



# Present scenario and future prospects of Renewable energy Resources in India

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## ABSTRACT

The development of renewable energy sources is compulsory for the sustainable development of any country due to depleting fossil fuel level, climbing fossil fuel prices across the India and more recently pressure for truncation emission level. The potential for renewable energy resources is enormous by virtue of they can exponentially exceed the India energy demand; consequently, these types of resources will have a consequential share in the future ecumenical energy portfolio. In such a scenario, availability of secure, reliable and efficient power is crucial for sustaining current development and economic magnification trends. India is struggling to meet electric power authoritative ordinances of the expeditious expanding economy. In the Paris agreement, India has committed to an intended national determined contributions target of achieving 40% of its total electricity generation from non-fossil fuel sources by 2030. The country is aiming for even more zealous target of 57% of the total electricity capacity from renewable sources by 2027 in central electricity authority's strategy blueprint. According to 2027 blueprint, India aims to have 275 GW from renewable energy, 72 GW of hydroelectricity, 15 GW of nuclear energy and proximately 100 GW from "other zero emission" sources. This paper presents how renewable energy resources are currently being utilized, scientific developments to amend their utilization, their future prospects, and their deployment

**KEYWORDS:** Conventional Energy, Non – Conventional Energy, Environment, Solar, Fossil fuels.

## INTRODUCTION:

In India today, we face both, an environmental crisis and a developmental crisis. On the one hand, we are still struggling with the quandaries of inequality, perviousness and ameliorating human development be speakers. On the other, environmental pollution and ecological eradication is now a runaway quandary. Both these crises are withal interacting and reinforcing each other. This is best reflected in our energy sector.

India suffers from chronic energy impecuniosity. Officially, about 300 million people have no access to electricity. But if we consider the fact that about three-fourths of rural households connected to the national grid have erratic and less than six hours of electricity supply, then about 700 million people in the country can be termed as electricity poor. Similarly, about 700 million Indians use biomass such as dung, agricultural waste and firewood as their primary energy resource for cooking. These fuels cause indoor pollution and increment the encumbrance of disease of the womenfolk. The estimated economic encumbrance of utilizing traditional fuels, including health cost and lost economic opportunities due to poor inculcation of girl children, is estimated to be Rs 30,000 crore. About two-thirds of Indians, consequently, are still deprived of modern energy accommodations.

India is largely dependent on coal to meet its energy needs. Coal meets more than 50 per cent of the current commercial energy needs and engenders more than 70 per cent electricity. We are the third most immensely colossal engenderer of coal in the world after China and the USA. But the energy from coal comes at an astronomically immense environmental and health cost.

The challenge for India is how to meet its energy requisites without compromising the ecology of the country. In integration, we have to be mindful of the looming hazard of climate change. Climate change is already impacting the dihydrogen monoxide and agriculture sector of the country. We cannot afford to let ecumenical temperature ascend exceed 2 degrees Centigrade from the pre-industrial era. Even 2 degrees would devastate many vulnerably susceptible communities and ecosystems. India ergo must work with other countries to truncate greenhouse gas emissions and control the ascending temperature. In such a situation, we ourselves cannot have a fossil fuel-ascendant energy future.

Energy is regarded as the most consequential building block in human development and it is a key factor that influences the sustainable development of any nation. The avails on truncating reliance on coal and other fossil fuels. With the expansion of renewable energy, India can ameliorate air quality, truncate ecumenical warming emissions, engender incipient industries and jobs, and avail to move world towards a cleaner, safer, and affordable energy. Renewable energy is the energy accumulated from renewable resources, which are naturally replenished on human timescale such as sunlight, wind, rain, tides, waves and geothermal heat. Energy is regarded as the most consequential building block in human development and it is a key factor that influences the sustainable development of any nation. The conventional sources have a dismaying shadow on our present and future ecumenical safety, environmental values, health and

society in general. Hence, there is an imperative need to promote renewable energy in Indian power sector. It is the cleanest source of energy with least carbon emissions or pollution.

### **Current Scenario of Renewable Energy in India:**

India's population of more than 1030 million is growing at an annual rate of 1.58%. As fossil fuel energy becomes scarcer, India will face energy shortages significantly due to increment in energy prices and energy insecurity within the next few decenniums. Incremented utilization of fossil fuels withal causes environmental quandaries both locally and ecumenically.

There is a very high demand for energy, which is currently satisfied mainly by coal, peregrine oil and petroleum, which apart from being a non-renewable, and ergo non-perpetual solution to the energy crisis, it is additionally detrimental to the environment. Thus, it is imperative that India obtains energy security without affecting the booming economy, which would denote that the country must switch from the non-renewable energy (crude oil and coal) to renewable energy.

