



Renewables - Energy of the Future



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With active support from government and innovative technological adoption, India is set to achieve the renewable energy targets much earlier than planned.

Rapid economic growth combined with faster urbanization led to an increase in energy demand. India has become the third largest producer of electricity in the world and the country now produces more electricity than Japan and Russia, which had 27% and 8.77% more electricity generation capacity installed than India about seven years ago. The massive development in the energy sector was sustained by transformational change in the government with supportive policy interventions as well as sector reforms. India's electricity production grew massively from a meagre 1362 MW after independence to reach 343.90 GW by the end of June 2018. It also recorded the phenomenal generation growth of 34% in last seven years to 2017. To meet the growing power demand in India, resource generation capacities are being enhanced continuously and coal based thermal power plants are still the main source of electricity. Wind

and solar generating capacity have also increased many folds over the past few years. In the last five years, India has put up 99.21 GW of additional capacity, of which 91.73 GW came from thermal sources, 5.48 GW from hydro, and 2 GW from nuclear sources. Towards the end of June 2018, India has generation capacity of 6.78 GW of nuclear energy, 45.40 GW of hydro energy and 69 GW of renewable energy including solar and wind. The Government of India's focus on attaining 'Power for all' has accelerated capacity addition in the country. A number of initiatives have been taken by the government to enhance the capacity, capability and efficiency for energy generation, transmission & distribution, and better management of power utilities in the country.

In order to fix the weakest link in the power value chain, the Ujwal Discom Assurance Yojna (UDAY) was rolled out to solve the present and potential future

problems of DISCOMS. Loss-making Discoms in the country have piled up debt to the tune of INR 4.8 trillion. Improvement in operations of several discoms is already visible via reduction in AT&C losses, power purchase cost, narrowing gap between cost and revenue and interest cost savings. The Deendayal Upadhyaya Gram Jyoti Yojana (DDUGJY) was launched to enhance rural electrification and modernization of transmission and distribution network including 100% metering and underground cabling. In strengthening sub-transmission and distribution systems, GARV-II, the mobile app provided real-time data of all rural electrification works across the country and significantly helped to track the progress of this scheme. The Integrated Power Development Scheme (IPDS) was launched to provide capital subsidy for strengthening and augmentation of the distribution system, reduction of AT&C losses, metering of distribution at transformers/feeders/consumers level, IT enabled energy accounting/auditing, improvement in billed energy based on metered consumption and collection efficiency.

The Unnat Jyoti by Affordable Lighting for All (UJALA) Scheme was launched to replace almost 770 million old-fashioned electric light bulbs with energy-efficient LED bulbs. Its purpose is not only to help reduce electricity bills of consumers but also contribute to energy security of India. Government seeks to reduce import of fossil fuels, boost underutilized power plants and to meet its climate change commitments through the Pradhan Mantri Sahaj Bijli Har Ghar Yojana (Saubhagya) scheme. With an aim to provide electricity to all families with provision of free electricity connection to poor families, this scheme will cover 30 million households, 25 million in rural areas and 5 million in urban areas.

Coal-based power plants account for more than 60% of India's total power production. In fact, India had spent a massive INR 60 lakh crore (US\$ 88 billion) on crude imports in 2017 which is going to increase by about 20% to US\$ 105 billion or INR 73 lakh crore this year. To cut down this cost substantially, it is vital to step up on the alternative energy sources.

Renewable Energy

Renewable energy is fast becoming a mainstream source of power across the world and so is in India. Continued research and technological advancements have significantly reduced the cost



of power from renewable sources. It is believed that the cost reduction trends will continue to make the renewable energy a self-sustained source of power in India without dependence on government subsidies. India has access to varied commercial sources of power generation including coal, natural gas, and oil, as well as unconventional sources such as solar, wind, hydro and biomass. With coal shortage and sources of domestic gas shrinking, it is becoming more difficult to augment thermal power plants and only viable option for India is to explore renewable energy sources for sustainability in a long run.

In 2017-18 about 11.88 GW of renewable energy was installed compared to 11.32 GW in previous year. The renewable energy installations in the country are progressively increasing and do not appear to be facing any major challenge at present. The Ministry of New and Renewable Energy is planning to achieve 175 GW of renewable energy generation by 2022 through 100 GW from solar, 60 GW from wind, 10 GW from biomass and 5 GW from small hydro power. Up to June 2018, 71.33 GW of renewable energy capacity has already been installed and to achieve the balance target of 103.67 GW, investment of around US\$ 76 billion has been estimated at present capital cost. Solar tariffs in India saw the lowest ever level of INR 2.44 per unit in reverse auctions carried out by Solar Energy Corporation of India (SECI) in May 2017, for 200 MW and again in July, 2018 for 600 MW. SPML Infra is executing rooftop solar power project in 4 States, Delhi, Haryana, Rajasthan, and Madhya Pradesh with

installation of 1000 KW rooftop solar power plants in each state.

The substantial growth of India's solar power generation over the past year is evident as more than 9.5 GW of solar projects were commissioned in 2017, accounting for approximately 45% of all new generation capacity added in India during the year. In the calendar year 2017, the total solar electricity generation in the country yielded over 21.5 billion units (BU) of electricity, a big leap in increase of over 86% from 11.6 BU generated in the year 2016. By June 2018, India's total solar power generation capacity was 21.65 GW. To achieve the target of 100 GW by 2022, we need to add about 20 GW of solar power every year from now.

