under

Forecast of the solar power market in India

Distributed Generation		Utility Scale Projects	
Rooftop Market (Fast Approaching Grid Parity)	4000MW	Government Support Utility Scale Market	4000MW
Diesel Replacement (Driven by Economics)	2000MW	(phase II program of central Govt and State solar programs)	
Captive and REC markets (driven by solar renewable purchase obligations and Accelerated depreciation Market - shifting demand from wind power)			2500 MW
Total Solar Market Potential by 2016-17		12500 MW	

Source: The Rising Sun - 2012, KPMG in India Analysis

The Govt. on one side and the NGOs', educational institutions and public at large need to adopt the practices within their reach. The corporate in the capacity of large users should allot special budgets for this purpose there by reducing the costs on long term basis. There is strong case for the building sector to keep special allocation for the energy efficient buildings right in the initial stage.

In Summary – Renewable energy is key to our future and Harnessing Solar Energy should be a the way forward for “Go-Green” for every Individual or Corporate – an old saying “Make Hay While the Sun Shines”.

About The Author :

*A graduate in Petroleum Engineering (1961) from Indian School of Mines, Dhanbad, he started his career with **Oil and Natural Gas Commission** as a Reservoir Engineer, and graduated to become a Production Engineer in Oil Fields of Western Region*

His next sojourn was a Post Graduate program run by ENI School Milan (Italy). He visited the Gas Fields in Offshore Adriatic and also the Offshore Fields in Persian Gulf. During this period he got special trainings in NITIE and Indian Institute of Management Ahmadabad as well as Administrative Staff College Hyderabad. As General Manager he practiced Personnel & Administrative function in Bombay Offshore project, Central Region Calcutta, Corporate Head office at Dehradun and as in-charge of Tripura Project.

After becoming Group General Manager in 1993 he was appointed as Director Personnel in Power Grid Corporation, where he got exposed to Top Level nuances of Power Sector and Telecommunication Business besides his core strength as HR expert.

*After superannuation he worked as Senior Advisor/consultant for several organizations on training and higher education assignments such as S.P. Wahi Technology and Management Consultant, AMITY University and University of Petroleum and Energy Studies. While on these assignments he developed a **great interest in sustainable development, climate change and Energy Management including renewable applications, and has written several papers and presentations.***

*At an age of 76 and more than 52years of experience he is often seen on several **Energy (Conventional and Non-Conventional) fora** as a veteran participant/ guide. He is an avid writer and voracious reader besides his other hobbies.*