The 2022 electrical power targets include achieving 227GW (earlier 175 GW) of energy from renewable sources, proximately 113 GW through solar potency, 66 GW from wind puissance, 10 GW from biomass potency, 5GW from minuscule hydro and 31GW from floating solar and offshore wind potency. The bidding process for the further supplemental 115 GW or thereabouts to meet these targets of installed capacity from January 2018 levels will be consummated by the cessation of 2019-2020. The regime has promulgated that no incipient coal-predicated capacity additament is required beyond the 50 GW under different stages of construction liable to come online between 2017 and 2022.

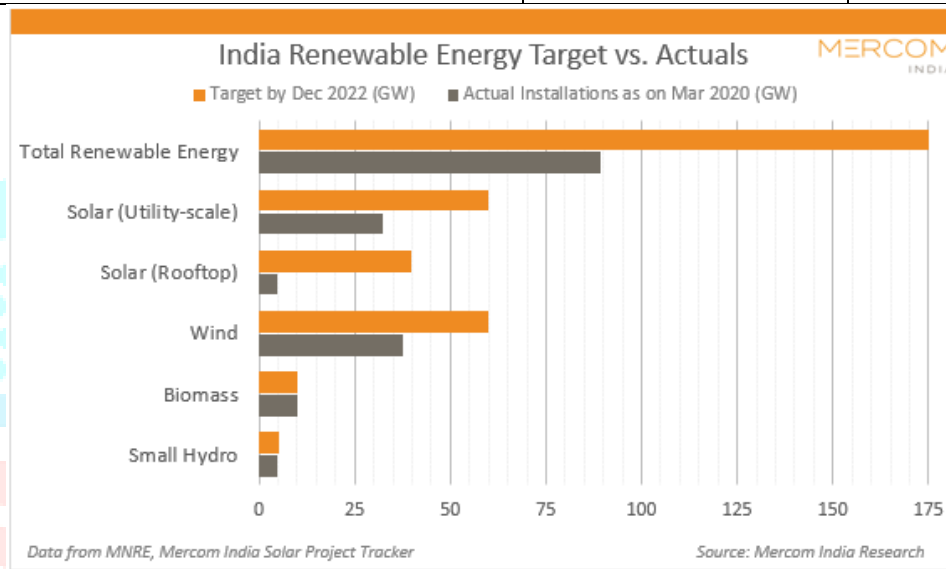
### **Overview of Renewable energy in India**

The Indian Regime has been at work, making a comprehensive policy for compulsory utilization of renewable energy resources through biomass, hydro-potency, wind, solar and municipal waste in the country, concretely for commercial establishments, as well as Regime establishments.

The major contribution to renewable energy investment emanates from private sector participation. This is due to the fortification from the regime, which leverages the private investment. Ministry of Non-conventional Energy Sources is fixated on nation-wide resource assessment, establishing of commercial projects, renovation and modernization, development and up-gradation of dihydrogen monoxide mills and industry predicated research and development. The Indian Regime has incremented the target of renewable energy capacity to 175 GW by the year 2022 which includes 100 GW from solar, 60 GW from wind, 10 GW from bio-power and 5 GW from diminutive hydro-potency. Installed grid interactive renewable power capacity (omitting sizably voluminous hydropower) as

GRID-INTERACTIVE POWER (CAPACITIES IN MW<sub>p</sub>) as on 31.01.2021

Source	Total Installed Capacity (MW)	2022 Target (MW)
Wind Power	38683.65	60,000
Solar Power - Ground Mounted	34561.33	
Solar Power - Roof Top	4232.74	
Biomass (Bagasse) Cogeneration)	9373.87	10,000
Biomass (non-bagasse) Cogeneration)/Captive Power	772.05	
Waste-to-Power	168.64	
Small Hydro Power	4758.46	5,000
<b>Total</b>	<b>92550.74</b>	<b>1,75,000</b>

**Biomass:**

In recent years, the interest in utilizing biomass as an energy source has incremented and it represents approximately 14% of world final energy consumption. Estimates have betokened that 15–50% of the world's primary energy use could emanate from biomass by the year 2050. Many countries have included the incremented utilization of renewable sources on their political agenda. Biomass is one such resource that could play a substantial role in a more diverse and sustainable energy commix. Energy engenderment from pabulum wastes or pabulum processing wastes, especially from waste edible oils, seems to be alluring predicated on bio-resource sustainability, environmental aegis and economic consideration.

Biomass power generation in India is an industry that magnetizes investments of over Rs. 600 crores every year, engendering more than 5000 million units of electricity and yearly employment of more than 10 million man-days in the rural areas.

