

RENEWABLE ENERGY PRESENT SCENARIO AND RURAL PERSPECTIVES

Narendra Kumar Mishra

India will emerge as a major country utilizing the roof space for solar rooftop systems on a very large scale. The target of 40 GW roof top solar by 2022 (set by Govt of India) will result in abatement of about 6 crore tonnes of Carbon dioxide per year and will help fulfill the Indian commitment towards its contribution in mitigating the effect of the climate change.

There is now a growing awareness amongst the scientific community and the civil society on the need for a global energy future with distinct departure from past trends and patterns of energy usage. So far the predominant route of energy value chain comprises of generation of steam to rotate turbine, from burning of fossil or nuclear fuels. The energy that is used for generation of power finds its application in various economic activities and house-hold uses.



Economic growth drives the energy demand. But contrary to the trend in other developed and developing countries, total primary commercial energy requirement in India has been falling with respect to the growth in GDP largely because higher energy prices have encouraged efficient use.

However, the energy elasticity of GDP growth in India may not fall as much in the future as rising income levels will encourage life style changes that are more energy intense. Energy is central to reducing poverty and providing vital facilities in the area of health, literacy, governance and equitable growth. However it is not the energy per-se that is used for any activity or process, rather it is energy service that creates value addition.

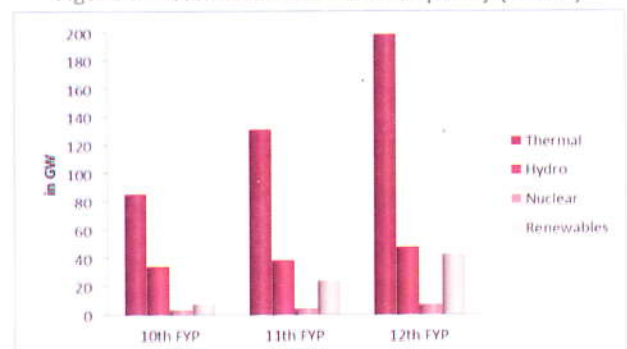
There is thus an undeniable relation between access to high quality energy services with human development and standard of living. Inadequate and unequally distributed energy services create hindrance for employment generation and acts as a constraint to education and health services.

Power Scenario in India

India has the fifth-largest power generation portfolio worldwide. Around 60 per cent of India's current power generation capacity is coal based. The country has been rapidly adding capacity over the last few years with total installed power capacity growing to 272.5 GW. India has grown from being the world's seventh-largest energy consumer in 2000 to the fourth-largest one within a decade. Economic growth and increasing prosperity, coupled with factors such as growing rate of urbanization, rising per capita energy consumption and widening access to energy in the country are likely to further raise the energy demand in the country.

The following figure depicts the installed capacity at the end of the Tenth and Eleventh Five Year Plan (FYP). It also shows the source wise capacity addition plans under the Twelfth FYP-

Figure 1 – Cumulative Installed Capacity (in GW)



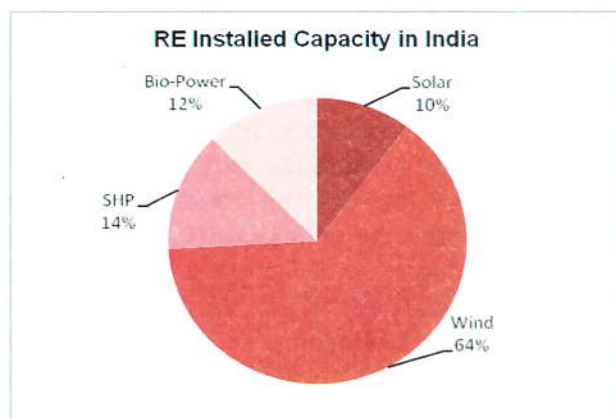
Source: EY Analysis

Renewable Energy (RE) Scenario in India

India's renewable power generation portfolio stands at 35.8 GW out of the total 272.5 GW power generated in the country, as on May 2015. As per the present estimates, India has an estimated RE potential of about 895 GW from commercially exploitable sources. Although the share of RE in the generation mix has been rising over the years, India still has large untapped RE potential.

India has vast RE potential through wind, solar, biomass and small hydro which is concentrated in certain parts of the country. The wind and solar potential is mainly in the southern and western states viz. Tamil Nadu, Karnataka, Andhra Pradesh, Maharashtra, Gujarat and Rajasthan. The following illustration summarizes the current split of installed RE capacity in India-

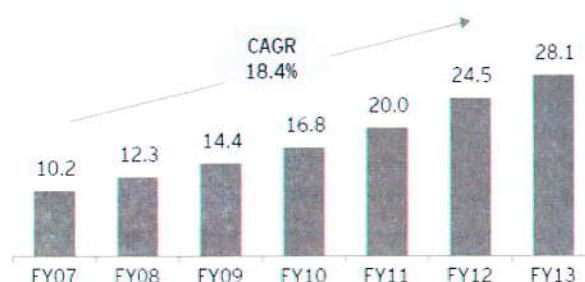
Figure 2 - Installed Renewable Energy Capacity in India (May 2015) [2]



Renewable Energy Targets in India

The Central Energy Authority (CEA) has made an assessment of capacity addition of 32 GW (wind/ solar/small hydro) likely to come up during the 12th Plan (2012 - 2017). The following graph depicts that at the current rate of growth, this target of 32GW of installed RE capacity by 2017, is achievable.