From the first hydropower power plant of 130 kW established in 1897 in Darjeeling, India has 45.40 GW installed capacity by June 2018. Between 2012 and 2017, India's hydropower capacity addition target was 10.90 GW while only 5.47 GW was achieved. We still have to go a long way as hydropower potential of India is around 145 GW and at 60% load factor, it can provide around 85 GW of energy. The government's initiative of river linking will provide better opportunities for hydro power projects. SPML Infra has constructed 38 MW capacities of hydro power plants in Karnataka and Himachal Pradesh.

India's total wind energy capacity by June 2018 stands at 34.04 GW, just a little over half of the target of 60 GW fixed to achieve by 2022. The potential for wind power generation for grid interaction has been estimated at about 102.78

GW in India. Increasing efforts towards expansion of renewable energy have led to a substantial increase in the past years however; total power generated by renewable energy sources was only about 35% percent as thermal still makes up majority of power generation with 65%. Solar and other renewable energy sources still have a long way to go before claiming the crown.

Innovative Technologies

The greater focus of renewable energy developers are on the adoption of emerging new technologies. Some of the recent development in term of new technology includes wind-solar hybrids, electric vehicles, offshore wind, and floating solar power plants. During the last few years, significant development has been witnessed in these areas, paving the way for a promising future.

Several pilot projects of Wind-solar hybrids have been initiated after the release of the draft national Wind-Solar Hybrid Policy in 2016 and National Institute of Wind Energy (NIWE), Chennai have identified the sites. The policy has come into effect from 14th May, 2018 and more such projects will be implemented in coming times. The government of India has planned to tap the 350 GW of offshore wind power potential and Gujarat government has initiated to set up India's first offshore wind farm of 500 MW capacity in the Gulf of Kutch. The National Institute of Ocean Technology identified Kanyakumari and Rameswaram, off the coast of Tamil Nadu, as the two suitable sites for offshore wind projects and 50 wind turbines with a capacity of 3.4 MW each will be installed 5 km away from the coastline of these cities.

The new concept of floating solar power plants is picking up in developing countries and is being adopted by most states in India as well. Andhra Pradesh government is setting up a 100 MW floating solar power plant at the Penna

Ahobilam Balancing Reservoir in Ananthapuramu District. NTPC has commissioned 100 KW floating solar plant in Kayamkulam district, Kerala. Stall regulated and pitch regulated wind turbines are being deployed for grid-interactive power generation.

The world is quickly adopting to electric vehicles and in the next couple of decades, these are going to be more mainstream mode of transportation. The research agencies have predicted that nearly 35% of vehicles manufactured by 2030 would be electric vehicles and this number may increase to 55-60% by 2040 that would make India among the largest markets for electric vehicles in the world. To aid the government's National Electric Mobility Mission Plan, NITI Aayog released a proposal in November 2017 to develop electric vehicle charging infrastructure in Delhi. Several projects were tendered or commissioned over the past year, kick-starting the e-vehicles program.

The infrastructure development companies are now using drones that have huge potential for reducing O&M costs. Their ability to monitor long stretches of transmission lines, windmills, solar plants or even directly removing debris causing outages are significant within a friction of time and cost being deployed earlier. It is estimated that global demand for drones in the energy sector is expected to reach a cumulative market value of US\$ 4.47 billion between 2017 and 2025. All these developments point towards a promising future for emerging technologies that will enable higher efficiencies and reduce the country's carbon footprint.

Way Forward

The renewable energy sector in India is consistently growing and continues to remain attractive for companies and investors from across the world. Solar and wind is set to become a crucial component of India's energy portfolio in the

next few decades. Renewable energy will be a big part of India's development agenda and it is in the process of developing renewable energy technologies to ensure a sustainable power system for future. India climbed to the 2nd spot in E&Y attractiveness index for renewables and this could happen due to a combination of strong government support and increasingly attractive economics.

India also received its first green bond issuances and declared that it remains committed to the Paris Climate Accord and will combat climate change with all efforts it can and should take. India's targets under the Paris Agreement are focused on clean energy expansion, with an early goal of 100 gigawatts of installed solar energy by 2022.

The key features of India's Paris targets are:

- Reduce energy emissions intensity by 30% to 35% from 2005 levels by 2030;
- Increase the share of non-fossil fuel energy to 40% of India's energy mix by 2030;
- Focus on a climate adaptation strategy of enhancing investments in development programs in areas vulnerable to climate change, including health and disaster management;
- Create an additional carbon sink of 2.5 billion to 3 billion tonnes of carbon dioxide (CO₂) equivalent through increasing forest and tree cover by 2030.

According to an analysis by an independent agency, with the solar photovoltaic prices dropping considerably, India's target to achieve 40% renewable energy mix in the total installed capacity by 2030 will be achieved eight years early. If the nation's new draft electricity plan is implemented, India could even reach 57% renewable energy share in the country's energy mix by 2027. With an active administration at the helm, the renewable energy outlook of India is looking bright and futuristic. ■