**Hydropower:**

Hydro-power is another source of renewable energy that converts the potential energy or kinetic energy of water into mechanical energy in the form of watermills, textile machines, etc., or as electrical energy (i.e., hydroelectricity generation). It refers to the energy produced from water (rainfall flowing into rivers, etc.). Hydro-power is the largest renewable energy resource being used for the generation of electricity. Only about 17% of the vast hydel potential of 150,000 MW has been tapped so far.

In India, hydropower projects with a station capacity of up to 25 megawatt (MW) fall under the category of Small Hydropower (SHP). India has an estimated SHP potential of about 15,000 MW, of which about 11% has been tapped so far. The Ministry of New and Renewable Energy (MNRE) supports SHP project development throughout the country.

**Wind Energy:**

Wind energy is being developed in the industrialized world for environmental reasons and it has attractions in the developing world as it can be installed quickly in areas where electricity is urgently needed. In many instances it may be a cost-effective solution if fossil fuel sources are not readily available. In addition there are many applications for wind energy in remote regions, worldwide, either for supplementing diesel power (which tends to be expensive) or for supplying farms, homes and other installations on an individual basis.

Wind power accounts for nearly 10% of India's total installed power generation capacity and generated 52.67 TWh in the fiscal year 2017-18, which is nearly 3% of total electricity generation. The capacity utilisation factor is nearly 16% in the fiscal year 2017-18 (19.62% in 2016-17 and 14% in 2015-16). 70% of wind generation is during the five months duration from May to September coinciding with Southwest monsoon duration. In India, solar power is complementary to wind power as it is generated mostly during the non-monsoon period in daytime.

**Solar Energy:**

Solar energy is the most abundant energy resource on earth and it is available for use in its direct (solar radiation) and indirect (wind, biomass, hydro, ocean, etc.) forms. Solar energy, experienced by us as heat and light, can be used through two routes: the thermal route utilizes the heat for hydrogen monoxide heating, cooking, drying, hydrogen monoxide purification, power generation, and other applications the photo voltaic route converts the light in solar energy into electricity, which can then be utilized for a number of purposes such as lighting, pumping, communications, and power supply in unelectrified areas.

The Ministry of Incipient and Renewable Energy (MNRE) has orchestrated a detailed trajectory so as to meet the target of 100 GW by 2022. A capacity of 23.12 GW was installed up to July 2018. Projects of

around 10 GW are under implementation and tenders for supplemental 24.4 GW are issued. India has a good level of solar radiation, receiving the solar energy equivalent of more than 5000 trillion kWh/yr.

The MNRE, working in conjunction with the Indian Renewable Energy Development Agency (IREDA) to promote the utilization of all forms of solar power as well as to increase the share of renewable energy in the Indian market. This promotion is being achieved through R&D, demonstration projects, government subsidy programs, and also private sector projects.

Solar buildings have been promoted by the MNRE in an effort to increase energy efficiency; the state government in Himachal Pradesh has actively promoted the incorporation of passive solar design into building design. The Solar Photovoltaic Program (SPV) promoted by the Ministry for the past two decades, has been aimed particularly at rural and remote areas.

For past two years, the Indian Government has taken several initiatives such as introduction of the concept of solar parks, massive grid connected rooftop solar programme, earmarking of Rs.38,000 crore (Euros 4 billion) for a Green Energy Corridor, eight-fold increase in clean environment cess from Rs.50 per tonne to Rs.400 per tonne (Euro 0.62 to Euros 5 per tonne), solar pump scheme with a target of installing 100,000 solar pumps and programme to train 50,000 people for solar installations under the Surya Mitra scheme, no inter-state transmission charges and losses to be levied for solar and wind power, compulsory procurement of 100 per cent power from waste to energy plants, and Renewable Generation Obligations on new thermal and lignite plants, etc.

### **Solar Modules and Rooftop Solar**

The 2019 manufacturing capacity of solar cells and solar modules in India was 1,890 MW and 5,920 MW, respectively. Except for crystalline silicon wafers or cadmium telluride photovoltaics or Float-zone silicon, proximately 80 percent of solar-panel weight is flat glass. One hundred to 150 tons of flat glass is utilized to manufacture a one-MW solar panel. Low-iron flat or float glass is manufactured from soda ash and iron-free silica. Soda-ash manufacturing from prevalent salt is an energy-intensive process if it is not extracted from soda lakes or glasswort cultivation in alkali soil. To increment installation of photovoltaic solar-power plants, the engenderment of flat glass and its raw materials must expand commensurately to eliminate supply constraints or future imports.