Figure 3 - Growth of Installed Capacity of RE in India (in GW)



Source: MNRE
Note: includes wind, solar, biomass (incl. bagasse) and small hydro. Excludes large hydro.

The following table compares the targets and actual installed capacity of RE in India since the beginning of the 12th Five Year Plan-

To put things in perspective, planned renewable capacity additions during the 12th FYP are almost one-third of the planned conventional energy capacity addition during the same period. In FY 2011 and 2012 the RE installations have exceeded the targets. In FY 2013 and FY 2014

Table 1: RE Targets and Actual Installed Capacity

Renewable Energy	2010-11		2011-12		2012-13		2013-14		2014-15	
	Target (MW)	Actual (MW)	Target (MW)	Actual (MW)	Target (MW)	Actual (MW)	Target (MW)	Actual (MW)	Target (MW)	Actual (MW)
Wind Power	2,000	2,350	2,400	3,197	2,500	1,699	2,750	512	3,000	2,312
Small Hydro	300	307	350	353	350	237	400	54	400	251.61
Bio Power	472	474	475	488	400	472	400	-	520	45
Solar Power	200	27	200	905	1000	754	1,000	75	2000	1117
Total	2,972	3,158	3,425	4,943	4,250	3,162	4,550	641	5,920	3,726

Source: EY Analysis

targets were not met, primarily as a result of decline in wind installations.

A road-map for integrating the envisaged RE production capacity into the electricity grid and its adaption to future requirements was prepared in July 2012 by Power Grid Corporation of India Limited (PGCIL) on behalf of the Ministry of New and Renewable Energy (MNRE). Considering India's RE potential and the target of 175 GW of additional capacity installation by 2022, it is estimated that the RE sector will require significant financing.

Solar power is also a prominent feature in India's Intended Nationally Determined Contributions (INDC) at the recently held Conference of Parties (COP) in Paris, France. India intends to achieve 40 percent cumulative electric power installed capacity from non-fossil fuel based energy resources by 2030, as one of ways to curb global temperature increase. Given the abundance of solar energy in the country, solar power is going to occupy a considerable share in this goal.

Programme/ Scheme wise Physical Progress in 2015-16 (Up to the month of February, 2016)			
Sector	FY- 2015-16		Cumulative Achievements
	Target	Achievement	(as on 29.02.2016)
I. GRID-INTERACTIVE POWER (CAPACITIES IN MW)			
Wind Power	2400.00	1773.68	25217.29
Solar Power	1400.00	1788.10	5547.21
Small Hydro Power	250.00	139.05	4194.40
Bio-Power (Biomass & Gasification and Bagasse Cogeneration)	400.00	400.00	4826.53
Waste to Power	10.00	0.00	115.08
Total	4460.00	3720.18	39900.51
II. OFF-GRID/ CAPTIVE POWER (CAPACITIES IN MWEQ)			
Waste to Energy	10.00	14.13	160.16
Biomass (non-bagasse) Cogeneration	60.00	49.50	652.37
Biomass Gasifiers	2.00	0.20	18.15
-Rural	6.00	8.67	160.57
-Industrial			
Aero-Genrators/Hybrid systems	0.50	0.15	2.67
SPV Systems	50.00	81.00	307.31
Water mills/micro hydel	2.00	0.00	17.21
Total	130.50	153.65	1318.44
III. OTHER RENEWABLE ENERGY SYSTEMS			
Family Biogas Plants (numbers in lakh)	1.10	0.50	48.48
Solar Water Heating – Coll. Areas (million m2)	-	0.00	8.90

Source: MNRE

Rural Perspectives

The 2011 Census estimates that almost 85 per cent of rural India depends on solid fuels for their cooking needs. This number alone is an indicator of challenges facing various energy policies and programs in India. In case of electricity, although a majority of rural households have a grid connection but the mere extension of grid does not guarantee access to reliable electricity. In India, the rural-urban gap in energy access levels has been significant. This indicates the need and importance of fast tracking access to energy especially in the rural India.



Indian government has also focused its attention on rural clean energy sector by supporting distributed generation in the form of community-based, self-sufficient biomass and solar power. **Government of India is all set to scale up the targets set up for Jawaharlal Nehru National Solar Mission from 20 GW to 100 GW by 2022. National Solar Mission also has an ambitious goal of providing 2 crore solar lighting systems in place of kerosene lamps to rural communities.**

Some of the areas of opportunities in India in the rural electrification are as follows.

