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How India can achieve the target of 40% energy by renewable energy sources by 2030

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Abstract: **-- The paper deals with the potentially tapped and untapped potential of Renewable sources or non-fossil fuels sources in India which can help India to achieve Agenda- 2030, I.e Achieving 40% of its total energy consumption demands by non fossil fuel sources.**

Index Terms**: -- Solar Energy, Geothermal Energy, India, Hydro-electricity, Urban Infrastructure, Real Estate, Renewable Energy**

I. INTRODUCTION

EAM Sushma Swaraj is her orientation in 71st UNGA said that India is looking to achieve 40% of its total energy consumption through non-fossil fuels by 2030. India's expected power consumption by 2030 is 4 trillion Units (Source: Economic times/ Mckinsey.com) Expected output from Non Fossil Fuels: 1.6 Trillion units(1600 kWh)

What should be the plan?

Hydro Electricity:

Costa Rica boasts 99% energy consumption from Renewable sources out of which 80% of the total power is generated from Hydro Electric power stations. India is gifted with immense Hydro Electric potential. During 2014-15, the total Hydro Electricity generation in India was 129 billion kWh at 60% capacity factor producing a total of 14% of India's total Power generation. If India is to achieve the target of 40% energy through non-fossil fuel sources the Hydroelectric Power must play a greater role. The total production by Hydro electric power plants must rise up-to 25-30%, i.e 400-480 billion units of electricity. This can be achieved by:

- By improving the capacity factor up to 85% like Canada.
- Construction of new dams
- Improving the efficiency of existing dams.

Capacity Factor is the ratio of the actual output of the plant by the potential output if the plant runs on its peak capacity. Capacity Factor depends mainly on two factors: Type of Fuel used and Design of the plant. The plant may be capable of producing electricity, but its "fuel" (wind, sunlight or water) may not be available. A hydroelectric plant's production may also be affected by requirements to keep the water level from getting too high or low and to provide water for fishes downstream.

Solar Energy:

Unlike Costa Rica, India is blessed with a better potential to generate power using solar energy. India is ranked number one in terms of solar electricity production per watt installed, with an insolation of 1700 to 1900 kilowatt hours per kilowatt peak. India currently has an installed capacity of 8,062 MW and the target is to increase the capacity up to 100,000 MW by 2022. if this target is achieved, India would be able to generate at around 22000 to 25000 kWh capacity. In India 1.33 million solar power plants can be implemented on 1% of its land (32,000 sqm).

Ministry of New and renewable Energy (MNRE) has drawn a scheme to set up number of solar parks across various states in the country, each with a capacity of Solar Projects generally above 500 MW. The Scheme proposes to provide financial support by Government of India to establish solar parks with an aim to facilitate creation of infrastructure necessary for setting up new solar power projects in terms of allocation of land, transmission and evacuation lines, access roads, availability of water and others, in a focused manner.

Government has Scheme for setting up at least 25 solar parks each with a capacity of 500 MW and above with a target of over 20,000 MW of solar power installed capacity in a span of 5 years from 2014-15 to 2018-19; with an estimated Central Financial Assistance(CFA) of Rs.4050.00 cr.

Also, around 5000 trillion kWh of solar radiations are incident on India per year with a potential of 0.25 kWh/m2. The need of the hour is to maximize the solar potential of India by implementing more schemes like this and make it a bigger contributor in generation of Renewable energy.

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Wind Energy:

While Costa rica only gets 2.1% of its power from wind energy, India, on the other hand, has the 4th largest installed wind capacity in the world behind China, USA and Germany.. In 2009-10, India had the largest growth rate among the top four countries. As of 31 July 2016, the installed capacity of wind power in India was 27,441.15 MW, however, an Offshore Wind Policy was announced in 2015 and presently weather stations and LIDARs are being set up by NIWE at some locations.Wind power accounts nearly 8.6% of India's total installed power generation capacity and generated 28,604 million Kwh (MU) in the fiscal year 2015-16 which is nearly 2.5% of total electricity generation. If India is to achieve the target of 40% by 2030, the total output should cross more than 5%.

Waste to Energy:

Every year, about 55 million tonnes of municipal solid waste (MSW) and 38 billion liters of sewage are generated in the urban areas of India. It is estimated that the amount of waste generated in India will increase at a per capita rate of approximately 1-1.33% annually. If India is to achieve the target, then the % of Waste to energy can not only help India in achieving the target but will also pave the way for effective waste management.

Geothermal Energy:

While Costa Rica accounts for than 12% of its renewable energy from geothermal energy, it is still an untapped area in India. Geothermal energy is the natural heat of earth. In India, exploration and study of geothermal fields started in 1970. The GSI (Geological Survey of India) has identified 350 geothermal energy locations in the country. The most promising of these is in Puga valley of Ladakh. The estimated potential for geothermal energy in India is about 10000 MW. This is the most promising way to cope up the demand for non-fossil fuel energy and Indian govt must take necessary steps like Flash Thermal Plant and Binary Plant to explore this potential.