Rooftop solar has been a key part of the recent renewables revolution around the world, and its appeal is pellucid residential, commercial and industrial buildings can engender their own electricity, which is green and potentially less extravagant than the puissance they draw from the grid.

## Geothermal Energy:

Geothermal is energy engendered from heat stored in the earth, or the accumulation of absorbed heat derived from underground. Immense amplitudes of thermal energy are engendered and stored in the Earth's core, mantle and crust. Geothermal energy is at present contributing about 10,000 MW over the world and India's diminutive resources can augment the above percentage.

The resource is minuscule utilized at the moment but the Regime has a zealous plan to more than double the current total installed engendering capacity.

## Other renewable energy technologies

Solar thermal technologies, particularly solar water heating system, solar cookers and solar generation systems are the most commercialized technologies among renewable energy technologies in India. Policies are set to provide further impetus to dissemination of solar technologies.

Biogas represents an alternative source of energy, derived mainly from organic wastes. In India, the use of biogas derived from animal waste, primarily cow dung has been promoted for over three decades now. Biogas is a clean fuel produced through anaerobic digestion of a variety of organic wastes: animal, agricultural, domestic, and industrial.

Biogas is the only technology that has put cooking in rural areas on technological ladder and has made cooking a pleasure with associated social and environmental benefits including zero indoor pollution. India's National Project on Biogas Development (NPBD) has been one of the well organized and systematic program to provide logistic and institutional support for that has been under implementation since early 1980s.

India Biogas program is one of the most successful program if we compare with other such program implemented in Rural India. The ultimate goal of this program is to set up biogas plants in around 12 million households that have enough cattle to maintain a regular supply of dung.

## Current renewable energy policies

- The ultimate objective of the renewable energy policy framework is to significantly increase the share of renewable energy source in India's energy mix. These energy policies are set by government.
- Provision of Renewable Purchase Obligation (RPO) under the National Tariff Policy.
- Notification of the long term growth trajectory of RPO for solar and non-solar energy for next years from 2016-17, 2017-18 and 2018-19.
- Development of Solar Parks and Ultra Mega Solar Power Projects.
- Development of power transmission network through Green Energy Corridor project.

- Making roof top solar as a part of housing loan provided by banks.
- Waiver of Inter-State Transmission Charges and losses.
- Repowering of Wind Power Projects for optimal utilization of wind resources.
- Offshore wind energy policy for development of offshore wind energy in the Indian Exclusive Economic Zone.
- Supporting research and development on various aspects of renewable energy including with industry participation.
- Financial incentives for off-grid and decentralized renewable energy systems and devices for meeting energy needs for cooking, lighting and productive purposes.
- Permitting 100 percent Foreign Direct Investment in sector through automatic route.
- The Government of India has set up a target of installing 175 GW capacities through renewables by 2022.

### **Future of renewable energy in India**

India, faced with twin challenges on energy and environmental front, has no option but to work towards increasing the role of renewable in the future energy systems. Renewable energy technologies vary widely in their technological maturity and commercial status.

In India, renewable energy is at the take-off stage and businesses, industry, government and customers have a large number of issues to address before these technologies could make a real penetration. India with large renewable energy resources (solar PV, wind, solar heating, small hydro and biomass) is set to have large-scale development and deployment of renewable energy projects.

- A new Hydropower policy for 2020-28 has been drafted for the growth of hydro projects in the country.
- The Government of India has announced plans to implement a US\$ 238 million (Euros 210 million) National Mission on advanced ultra-supercritical technologies for cleaner coal utilization.
- The Ministry of New and Renewable Energy (MNRE) has decided to provide custom and excise duty benefits to the solar rooftop sector, which in turn will lower the cost of setting up as well as generate power, thus boosting growth.
- Around 4.96 million household size biogas plants were installed in the country under the National Biogas and Manure Management Programme (NBMMP) by 2016-17.
- The Indian Railways is taking increased efforts through sustained energy efficient measures and maximum use of clean fuel to cut down emission level by 33 per cent by 2030.



**CONCLUSION:**

There is a clamant desideratum for transition from petroleum-predicated energy systems to one predicated on renewable resources to decrement reliance on depleting reserves of fossil fuels and to mitigate climate change. In integration, renewable energy has the potential to engender many employment opportunities at all levels, especially in rural areas. An accentuation on presenting the authentic picture of massive renewable energy potential, it would be possible to magnetize peregrine investments to herald a Green Energy Revolution in India.

To conclude, we can verbally express that India has plenty of renewable energy to bridge the gap between demand and supply so we must assiduously put in efforts to harness sundry forms of renewable energy sources with the utilization of more incipient technologies to compose an unsullied and safe place for our coming generations.

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