- Photovoltaic (PV) home lighting systems & products
- PV Mini-grids
- PV pumping

Low Cost Solar Lanterns

Solar lanterns are increasingly finding applications in the rural areas for lighting

purpose with key features such as LEDs, mobile charging, battery back-up etc. These lanterns are environment-friendly and can be immensely useful for children's study besides household and other economic activities. They have a huge potential to replace currently used kerosene lamps thus reducing the subsidy burden of kerosene. However, their price continues to be prohibitively high for the rural population.

Hence, Solar Energy Corporation of India (SECI) has embarked on development of 6 Lakh robust and efficient solar lanterns for distribution in the rural areas of the country. This is with a view to safeguard customers from spurious and unreliable products flooding the market and to have competitive pressure on high prices so as to achieve large scale rapid diffusion of solar lanterns in the rural areas across the country.

Microgrids are modern, small-scale versions of the centralized electricity system. They are very effective for achievement of community-level electrification in remote areas using renewable energy sources and have a low carbon footprint. Microgrids generate, distribute, and regulate the flow of electricity to consumers locally. Microgrids are an ideal way to integrate various renewable resources and allow for community participation in the electricity enterprise.

Ministry of Power is the nodal ministry for the extension of the centralized grid electrification system in the country; it has also been instrumental to promote renewable energy-based mini-grids to electrify remote and far-off areas. **The MNRE started promoting mini-grids under the off-grid electrification programmes during the late nineties and early part of 2000 to cover villages that are unlikely to be covered through grid extension. At that time, the Government of India, estimated that there were around 25000 remote villages which will be difficult to connect through grid-supplied systems. Therefore, renewable energy-based mini-grids or stand-alone systems were considered to electrify these identified remote villages.**

Irrigation Pumps

India's new government led by Prime

Minister Shri Narendra Modi, has announced that it wants to provide electricity to all households by 2019. This is a challenging task, considering that only 55.3 per cent rural households and 67.2 per cent households across the country have access to electricity as per the 2011 Census. 43.2 per cent of rural households and 6.5 per cent urban households use kerosene for lighting and around 30 crore Indians still have no grid power. Another 30 crore have only very unreliable grid power. Most of them live in rural areas.

Most of the rural population depends on diesel and kerosene for energy. Diesel pumps however have three disadvantages. First their fuel is costly; second, they deplete the water table more than necessary by pumping heavily at short intervals and third, they create local pollution and carbon emissions. Agriculture sector consumes a significant portion of overall electricity (20 per cent) in India and irrigation pump sets contribute a significant share (90 per cent) to the overall electricity consumption in agricultural sector.

Solar based pumping systems and solar light and off grid solar panel would be better on all accounts. India is witnessing an increase in solar energy application in agricultural sector. 1,38,267 solar pumps have been sanctioned in the country out of which 34,941 pumps have been installed till date. Rajasthan leads the list followed by Punjab, Madhya and Uttar Pradesh. For drinking water, the government has sanctioned 15,330 solar water pumps, out of which only 200 pumps have been installed.

Solar energy is best options for rural population. Though, renewables have long been seen as a solution to ending energy poverty, but for decades, the products were too expensive and unreliable. All that has changed in recent years. Prices of solar PV have come down drastically and advances in battery and LED lighting technology has created a growing industry that puts power generation directly in the hands of rural citizens rather than an unreliable energy grid.

Solar based electricity and solar based irrigation pumping facility has created livelihood and income generation opportunities for the local population. Reliable electricity in the evening has also improved educational opportunities for

village children and has provided much needed safety on the streets after sunset.

Roof Top Solar – Off Grid

A large potential is available for generating solar power using unutilized space on rooftops in buildings and huts. Government is encouraging installations of solar power systems, particularly on rooftops, all over the country including on railway stations and airports. Solar power generated by each individual household, industrial, institutional, commercial or any other type of buildings, can be used to partly fulfill the requirement of the building occupants and surplus, if any, can be fed into the grid. So far, 26 states have notified their regulations to provide Net Metering /Gross Metering facilities to support solar rooftops installations.

India will emerge as a major country utilizing the roof space for solar rooftop systems on a very large scale. The target of 40 GW roof top solar by 2022 (set by Govt of India) will result in abatement of about 6 crore tonnes of Carbon dioxide per year and will help fulfill the Indian commitment towards its contribution in mitigating the effect of the climate change.

A robust national framework for implementation and funding support for states would be critical to achieve these targets. A dedicated nodal agency at the centre to co-ordinate effectively with state level agencies could help. A vast awareness and marketing campaign would be required as well as a significant push in capacity building at the local level for installation, operation, maintenance and repair of such systems. Of course, the state would not have to do everything by itself. In fact, it should not. Instead, it should allow a competitive ecosystem of private companies, investors and banks to do most of the legwork.

In fact, sky is the limit and future indeed is sunny, only if we take the right steps, making effective use of learning from innovative rural projects and initiative.

(The author is working with a leading industry body in the area of Energy & Natural Resources. Email: narendrakumar.mishra@gmail.com)