Flash Steam Power Plants are the most common form of geothermal power plant. The hot water is pumped under great pressure to the surface. When it reaches the surface the pressure is reduced and as a result some of the water changes to steam. This produces a ‘blast’ of steam. The cooled water is returned to the reservoir to be heated by geothermal rocks again. Binary cycle geothermal power generation plants differ from Dry Steam and Flash Steam systems in that the water or steam from the geothermal reservoir never comes in contact with the turbine/generator units. Low to moderately heated (below 400°F) geothermal fluid and a secondary (hence, "binary") fluid with a much lower boiling point that water pass through a heat exchanger. Heat from the geothermal fluid causes the secondary fluid to flash to vapor, which then drives the turbines and subsequently, the generators.

How efficient Real Estates and Urban Infrastructures can help in achieving this target:

Zero Garbage Buildings:

When planning for waste management, what may first come to mind is human waste and trash. However, buildings generate waste well before any ground is broken. It starts in the design firm’s office by way of discarded drawings, as well as with the conversion and transmission wastes in sending electricity to power-hungry office equipment. When the building reaches its end of life, demolition will generate even more waste. In the construction phase, waste must be completely diverted from the landfill. Once in operation, a building must generate energy on site and adhere to strict consumption limits. Garbage and food scraps must be recycled to the extent possible. Project teams are encouraged to consider closed-loop water recycling systems, which reduce water usage and eliminate wastewater discharge. Some teams separate the three wastewater streams—black-, gray-, and stormwater—and address each individually. The possibilities are many, but so are the complexities. One challenge is regulatory barriers, Sturgeon says. Many municipalities heavily regulate or even ban onsite treatment of graywater or blackwater.

Zero Waste Kovalam is an attempt to implement zero waste concepts at a tourist beach destination in Kerala, India. The project was conceived and launched as a fall out of an anti waste incineration campaign launched by Thanal in 1996. The project was drawn in 2001 focusing on building capacity and relationship among the local community for lobbying for better resource management policies, generating clean and sustainable employment through discards recovery and material substitution.

India needs more buildings like this to achieve this target. It will not only help in efficient waste management but can also act a catalyst to the energy demand.

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Installing Solar Panels in Societies and Commercial Buildings (Solar Rooftop System):

In a solar rooftop system, the solar panels are installed in the roof of any residential, commercial, institutional and industrial buildings. This can be of two types (i) Solar Rooftop System with storage facility using battery, and (ii) Grid Connected Solar Rooftop System. Such rooftop systems have battery as storage facility. Such rooftop systems can be installed at the roofs of residential and commercial complex, housing societies, community centers, government organizations, private institutions etc. The average cost of grid connected rooftop solar systems is about Rs. 80 per watt or Rs. 8.0crore per MW capacity. There is a provision of Central Financial Assistance of 15% of the total cost or Rs. 12 per watt or Rs. 1.20 crore per MWp under the Grid Connected Rooftop and Small Solar Plants Programme of the Ministry. This CFA has been reduced from 30% to 15%. It also requires less area as about 10sq.m area is required to set up 1 kWp grid connected rooftop solar system. According to a study conducted by TERI, a potential of 124 GWpSPV Rooftop plants has been estimated in the country. This can be achieved through active supports from the States.

Examples from India:

In a move that cuts the annual electricity bill by 90% thereby reducing carbon footprint, a residential complex at Lokhandwala, Andheri (West), has installed 120 solar panels atop its building lessening its dependency on the electricity grid.Installed last month at the 16-storeyed Cliff Tower apartment with 62 flats, the panels generate 30 kilowatt (kW) solar energy per hour that lights up its common areas, passage, terrace and compound lights and powers three lifts and five water pumps. An average household in Mumbai uses 2.5kW electricity every hour."Our monthly bill was Rs55, 000. After installing this clean energy source, we save Rs50, 000 every month. What we spent every month will now be spent in a year reducing our annual expenditure by 90%," said R Sahgal, secretary, Cliff Tower.The system allows excess electricity generated by the solar panels to be sent back to the grid, which is compensated by the electricity supplier at the end of the year.If the society generates 4,500 units of electricity per month via solar power vis-a-vis the requirement of 4,200 units, the additional 300 units will be carried over to the next month and so on.

With no maintenance fee required for 25 years, the society spent Rs 23 lakh to set up the project that will be recovered over the next four years. The panels generate 100% solar power during 10 months of the year, but there is a 35% decrease during cloudy days in July and August.

Thus, it can be seen that installing solar panels not only generates power through non-fossil fuel source but also reduces the demand of power.

High Rise Wind Turbine Projects:

A wind turbine is a device that converts the wind's kinetic energy into electrical power. Wind turbines can be placed in the roof of the high rise structures of commercial as well as residential structures. In India, the turbine is engineered for ease of integration and delivery to a wide range of locations, including those with challenging site conditions or poor wind resources. There are 1.5 MW turbine power projects in the states of Maharashtra, Karnataka and Tamil Nadu.

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